

ISSN-0976-0245 (Print) • ISSN-0976-5506 (Electronic)

Volume 10

Number 3

March 2019



Indian Journal of Public Health Research & Development

An International Journal

SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development
Scopus coverage years: from 2010 to 2018 Publisher:
R.K. Sharma, Institute of Medico-Legal Publications
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine:
Public Health, Environmental and Occupational Health

Cite Score 2017- 0.03

SJR 2017- 0.108

SNIP 2017- 0.047



Website:

www.ijphrd.com

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Print-ISSN: 0976-0245-Electronic-ISSN: 0976-5506, Frequency: Quarterly
(Four issues per volume)

Indian Journal of Public Health Research & Development is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

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Editor

Dr. R.K. Sharma

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Printed, published and owned by

Dr. R.K. Sharma

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Published at

Institute of Medico-legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)



Indian Journal of Public Health Research & Development

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Indicator of Dyslipidemia for Ischemic Stroke in Elderly with Hypertension

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ABSTRACT

Elderly with hypertension have a greater risk for ischemic stroke. It can be caused by dyslipidemia which is an abnormal amount of lipids in the blood such as increased levels of total cholesterol, LDL cholesterol, triglycerides and decreased levels of HDL cholesterol. The aim of this study is to analyze the indicator of dyslipidemia for ischemic stroke in elderly with hypertension. This study is an observational studies of analytical epidemiology with case control study design. The subject of study is the occurrence of ischemic stroke in elderly with hypertension who were admitted to outpatient installation RSU Haji Surabaya. The sample size for case and control samples were 74 patients. Samples were taken using simple random sampling methods. The data of total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides from patient medical records were analyzed using bivariate analysis ($p=0.25$) is selected as a candidate for the multivariate analysis with multiple logistic regression ($p=0.05$). Total cholesterol, LDL cholesterol and triglycerides are selected as a candidate ($p=0.00$, $p=0.18$, $p=0.18$). The results showed that the most influential independent variables and became a model to predict the incidence of ischemic stroke in RSU Haji Surabaya was elevated total cholesterol ($p=0.03$; OR=4.87; 95% CI=1.10-21,53). It was concluded that total cholesterol had an effect on the incidence of ischemic stroke in RSU Haji Surabaya. Self-awareness is required to perform blood cholesterol screening as a prevention efforts, especially for elderly with hypertension because of greater risk for ischemic stroke.

Keywords: *ischemic stroke, dyslipidemia, elderly, hypertension, cholesterol*

INTRODUCTION

Non-Communicable Diseases (NCDs) are the cause of death around the world. The cases keep increasing and kill 38 million lives annually. As many as 85% of cases occurred in developing countries, including Indonesia. NCDs in Indonesia are estimated to reach 71% of total deaths ^[1].

Stroke is a non-communicable disease that notoriously becomes worldwide problem since it is worlds number three cause of death, after heart disease

and cancer. In developing countries, it accounts for 85% of deaths and 87% lifelong disabilities ^[2].

Indonesia is a developing country in Asia which ranks first as the country with the highest number of stroke patients. It is predicted that 500,000 Indonesians suffer from stroke every year, with about 25% of people dying and 75% having minor or severe disabilities ^[3].

Based on the report of the results of basic health research in Indonesia, the increase in stroke prevalence diagnosed by health workers in 2007 reached 8.3/1000 population and in 2013 reached 12.1/1000 population. One province with a higher prevalence of stroke than the national average is the province of East Java, which is 16/1000 population. Higher than in 2007 of 7.7/1000 population ^[4].

Stroke is generally classified into ischemic stroke with 80-85% of cases and hemorrhagic stroke with 15-20% of cases ^[5]. In Indonesia, ischemic stroke is the most

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common type of stroke that is 52.9% of cases [6]. Age is one of the most influential risk factors for ischemic stroke. Because along with increasing age, the greater the risk of a person suffering from ischemic stroke. This is due to degeneration of organ function in the body that is the decrease of blood flow to the brain resulting in the occurrence of stroke [7]. Based on Law Number 13 Year 1998 about the welfare of the elderly, it is explained that the elderly is someone who reached the age of 60 years and over [8].

The results of basic health research in 2013 it is known that the top 10 diseases in the elderly are dominated by the class of cardiovascular disease and the highest is hypertension, because the elderly will naturally experience a decrease in the degree of health. Uncontrolled hypertension or a history of hypertension in the elderly can lead to stroke. The prevalence of stroke in the diagnosed age group increased or experienced the highest symptoms at age ≥ 75 years and increased along with the age of a person [4].

World Population Prospects stated that the world's elderly population is increasing by 7.2% in 2013 and is predicted to increase to 9.6% by 2050. In Indonesia, there is also a potential fairly rapid increase of percentage in the elderly compared to other ages since 2013 as much as 8.9% until 2050 as much as 21.4%, and in contrast at age of 0-14 and 15-59 the percentage tends to decrease [9].

Stroke can be caused by dyslipidemia which is an abnormal state that is present in the blood. Dyslipidemia is indicated by increased levels of total cholesterol, *Low Density Lipoprotein* (LDL), triglycerides, and decreased levels of *High Density Lipoprotein* (HDL) [10].

Total cholesterol is an overall amount of HDL cholesterol level, LDL cholesterol and 20% triglycerides [11]. Total cholesterol level is associated with stroke because it is the risk factor for ischemic stroke [12]. An increase of 1 mmol/L can increase the risk as much as 25% [13]. That increase results in atherosclerosis which plays part in the occurrence of ischemic stroke [7, 11].

Dyslipidemia is a major risk factor for the atherothrombotic vascular disease, including ischemic stroke. Drug therapy is needed in the treatment of dyslipidemia, as well as slowing the progression of atherosclerosis, stabilizing rupture-prone plaque, reducing the risk of arterial thrombosis, and improving prognosis. But first, a diagnosis and an evaluation of

blood cholesterol levels is needed, consisting of total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides [5]. The aim of this study is to analyze indicator of dyslipidemia for ischemic stroke in elderly with hypertension, especially in RSU Haji Surabaya.

METHOD

This research is an observational study of analytical epidemiology. Case control study design was conducted from November 2016 until January 2017 in Outpatient Installation RSU Haji Surabaya. The case population is the whole occurrence of ischemic stroke in elderly with hypertension. The control population is the whole occurrence other than ischemic stroke in elderly with hypertension. Samples are determined by the inclusion criteria of patients who perform complete blood cholesterol tests. To minimize the bias, exclusion criteria were set which are patients diagnosed with Hemorrhagic Stroke, Diabetes Mellitus and Coronary Heart Disease (CHD). The ratio of sample size for case and control is 1:1 so the total samples were 74 patients. Samples were taken using simple random sampling methods, lottery all the registration numbers of patients undergoing treatment by 2015. The data of total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides from patient medical records were collected using case data form and control data form.

The data were processed and analyzed with univariate, bivariate and multivariable analysis. Univariate analysis was conducted to examine the distribution of respondents data on the research. The results are presented in narrative and table format. To find the independent variable that qualified to become the candidate of multivariable analysis, selection with bivariate analysis ($p < 0,25$) was conducted. The influential variables to see the effect of independent variable to the dependent variable was determined by multivariable analysis with Multiple Logistic Regression Test ($p < 0,05$).

RESULTS AND DISCUSSIONS

Table 1 showed the distribution of gender that the more than half (54.1%) were male respondents. Analysis of the gender of the respondents in this study showed that the majority of ischemic stroke respondents were male, which is similar to what has been reported in previous studies that more than 50% of patients with

ischemic stroke are male [14, 15]. This is because women are protected by the hormone estrogen so as to avoid heart disease and stroke. However, after entering the age of the elderly and experiencing the menopause, women's risks become equal to male. Many menopausal women in Canada die from stroke and heart disease each year compared to cancer [16]. Men with hypertension were 23.07 times more likely to have a stroke than women [17]. Gender is one of the risk factors that cannot be controlled and potentially effect on the incidence of stroke [18].

Table 1: Distribution of gender

Gender	Ischemic stroke	Without ischemic stroke	N (%)
	n (%)	n (%)	
Male	20 (54,1)	20 (54,1)	40 (54,1)
Female	17 (45,9)	17 (45,9)	34 (45,9)

Table 2 showed the total cholesterol, LDL cholesterol and triglycerides are selected as a candidate ($p=0.00$, $p=0.18$, $p=0.18$) for the multivariable analysis. There are 3 variables that become candidates as indicator of dyslipidemia for ischemic stroke in elderly with hypertension in RSU Haji Surabaya.

Table 2: Candidates of multivariable analysis

Variabels	p-value	Results
Total cholesterol ≥ 200 mg/dl	0,00	candidate
LDL cholesterol ≥ 130 mg/dl	0,18	candidate
HDL cholesterol < 30 mg/dl	0,63	not a candidate
Triglycerides ≥ 150 mg/dl	0,18	candidate

The results presented in bivariate analysis of total cholesterol for ischemic stroke in elderly in RSU Haji Surabaya is eligible to be included in multivariable analysis. The results is similar with a study by Hakim (2013) which showed a significant association ($p=0.03$) between total cholesterol levels and the incidence of stroke. High total cholesterol can lead to plaque buildup in the arteries that supply blood to the brain causing stroke [20].

Total cholesterol can also affect the clinical outcomes of patients with ischemic stroke [21]. High total cholesterol levels can worsen the clinical outcomes of stroke due to the oxidation of cholesterol that can

initiate inflammatory processes and lead to plaque buildup in blood vessel walls that can inhibit blood flow in the arteries [22]. In contrast, in some cases high total cholesterol levels can also produce better clinical outcomes as they are affected by the protective effects of statin use in the acute phase of stroke [23]. These results are supported by Muhammad *et al.* (2014) who stated that patients with high total cholesterol levels have good clinical outcomes because cholesterol can serve as a buffer to neutralize free radicals and prevent the destruction of nerve cell tissue.

A study by Hakim (2013) in Dr. Kariadi Semarang and a study by Wu (2013) in China found significant results that showed a relationship between LDL cholesterol levels and the incidence of ischemic stroke. LDL cholesterol has a tendency to stick to blood vessel walls to form plaque that can narrow the blood vessels. Blockage mainly occurs in small blood vessels that supply nutrition to the heart and brain. Plaque on the vessels can detach and clog blood flow to the brain. Uneven blood vessels can also cause the formation of blood clots in the vessels. It can block the flow to the brain and cause stroke [26]. A decrease in LDL cholesterol by 1 mmol would decrease the fatal stroke by 17% [27].

A Study by Soebroto (2010) in RS Dr. Moewardi Surakarta, Muliawati (2015) in RSUP Dr. Kariadi Semarang and Sumiyah (2016) in RSD dr. Soebandi Jember showed that there is no specific relationship between LDL cholesterol levels and the incidence of ischemic stroke. The difference is caused by the difference of sample used in previous research that is on ischemic stroke and hemorrhagic stroke, history of ischemic stroke patients with diabetes mellitus complication and most of respondents who are ischemic stroke patients with productive age of ≤ 55 years.

The results presented in bivariate analysis of HDL cholesterol for ischemic stroke in elderly in RSU Haji Surabaya is not eligible for entry in multivariable analysis. This is because HDL cholesterol can also be pro-inflammatory and pro-atherogenic in stroke patients, which causes patients with normal HDL levels to have a poor clinical outcome [22]. HDL cholesterol levels can be increased by reducing weight, increasing physical exercise, and quitting smoking [31]. HDL cholesterol can be a risk factor for ischemic stroke [32]. One way that can be done to prevent for ischemic stroke is to increase HDL

cholesterol levels. HDL cholesterol acts as a “vacuum cleaner” that sucks in excess of cholesterol as much as possible. HDL cholesterol takes excess cholesterol from the cells and tissues and bring it back to the liver [33].

The difference results showed a significant relationship between HDL cholesterol level and the incidence of stroke [19]. The study by Yeh *et al.* (2013) in Taiwan and Sohail *et al.* (2013) in Pakistan stated that patients with low HDL (≤ 35 mg/dl) had greater stroke severity and poor clinical outcomes. Low HDL cholesterol levels can increase the risk of blood clots in the carotid arteries, causing a risk of stroke. Low HDL cholesterol levels have the same danger of having too high cholesterol levels of LDL [36].

The 33-years study with 7579 female patients and 6372 male patients showed that elevated triglyceride levels contribute in increasing the risk of ischemic stroke in men and women [37]. The high triglycerides and low HDL cholesterol were associated with an increased incidence of ischemic stroke in both genders [38]. A cohort study by Nodestgaard *et al.* (2007) it was seen that there was an increased risk of stroke associated with blood fat levels called triglycerides. The high triglycerides can increase risk factors for ischemic stroke three to four times greater [40]. Increased triglyceride levels also make LDL cholesterol toxic to artery walls and reduce the beneficial effects of HDL cholesterol [41].

Triglycerides formed as a result of the metabolism of foods in the form of fat and also in the form of excessive carbohydrates and protein are not entirely needed as an energy source [42]. A study by Wardaini (2012) stated that triglycerides are not associated with ischemic stroke. Patients with obese often have high triglyceride levels and these conditions can lead to elevated risk of heart disease or stroke [44].

Table 3 showed that the most influential independent variables and became a model to predict the incidence of ischemic stroke in elderly with hypertension in RSU Haji Surabaya is total cholesterol. This is evidenced by the results of statistical analysis are significant with $p=0.03$ ($p<0.05$). Total cholesterol with OR=4.87 which means that the possibility of elderly with hypertension with total cholesterol level ≥ 200 mg/dl will suffer an ischemic stroke 4.87 times greater when compared with elderly with hypertension with total cholesterol of <200 mg/dl.

Table 3: Indicator of dyslipidemia for ischemic stroke in elderly with hypertension

Variabel	B	OR	95% CI	p-value
Total cholesterol ≥ 200 mg/dl	1,58	4,87	1,10-21,53	0,03
LDL cholesterol ≥ 130 mg/dl	0,16	0,85	0,19-3,74	0,83
Triglycerides ≥ 150 mg/dl	1,08	2,96	0,78-11,21	0,11
Constant	-1,64			0,01

Multivariable analysis showed that total cholesterol level becomes the most influential cholesterol test, thereby it is used as an indicator for ischemic stroke, especially in elderly with hypertension. Many studies have shown that high total cholesterol levels are often associated with the risk of stroke [45]. Increased total cholesterol levels in the blood will lead to the formation of plaque in the blood vessels causing a stroke [7].

The patients with ischemic stroke with a total cholesterol level of ≥ 200 mg/dl had a 3.584 times greater risk of having poorer clinical outcomes compared to patients with normal total cholesterol levels [46]. A study by Karunawan *et al.* (2016) in RS Bethesda Yogyakarta obtained significant results ($p=0,00$) on the correlation of total cholesterol level with functional outcome of ischemic stroke patients. In addition, high total cholesterol levels can also worsen the clinical outcomes of stroke. The cause is the oxidation of cholesterol can initiate the inflammatory process and the formation of plaque on blood vessel walls that can inhibit blood flow in the arteries [22]. A study by Khalil *et al.* (2013) in Egypt, it is known that the Relative Risk of total cholesterol in ischemic stroke patients with hypertension is 3.35 which means the possibility of patients with high total cholesterol levels accompanied by hypertension to have ischemic stroke is 3.35 times greater when compared to hypertensive patients with low total cholesterol levels. The results were obtained from 63.81% of ischemic stroke patients aged ≤ 65 years. Total cholesterol levels and the disability outcomes also showed a significant association of acute ischemic stroke patients [49].

Based on modified levels of stroke risk factors it was found that high total cholesterol levels increased the relative risk of death by 3.9 times. As a correlation between the severity rating system of each dyslipidemia and other modifiable risk factors and patterns it was found

that APACHE II scores correlated positively with high total cholesterol levels and strongly correlated positively with age. At the same time, according to Glasgow Coma Scale (GCS) mortality is positively correlated with high total cholesterol [48].

The difference results showed a high total cholesterol was associated with reduced stroke severity and resulted in better clinical outcomes because it was influenced by the protective effects of statin use in the acute phase of stroke [23]. High total cholesterol levels have good clinical outcomes because cholesterol can serve as a buffer to neutralize free radicals and prevent damage to nerve cell tissues [24].

CONCLUSIONS

It can be concluded that the indicator of dyslipidemia for ischemic stroke in elderly with hypertension in RSU Haji Surabaya is total cholesterol level with $OR=4.87$. The hospitals can perform routine total cholesterol tests for patients diagnosed with ischemic stroke, so as to control the occurrence of recurrent strokes and other comorbid complications that can worsen the condition of the patient. The public should have self-awareness is required to perform blood cholesterol screening as a prevention efforts, especially for elderly with hypertension because of greater risk for ischemic stroke.

ACKNOWLEDGEMENTS

The authors would like to acknowledge all the School of Undergraduate Studies Airlangga University who took part in this study and parents involved in this study for their cooperation and support. The authors also would like to thank the Outpatient Installation RSU Haji Surabaya for their help in data collection.

Conflict of Interest: The authors reported no conflict of interest.

Ethical Clearance: This research was approved by the Ethics Committee of the Faculty of Public Health Airlangga University, Surabaya, East Java, Indonesia.

REFERENCES

1. WHO. *World Health Statistic: Stroke Surveillance*. Switzerland. 2014;
2. Feigin V. *Stroke: Illustrated Guide to Stroke Prevention and Recovery*. Jakarta: Bhuana Ilmu Populer. 2011;

3. Indonesian Stroke Foundation. *Increases Sharply of Stroke Incidence*. Jakarta: Yastorki. 2012;
4. Indonesian Ministry of Health. *Basic of Health Research*. Jakarta. 2013;
5. Goldszmidt AJ, and Caplan LR. *Stroke Essential*. 2nd ed. Jakarta: Indeks. 2013;
6. Dinata CA, Safrita Y, Sastri S. Overview of Risk Factors and Stroke Types in Hospitalized Patients in Internal Medicine in 1 Januari 2010-31 Juni 2012. *JKA* 2(2). 2013;
7. Gofir. *Stroke Management: Evidence Based Medicine*. Yogyakarta: Pustaka Cendekia Press. 2009;
8. Indonesian Ministry of Health. *Info of Datin: Elderly Situation in Indonesia*. Jakarta. 2016;
9. Indonesian Ministry of Health. *Info of Datin: Situation and Analysis of Elderly*. Jakarta. 2014;
10. Hartwig MR. *Cerebrovascular Disease in Pathophysiology Clinical Concepts of Disease Processes*. Jakarta: ECG. 2012;
11. American Stroke Association. *Stroke Risk Factors*. New York. 2014;
12. Lee AH, Someford PJ, Yau KKW. Factors Influencing Survival After Stroke in Western Australia. *The Med. J. of Aust.* 179(6). 2012;
13. Baluch UT, Kiani I, Zaib-un-nisa, Badshah M. Association of Dyslipidemia and Ischemic Stroke. *Ann. of Pak. Inst. Med. Sci.* 4(3). 2008;
14. Karuniawati H, Ikawati Z, Gofir A. Usage Profile of Secondary Prevention Therapy in Ischemic Stroke Patients. *Uni. Res. Coll.* 3(1). 2016;
15. Patricia H, Kembunan MAHN, Tumboimbela MJ. Characteristics of Hospitalized Ischemic Stroke Patients in RSUP Prof.. Dr. R. D. Kandou Medan in 2012-2013. *J. e-Clinic* 3(1). 2015;
16. Heart and Stroke Foundation of Canada. *Ischemic Stroke*. Ottawa. 2008;
17. Jayanti AA. *Relationship of Hypertension with Stroke in South Sulawesi in 2013 (Data Analysis of Basic Health Research in 2013)*. Islamic University of Syarif Hidayatullah. 2015;

18. Junaidi I. *Stroke: Beware of the Threat*. Yogyakarta: ANDI. 2011;
19. Hakim RAS. *Relationship Between Dyslipidemia and Stroke Occurrence in Inpatient ward IRNA B1 in Division of Neurology in Dr. Kariadi Hospital Semarang*. Muhammadiyah University of Semarang. 2013;
20. Caplan LR. *Stroke Chapter 4: How Can Stroke Be Prevented*. New York: American Academy of Neurology. 2006;
21. Florence, Pinzon RT, Pramudita EA. Relationship of HDL Cholesterol Levels When Entering Hospital with Clinical Outcomes of Ischemic Stroke Patients in Bethesda Hospital Yogyakarta. *BIKDW J*. 1(1). 2015;
22. Xu T, Zhang JT, Yang M, Zhang H, Liu, WQ, Kong Y, Xu T, Zhang YH. Dyslipidemia and Outcome in Patients with Acute Ischemic Stroke. *Bri. Eco. Soc. J*. 27(2). 2014;
23. Olsen TS, Christensen RHB, Kammersgaard LP, Anderson KK. Higher Total Serum Cholesterol Levels Are Associated With Less Severe Strokes and Lower All-Cause Mortality Ten-Year Follow-Up of Ischemic Strokes in the Copenhagen Stroke Study. *Am. Heart Ass. J*. 38(1). 2007;
24. Muhammad D, Javed M, Sheikh GA. Acute Ischemic Stroke: Correlation Between Higher Total Cholesterol Level and High Barthel Index Score in Patients. *The Prof. Med. J*. 22(3). 2015;
25. Wu J, Chen S, Liu L, Gao X, Zhou Y, Wang C, Zhang Q, Wang A, Hussain M, Sun B, Wu S, Zhao X. Non High Density Lipoprotein Cholesterol vs Low Density Lipoprotein Cholesterol as a Risk Factor for Ischemic Stroke: A Result From the Kailuan Study. *J. Neu. Res*. 35(5). 2013;
26. Durstine LJ. *Action Plan for High Cholesterol*. Indianapolis: American College of Sports Medicine. 2006;
27. Amarenco P, Goldstein LB, Szarek M, Silleesen H, Rudolph AE, Callahan A, Hennerici M, Simunovic L, Zivin JA, Welch KM. 2007. Effects of Intense Low Density Lipoprotein Cholesterol Reduction in Patients With Stroke or Transient Ischemic Attack: The Stroke Prevention by Aggressive Reduction in Cholesterol Levels (SPARCL) Trial. *Am. Heart Ass. J*. 10(1161). 2007;
28. Soebroto L. *Relationship Between LDL Cholesterol Levels in Stroke Patients in Dr. Moewardi Hospital Surakarta*. Sebelas Maret University. 2010;
29. Muliawati R. *Risk Factors Affecting Ischemic Stroke Occurrence in Patients with Type 2 Diabetes Mellitus (Case Study in Dr. Kariadi Hospital Semarang)*. Diponegoro University. 2015;
30. Samiyah SSA. *Relationship of LDL Cholesterol Levels with Stroke Occurrence in dr. Soebandi Hospital Jember*. Jember University. 2016;
31. Anwar TB. *Dyslipidemia as a Risk Factor for Coronary Heart Disease*. Sumatera Utara University. 2004;
32. Alway D, and Cole JW. *Essential Stroke Primary Services*. Jakarta: EGC. 2012;
33. Freeman and Christine. *Low Cholesterol Healthy Heart*. Jakarta: Bhuana Ilmu Populer. 2005;
34. Yeh PS, Yang CM, Lin SH, Wang WM, Chen PS, Chao TH, Lin HJ, Lin KC, Chang CY, Cheng TJ, Li YH. Low Levels of High Density Lipoprotein Cholesterol in Patients with Atherosclerotic Stroke: A Prospective Cohort Study. *JACC J*. 228(2). 2013;
35. Sohail A, Khatri IA, Mehboob N. Effect of Dyslipidemia Severity and Outcome of Stroke Using mRI Scores in Northern Pakistani population. *Rawal Med. J*. 38(4). 2013;
36. Yoviana S. *Cholesterol*. Yogyakarta: Pinang Merah Publisher. 2012;
37. Varbo A, Nordestgaard BG, Hansen AT, Schnohr P, Jensen GB, Benn M. Nonfasting Triglycerides, Cholesterol, and Ischemic Stroke in The General Population. *Ann of Neu*. 69(4). 2011;
38. Holme I, Aastveit AH, Hammar N, Jungner I, Walldius G. Relationships Between Lipoprotein Components and Risk of Ischaemic and Haemorrhagic Stroke in the Apolipoprotein Mortality Risk study (AMORIS). *J. of Internal Med*. 265. 2008;

39. Nordestgaard BG, Chapman MJ, Ray K, Borén J, Andreotti F, Watts GF, Ginsberg H, Amarenco P, Catapano A, Descamps OS, Fisher E, Kovanen PT, Kuivenhoven JA, Lesnik P, Masana L, Reiner Z, Taskinen MR, Tokgözoğlu L, Tybjaerg-Hansen A. Lipoprotein(a) as a Cardiovascular Risk Factor: Current Status. *Eur. Heart J.* 31(23). 2010;
40. Freiberg J, Hansen A, Jensen JS, Nordestgaard BG. Nonfasting Triglycerides and Risk of Ischemic Stroke in the General Population. *J. of the Am. Med. Ass.* 300(18). 2008;
41. Bull E, and Jonathan M. *Cholesterol*. Jakarta: Erlangga. 2007;
42. Siswono. *Stroke Sufferers Must Be Treated Immediately*. Jakarta: Voodoo Inc. 2006;
43. Wardaini L. *Relationship Between Triglyceride Levels and Ischemic Stroke*. Sumatera Utara University. 2012;
44. Ginsberg M. Neuroprotection for Ischemic Stroke: Past, Present, and Future in Neuropharmacology. *Int. J. of Neu.* 55(3). 2008;
45. Ebrahim S, Sung J, Song YM, Ferrer RL, Lawlor DA, Smith GD. Serum Cholesterol, Hemorrhagic Stroke, Ischaemic Stroke, and Myocardial Infarction: Korean National Health System Prospective Cohort Study. *BMJ J.* 333(7557). 2006;
46. Tian J, Chen H, Jia F, Yang G, Li S, Li K, Zhang L, Wu J, Liu D. Trends in the Levels of Serum Lipids and Lipoproteins and the Prevalence of Dyslipidemia in Adults with Newly Diagnosed Type 2 Diabetes in the Southwest Chinese Han Population during 2003-2012. *Int. J. of Endocrinology.* 2015. 2015;
47. Karunawan NH, Pinzon RT, Saputro SA. The Influence of Hyperglycemia Conditions When Entering Hospital to Functional Outcomes of Ischemic Stroke Patients in Bethesda Hospital. *CDK J.* 43(2). 2016;
48. Khalil OA, Selim FO, El-Ashmawy HM, Saeed J, Fawizy MS. Prevalence and Pattern of Dyslipidemia in Acute Cerebral Infarction in Medical Intensive Care in Egypt. *Bri. J. of Sci.* 10(1). 2013;
49. Florence, Pinzon RT, Pramudita EA. Relationship of HDL Cholesterol Levels When Entering a Hospital with Clinical Outcomes of Ischemic Stroke Patients in Bethesda Hospital Yogyakarta. *BIKDW J.* 1(1). 2015;

Supporting Factors to Get Coverage of Malaria Mass Blood Survey (MBS) Above 80% : Lesson Learn From Gripit Village, Banjarmangu Sub District, Banjarnegara District

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ABSTRACT

Malaria in Gripit Village, Banjarmangu Sub district was increased at the end of 2017, by discovery of 14 patients with malaria indigenous. Mass Blood Survey (MBS) activity was carried out in this village because malaria transmission still occurred even though Mass Fever Survey has been held and malaria patient without specific symptoms were found. The purpose of this paper is to analyze factors that support the coverage of malaria MBS above 80%. The method was observation by using observation guideline before and during MBS implementation. MBS was done in 2 days in January 2018. The result showed that the MBS coverage in Desa Gripit was 86.38%, the supporting factors were socialization before the activity, MBS was held together with the distribution of the mosquito net (something was obtained), MBS was done whole day (morning, noon, evening), monitoring coverage in MBS process, and active role from health cadres to persuade the villagers. MBS coverage more than 80% supported by multifactor.

Keywords: : Mass Blood Survey, malaria, banjarnegara, socialization, health cadres

INTRODUCTION

Malaria in Indonesia tend to decreases with Annual Paracyte Incidence (API) 2.8/1,000 inhabitants at 2007 and API of malaria in 2016 0.77/1,000 inhabitants.^{1,2} Linier with API malaria in Indonesia, API malaria in Central Java at 2007 0.05/1,000 inhabitants while at 2017 0.01/1,000 inhabitants.³ Banjarnegara is one of district in Central Java with malaria problem. Data from Banjarnegara Health District shows Annual Paracyte Incidence malaria in Banjarnegara at 2007 as much 0.09/1000 inhabitants and 2017 0.09/1,000 inhabitants. Malaria in Banjarnegara focused in some of Sub district. One of Subdistrict in Banjarnegara with malaria problem is Banjarmangu. Mass Blood Survey is one of method to find malaria cases to cut chain of malaria transmission.

Mass Blood Survey done in endemic area of malaria, endemic area with malaria cases without specific symptom, area with increases malaria, area with low access to health provider.⁴

Banjarmangu Subdistrict have 2 Public Health Center ie : Banjarmangu 1 and Banjarmangu 2 Public Health Center. Banjarmangu 1 public health center had 9 villages, ie : Rejasari, Paseh, Sigeblog, Pekandangan, Banjarmangu, Jenggawur, Banjarkulon, Gripit Village. Malaria in Banjarmangu I Public Health Center at 2016-2017 found in almost every month. Malaria cases in Banjarmangu I Public Health Center at 2016 and 2017 always found in every month. Malaria at the end of 2017 in Banjarmangu dominated in Gripit Village. Mass Blood Survey had been done in Gripit Village because there were malaria increase and the tendency malaria in this area without specific symptom.

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METHOD

The method used is observation by using observation guideline done before and during MBS implementation. MBS was done 2 days in January 2018 in Gripit Village Banjarmangu Sub district Banjarnegara District.

RESULTS AND DISCUSSIONS

Malaria incidence was interaction from host, agent (plasmodium) and environment. The existence of plasmodium in host could be source of malaria transmission specially plasmodium in gamet phase. The malaria vector (Anopheles) having role to transmit plasmodium from human to human.⁵ Mass Blood Survey is one of method to find human with plasmodium in their blood stream. The success of Mass Blood Survey (MBS) based on two main aspect, the readiness of health worker and community participation. Health worker with good microscopist and active cadre that have ability to build community participation. Community with high participation supporting for the success of MBS. Commonly to get MBS coverage over 80% was rare. Research in Purworejo District show that MBS coverage 26%.⁶ Combination of PCR and microscopic malaria examination was done in North West Thailand this research conclude that a combination of pooling, real time PCR and expert microscopy provide a feasible approach to identifying and threating asymptomatic malaria infection in timely manner.⁷ The weakness of analysis of this paper not including time required to send sample before check by PCR. Polymerase Chain Reaction to detect malaria is needed because in low endemic area of malaria there is

possibility to find malaria cases asymptomatic and negative in microscopic test but carry plasmodium in their body. In pre elimination and elimination area where malaria paracyte density is low It could be source of malaria transmission.

Active Case Detection was done in Griplit Village by collaboration of officer from Banjarmangu 1 Public Health Center, Banjarnegara Health District, Research and Control Animal Disease Control Unit. The beginning of MBS was socialization to health cadre, public figure and village government leaders. Strategy of MBS implementation, teamwork and MBS pos, target estimated coordinated at the time of socialization. Officers Mass Blood Survey divided into three team, each team stay in one sub village. There were 3 Sub Village in Griplit : Griplit, Grumung and Sikasur. Purpose of MBS were to found malaria sufferers in high endemicity areas that have not demonstrated any specific clinical symptoms in the community, decrease the source of transmission by treatment of all malaria-positive patients and find and meat the time of socialization treat malaria sufferers in the area of increasing cases. Pos of Mass Blood Survey in Griplit Village can be see in Pic 1



Picture 1: Pos of Mass Blood Survey

Observation on the step of malaria Mass Blood Survey (MBS). We conclude there were five important step in this MBS process. Five step in MBS could be applied in another area Step number one is determine population target and area in the MBS of malaria.

Population target useful in calculating material planning and number of teams, estimate number of days and as denominator in MBS coverage calculation. Discussion with Banjarmangu 1 Public Health Centre Officer to understanding the wide of malaria problem. Griplit

Village population with estimated population about 1,000 people. MBS officers planned to be divided into three team. Each team contain : registration officer, taking of finger blood and making thick and thin blood smear officer, staining malaria blood smear officer, malaria microscopist officer, health cadre. In step number one determine population target and area in the MBS of malaria, not always in Village scoupe. Target could be Sub Village or a group of houses. Epidemiological analysis need to determining target of MBS. In area with asymptomatic carier represent an important reservoir.⁸

Step number two was socialization and discusion of work plans, determination of malaria MBS pos and teams based on population data. Date and length of MBS, MBS pos in Head of Sub Village houses. Divide team survey collaboration from Banjarnegara District Health officer, Banjarmangu 1 public health center officer, Banjarnegara Health Research and Development Unit Class 1 and Health cadre. Mass Blood Survey done in all time a part of time stay in the Sub Village, people could be tested at every time morning, noon or at night so people could be take blood finger in every time. When socialization we can submitting result from another research that direct cost of malaria in consumed 28-34% of annual income of poor households and 1-2% of high income households.⁹ Managemen for success MBS needed and to be shown in step 2.

Step number three Socialization of malaria MBS to the community. Village officer announce time and place of pos MBS to the Griplit Village community through mosque loudspeaker before MBS done and repeat the information when MBS ongoing. Health cadre also

participate in influence community to participate in MBS. There are many way to socialization of malaria MBS to community. In another location probably have different characteristic so the choice of socialization based on local characteristic.

Step number four was implementation of malaria MBS activity. When MBS ongoing 2 registration officer noted identity of participant, 2 officer taking of finger blood and making thick and thin blood smear officer (but when in not busy time each of pos 1 officer), 1 officer staining malaria blood smear, 1 officer malaria microscopist examine with microscope. Health cadre monitoring the incoming participant and reminding them to bring family member. When there is spare time the coverage progress is monitored periodically and find out residents not yet present. Beside the success of MBS coverage, time lapse of microscopic examination must be paid attention.

The final step was Reporting of MBS of malaria. The achievement of MBS 80% of the target can be achieved by monitoring the target achievement in the MBS process and recognizing the target that has not been in MBS for the effort to be taken the blood supply. Reporting MBS malaria useful to determining step hereinafter to eliminate malaria. Social aspect is important in malaria control program. Research shows that family is the most social environment plays a role in prevention of malaria. Neighbour also impact to spread information about malaria control.¹⁰ In MBS activity the role of health cadre very important to push community to join in MBS. Table 1 shows result of malaria MBS in this survey.

Table 1: Result of malaria MBS in Griplit Village Banjarmangu Subdistrict Banjarnegara District

No.	Sub Village	Number of community	Number of community stay	Number of community examined	Result of malaria microscopic lab	
					Positive	Negative
1.	Griplit	395	370	299	2	297
2.	Sikasur	230	221	217	0	217
3.	Grumung	419	371	315	0	315
	Total	1.044	962	831	2	829

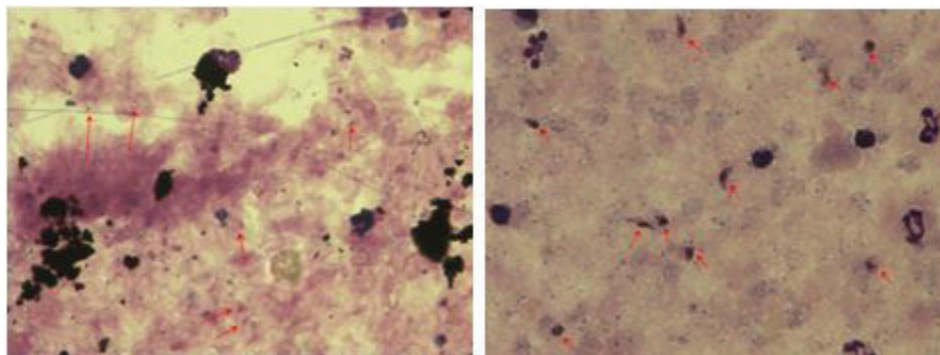
Information: Data number of community stay from each pos get from village officer in each pos.

Coverage of MBS in Griplit Village as much $831/962=86.38\%$, coverage MBS more than 80% success. Malaria microscopic test show two positive

malaria. One sample positive *Plasmodium falciparum* in gametosit phage with initial AN, male children 9 years old and one sample *Plasmodium falciparum* in ring phage inisial TS, man 22 year's old without clinical symptom. Research in Afrika showed that the prevalence of asymptomatic malaria 6.8% (n=26).¹¹

Children with initial AN one week before take finger blood medicinize to doctor's practice with diagnose not malaria. Before that AN also had been taking malaria blood smear by JMD when Active case Detection

activity with resut negative. Two of malaria cases stay in the same area (RT 2 RW 1/ Griplit Sub Village Griplit Village). Slide with malaria positive show in picture 2



Picture 2: Plasmodium falciparum ring (i) and P. falciparum gamet (ii) in blood smear from malaria MBS in Griplit Village (pic from compound microscope magnification 1000x)

CONCLUSIONS

The result shows that the malaria MBS coverage in Griplit Village was 86.38%, the supporting factors were socialization before the activity, the time of MBS implementation in line with the distribution of the mosquito net (something was given), MBS done all times (morning, noon, night), monitoring MBS coverage in MBS process, health cadres play an active role in bringing villagers that had not join to MBS by examined malaria from blood finger

ACKNOWLEDGEMENTS

The authors would like thank to Head of Banjarnegara Health Research and Development Unit Class 1 for giving us the opportunity to carry out this research, microscopic team in Banjarnegara Health Research and Development Unit Class 1. Our best gratitude is particularly addressed to the Head of Banjarnegara District Health Office, Head of Banjarmangu 1 Public Health Centre, Had of Griplit Village and staff for its cooperation in execution of MBS of malaria in Griplit Village.

Conflict of Interest: The authors report no conflict of interest in this work.

Ethical Clearance: People who participated in MBS activities were not forced and were given an explanation of what would be done including finger blood taking using a sterile lancet, and the volume of blood drops taken. The effect that will be felt is like a needle/thorn. Here also

stated that they were entitled to receive the results of examination of malaria blood smear and receive treatment if the results of the examination were positive.

REFERENCES

1. Ministry of Health Republic of Indonesia. Indonesia Helath Profil in 2015.; 2016.
2. Data and Information Center Ministry of Health Republic of Indonesia . Data and Information of Indonesia Health Profil 2016. 2017.
3. Province Health Office of Central Java Tengah. Malaria Data in Central Java Province. 2018.
4. Ministry of Health Republic of Indonesia, Directorate General of Disease Control and Envoronment Health. malaria manajemen guidance; 2015.5. Soedarto. *Malaria*. Sagung Seto; 2011.
6. Setiadi D, Santjaka A. Description of Mass Blood Survey (MBS) in Purworejo District at 2015. *Keslingmas*. 2015;35.
7. Congpuong K, Saejeng A, Sug-aram R, et al. Mass blood survey for malaria : pooling and real- time PCR combined with expert microscopy in. *Malar J*. 2012:2-5.
8. Harris I, Sharrock WW, Brain LM, Gray KA, Bobogare A, Boaz L, Lilley K, Krause D, Vallely A, Johnson ML, Gatton ML, Shanks GD CQ. A

- large proportion of asymptomatic plasmodium infection with low and sub microscopic parasites densities in the low transmission setting of Temotu Province. Solomon Island : challenges for malaria diagnostic in an elimination setting. *Malar j.* 2010;9:254.
9. Md Shahin Mia, Rawshan Ara Begum, Ah-Choy Er RDZRZA and JJP. Burden of Malaria at Household Level : A Baseline Review in the Advent of Climate Change. *J Environ Sci Technol.* 2012;5(1):1–15. doi:10.3923/jest.2012.1.15.
10. Indah Margarethy AY. Peran lingkungan sosial dalam pencegahan malaria. 2016;8(1):1–10.
11. Worku L, Damtie D, Endris M, Getie S, Aemero M. Asymptomatic Malaria and Associated Risk Factors among School Children in Sanja Town , Northwest Ethiopia. *Int Sch Res Not.* 2014;2014(Article ID 303269):16.

Leptospirosis Outbreak during Rice Harvesting Season in Kebumen, Central Java Indonesia (The First Case Report in Kebumen)

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ABSTRACT

Leptospirosis, a public health problem in Indonesia, has never been reported in Kebumen before, but Kebumen Public Health Office reported several new leptospirosis cases in this regency during paddy harvesting season in February 2017. A descriptive cross-sectional study was conducted to investigate leptospirosis epidemiology (eg, the reservoir animals, the geographical distribution, and specific populations at risk) in Kebumen on March 2017. Thirty febrile patients were enrolled in Public Health Services and tested for leptospirosis using Leptotek. The positive cases were investigated by interview and site inspection to assess environmental risks. Rat traps were set randomly at housing areas near the positive cases's house in Kuwarasan and Buayan subdistricts. Kidneys were removed from rats and analysed using PCR assay for pathogenic *Leptospira* detection. Thirteen positive leptospirosis cases out of 30 febrile patients were found in 6 subdistricts consisted of Kuwarasan (30.7%), Buayan (30.7%), Karanganyar (7.7%), Gombang (7.7%), Sempor (7.7%) and Sruweng (15.4%). 92,31% of the patients were farmers, indicating occupational exposures at paddy fields. Most of the case were in the age group of 31-40 years (53,85%). High vulnerability among males due to activities in outdoor settings was revealed from male to female ratio (12:1). Clinical symptoms consisted of calf muscle pain (100%), jaundice (84.6%), oliguria (38.5%) and renal failure (15.4%), with case fatality rate was 23,08%. Rats (*Bandicotta indica*) with positive *Leptospira* were found at Kuwarasan subdistrict (6.25%). Based on the results of this study, paddy harvesting season is a critical period associated with leptospirosis transmission in Central Java. Indeed, preventive efforts should be done to avoid leptospirosis outbreak

Keywords: leptospirosis, farmer, harvesting season, outbreak

INTRODUCTION

Leptospirosis is a global health problem which endemic in many tropical areas and causes large epidemics particularly after heavy rainfall and flooding¹. This disease caused by the spirochetal bacterium from the genus *Leptospira* and transmit from infected animals through their urine, commonly through infected soil and water or infected animal tissue. The most important animal group as *Leptospira* reservoir such as dogs, pigs, and cows, but rats found be the main source of leptospirosis infection in humans². Mainly this disease is zoonosis, with humans serving as accidental hosts. Generally, this disease has been associated with occupational exposures and rural-based farming settings³. The World Health Organization (WHO) estimates the incidence of leptospirosis in more than

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500,000 cases per year worldwide, with more incidence in poor populations in tropical developing countries. It is estimated that there were 1.03 million cases of Leptospirosis annually and 58,900 deaths worldwide. Most of cases were found in Global Burden of Disease (GBD) regions of South and Southeast Asia, Oceania, Caribbean, Andean, Central, and Tropical Latin America, and East Sub-Saharan Africa ⁴.

Infected animals such as rats with *Leptospira* mostly play a role as carriers, which may not show clinical symptoms of disease. They could excrete leptospires intermittently or regularly for months or years, or for their lifetime. In endemic area, Leptospiral infections in human usually mild or asymptomatic⁵. More severe clinical symptoms likely depends on three factors: epidemiological conditions, host susceptibility, and pathogen virulence⁶. High-risk populations of leptospirosis infection are those who work in rice fields, animal farming, mining, slaughtering, fishing industry, and veterinary medicine. Activities at risk of transmission include river swim activities, hunting, and activities within the forest. Exposure can also occur in daily activities with high risk during the rainy season and flooding. Urban slum dwellers with poor sanitation are also at risk for this disease⁷.

In Indonesia, Leptospirosis seems to be highly underestimated continuous health problem since the lack of community awareness to this disease ⁸. Leptospirosis has been reported from 15 provinces in Indonesia, and the higher number of cases has been reported from Jakarta, West Java, Central Java and Yogyakarta with mortality varies from 4.1 to 15.1 percentages ⁹. Central Java is Leptospirosis endemic provinces, with the highest number of cases in Indonesia in 2015. During the last 5 years cases of leptospirosis were reported in 20 districts in Central Java. Kebumen Regency reported the first human Leptospirosis cases in 2017 in its area. Up to mid-February 2017, Kebumen District Health Office reported the number of cases of leptospirosis to reach 5 cases with 2 cases of death. All of the leptospirosis patients found in Kebumen are farmers or farm laborers working in rice fields that are entering the rice harvest. Indeed, it is interesting to conduct epidemiological study about this epidemic phenomenon in Kebumen. This study aims to investigate leptospirosis epidemiology (eg, the reservoir animals, the geographical distribution, and specific populations at risk) during epidemic period in Kebumen.

Results of this study will give indepth understanding about epidemiology of Leptospirosis during outbreak, so that prevention effort could be carried out effectively.

METHOD

Study Design: This study was descriptive cross-sectional which conducted to investigate leptospirosis epidemiology (eg, the reservoir animals, the geographical distribution, and specific populations at risk) in Kebumen Regency on March 2017. The research sites for rat catching were carried out in Mangli, Kuwarasan and Sikayu Buayan villages based on the latest case report.

Data Collection: Interviews were carried out on patients or families of leptospirosis patients in Kebumen Regency. Verbal consents were obtained before taking 3 ml of blood for serological assay. The collected serum samples were examined with Leptotek Lateral Flow to detect serum anti-*Leptospira* antibodies.

Interviews by questionnaire were conducted to positive case of leptospirosis patients based on an examination with Leptotek Lateral Flow. If the case died, the interview was done to representative of the family. The questionnaire includes information on demographic characteristics, occupation, travel history, clinical information, and possible exposure over the past 2 weeks (contact with rodents, injury and activity in a watery environment).

The catching of rats was conducted by installing 150 single live traps per location in the afternoon. Two pieces of trap were installed in each house, and four pieces for wider house. The rest of traps were installed in the garden and rice fields. Traps were left in place for 2 days and checked every day. The caught rats were sedated with ketamine HCL doses of 50 - 100 mg/kg weight of rats. Subsequently, rats identification was done using identification key. Kidney dissection was carried out for further PCR analysis.

PCR assay for *Leptospira* Detection: Kidney of rats were examined by Polymerase Chain Reaction (PCR) following previous procedure to detect the presence of *Leptospira* bacteria ¹⁰. The examination was conducted at the Laboratory of Microbiology, Biomolecular and Immunology Health R & D Unit, Banjarnegara, Indonesia.

RESULTS AND DISCUSSIONS

The area of study, Kebumen Regency, had experienced Leptospirosis epidemic that had never reported before, therefore it is important to conduct epidemiological investigation to find out why cases can occur and its risk factors. Based on Leptotek Lateral Flow examination, 13 were found positive results of leptospirosis infection among 30 people examined. From 13 positive cases of leptospirosis found in Kebumen District, 3 of them died (CFR 23.07%). Thirteen people of positive Leptospirosis were distributed in 6 sub districts, namely Kuwarasan (30.7%), Buayan (30.7%), Karanganyar (7.7%), Gombong (7.7%), Sempor (7.7%) and Sruweng (15.4%).

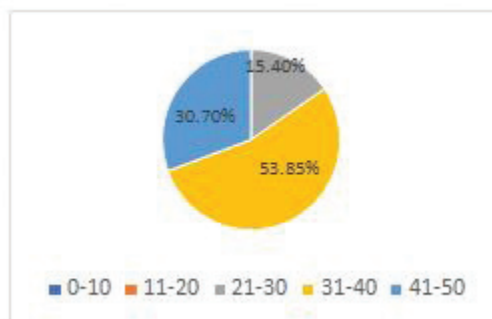


Figure 1: Age Group of Leptospirosis Patients

Based on age group of patient, most of cases (53.85%) of leptospirosis cases in Kebumen Regency were from the 31-40 year age group (Figure 1), and most of them were male (Figure 2).

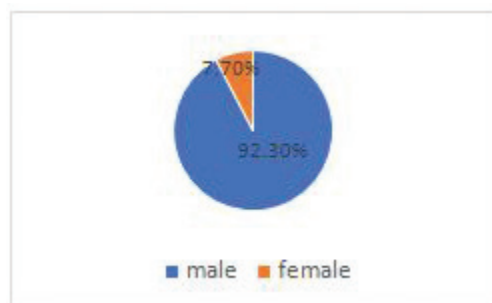


Figure 2: Leptospirosis Patients based on sex group in Kebumen Regency.

Current understanding about Leptospirosis showed that outbreaks of leptospirosis usually happened through occupational exposure, such as rice farming and other agricultural activities in rural areas of the tropics¹¹. This fact relevant with the situation in our study area because the outbreak happened during the rice harvesting time. Based on interviews, 92.31% of leptospirosis patients

in Kebumen district worked as farmers/farm laborers in the rice fields, indicating that the Leptospirosis outbreak is closely related with rice farming and agricultural activities. Much of the water needed for rice farming in rural areas is supplied from rivers that are likely to be contaminated with rodents or infected animals. Previous studies from rice-producing countries such as Thailand, Bangladesh, Brazil, India and Iran have also documented Leptospirosis infection which associated with rice fields¹².

Possible transmission patterns which occurred at leptospirosis outbreaks re contact between hand or foot injuries and contaminated soil or water by mouse urine or direct contact with rats. Significant association with leptospirosis infection in human with the presence of skin wounds, the existence of rodents, especially rats, and activities related to contact with contaminated surface water are factors frequently reported to have in Indonesia and in other Asia-Pacific countries¹³. Farmers and farm workers rarely wear gloves while working in the fields, which increase the risk of transmission¹⁴. Based on clinical symptoms, almost all patients (84.6%) had jaundice, indicating that the infection had invaded the liver organ. In addition, 15.4% of patients had renal failure.

Table 1: Clinical Symptoms of Leptospirosis Patients in Kebumen Regency

Clinical Symptoms	Number of Patients	Percentage (%)
Calf muscle pain	13	100
Jaundice	11	84.6
Fever	9	69.2
Oligouria	5	38.5
Renal failure	2	15.4

The impaired function of liver and kidney indicated delay of treatment that could be caused by mis diagnostic^{15,16}. This might be because still lack of awareness to Leptospirosis in both community and health personnel. Increasing knowledge among public practitioners and hospital staff to facilitate early recognition and treatment of leptospirosis are very important. Clinical symptoms of Leptospirosis described in Table 1.

The results showed that the composition of rats caught in the subdistrict of Kuwarasan and Buaran sub-district was similar. In Kuwarasan sub-district, 26 rats species were *Bandicota indica*, *Mus musculus*, *Rattus tanezumi* and *Suncus murinus*. The most widely caught species was *Rattus tanezumi* (Figure 3).

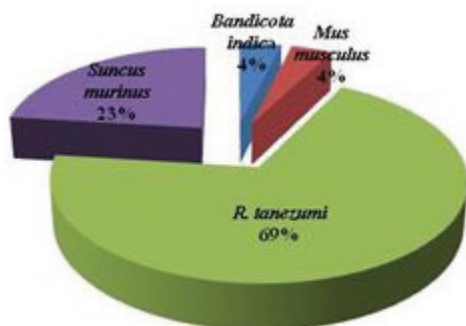


Figure 3: Distribution of captured rats in Kuwarasan Sub District

The results of PCR examination on rats in Kuwarasan Sub district showed that one mice of *Bandicota indica* species was positive containing *Leptospira* pathogen.

The number of rats that were caught in Buaran Sub-district was more than the number of rats caught in Kuwarasan Sub-district, which were 43 rats. Rat species which caught in Buaran Subdistrict includes *Bandicota indica*, *Mus musculus*, *Rattus tanezumi*, *Rattus exulant* and *Suncus murinus*. The widely caught species was *Rattus tanezumi*.

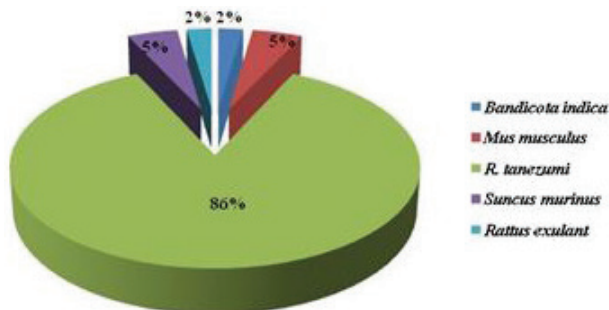


Figure 4: Distribution of Rats Caught in Buaran Sub District

The results of PCR assay on rats samples in Buaran sub district showed no positive *Leptospira* bacteria. Detection of anti-leptospira antibodies in leptospirosis patients and detection of pathogenic *Leptospira* genes in captured rats in the area of study indicated that rats play an important role as reservoirs and sources of infection. Increased rat populations can lead to an increase in the number of leptospirosis infections in the human population in the future¹⁷. Minimize contact with rodent should be done to risky workers such as farmers to prevent disease transmission. Personal protective equipment such as gloves and boots should be worn while working in the fields. Rodent control, improved hygiene, and preventing rodents in the surroundings

area several methods to minimize the route transmission between rodent and human¹⁸. Trapping rodent to removal of animals rather than reducing the suitability of the environment for rodents will have the greater impact on reducing human cases of leptospirosis¹⁹. Further plan and work should be involved collaborative actions involving agriculture, health and veterinary to prevent the disease. The occurrence of outbreaks in the harvest season should also be a concern for farmers to be able to do prevention.

CONCLUSIONS

The outbreak indicated a local transmission of leptospirosis which related to occupational exposure in rice harvesting season. Detection of anti-leptospira antibodies in leptospirosis patients and detection of pathogenic *Leptospira* genes in captured rats in the area of study indicated that rats play an important role as reservoirs and sources of infection. Increased rat populations can lead to an increase in the number of leptospirosis infections in the human population in the future

ACKNOWLEDGEMENTS

We thank to Jastal (The head of Health Research and Development of Unit, Banjarnegara) for giving us support and laboratory staff in Rodentology and Microbiology Department who help us during data collection and laboratory analysis.

Conflict of Interest: We declare that we have no competing interest.

Source of Funding: National Institute of Health Research and Development-Indonesian Ministry of Health

Ethical Research: National Institute of Health Research and Development-Indonesian Ministry of Health.

REFERENCES

1. Haake DA, Levett PN (2015) Leptospirosis in Humans. *Current topics in microbiology and immunology* 387: 65-97.
2. Minter A, Diggle PJ, Costa F, Childs J, Ko AI, et al. (2017) Evidence of multiple intraspecific transmission routes for *Leptospira* acquisition in Norway rats (*Rattus norvegicus*). *Epidemiol Infect* 145: 3438-3448.

3. McBride AJ, Athanazio DA, Reis MG, Ko AI (2005) Leptospirosis. *Curr Opin Infect Dis* 18: 376-386.
4. Costa F, Hagan JE, Calcagno J, Kane M, Torgerson P, et al. (2015) Global Morbidity and Mortality of Leptospirosis: A Systematic Review. *PLoS Neglected Tropical Diseases* 9: e0003898.
5. Marchiori E, Lourenco S, Setubal S, Zanetti G, Gasparetto TD, et al. (2011) Clinical and imaging manifestations of hemorrhagic pulmonary leptospirosis: a state-of-the-art review. *Lung* 189: 1-9.
6. Esteves LM, Bulhões SM, Branco CC, Mota FM, Paiva C, et al. (2014) Human Leptospirosis: Seroreactivity and Genetic Susceptibility in the Population of São Miguel Island (Azores, Portugal). *PLoS ONE* 9: e108534.
7. Kamath R, Swain S, Pattanshetty S, Nair NS (2014) Studying Risk Factors Associated with Human Leptospirosis. *Journal of Global Infectious Diseases* 6: 3-9.
8. Victoriano AFB, Smythe LD, Gloriani-Barzaga N, Cavinta LL, Kasai T, et al. (2009) Leptospirosis in the Asia Pacific region. *BMC Infectious Diseases* 9: 147-147.
9. WHO (2018) Leptospirosis.
10. Scola BL, Bui LTM, Baranton G, Khamis A, Raoult D. Partial rpoB gene sequencing for identification of *Leptospira* species. *FEMS Microbiology Letters*. 2006; 263:142-7.
11. Koizumi N, Muto M, Tanikawa T, Mizutani H, Sohmura Y, et al. (2009) Human leptospirosis cases and the prevalence of rats harbouring *Leptospira interrogans* in urban areas of Tokyo, Japan. *J Med Microbiol* 58: 1227-1230.
12. Alavi SM, Khoshkho MM (2014) Seroprevalence Study of Leptospirosis Among Rice Farmers in Khuzestan Province, South West Iran, 2012. *Jundishapur Journal of Microbiology* 7: e11536.
13. Sakundarno M, Bertolatti D, Maycock B, Spickett J, Dhaliwal S (2014) Risk factors for leptospirosis infection in humans and implications for public health intervention in Indonesia and the Asia-Pacific region. *Asia Pac J Public Health* 26: 15-32.
14. Mwachui MA, Crump L, Hartskeerl R, Zinsstag J, Hattendorf J (2015) Environmental and Behavioural Determinants of Leptospirosis Transmission: A Systematic Review. *PLOS Neglected Tropical Diseases* 9: e0003843.
15. Kishimoto M, Brown JD, Chung HH, Howman S (2004) Leptospirosis misdiagnosed as pulmonary-renal syndrome. *Am J Med Sci* 328: 116-120.
16. Musso D, La Scola B (2013) Laboratory diagnosis of leptospirosis: A challenge. *Journal of Microbiology, Immunology and Infection* 46: 245-252
17. Loan HK, Van Cuong N, Takhampunya R, Kiet BT, Campbell J, et al. (2015) How Important Are Rats As Vectors of Leptospirosis in the Mekong Delta of Vietnam? *Vector Borne and Zoonotic Diseases* 15: 56-64.
18. Mohan Rao A (2006) Preventive measures for leptospirosis: rodent control. *Indian J Med Microbiol* 24: 325-328.
19. Holt J, Davis S, Leirs H (2006) A model of Leptospirosis infection in an African rodent to determine risk to humans: seasonal fluctuations and the impact of rodent control. *Acta Trop* 99: 218-225.

Housing Condition as Tuberculosis Infection Risk Factor

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ABSTRACT

Indonesia is a country with the third tuberculosis (TB) incidence in the world. Bandar Lampung is one of the cities in Indonesia with a high TB incidence. TB incidence in the city increased about 80% during four years period (2,056 cases in 2016 compared to 1,195 cases in 2012). Bandar Lampung is located in the fifth poorest province in Indonesia, which closely related to poor housing condition. This study aimed to identify significant influence of housing condition, which consisted of variables: ventilation, in-house sunlight, in-house smoking pollution and in-house TB contact; to TB infection. A case control study was used to study the influence of related variables. Case sample group consisted of 31 smear-positive TB patients; meanwhile control sample group consisted of 62 patients without TB. Both sample groups were obtained from Sukaraja and Panjang Community Health Service which have performing Directly Observed Treatment Shortcourse and have highest TB incidence in Bandar Lampung. Data were collected by using structured interview questions and observation; and was then analyzed using bivariate Chi square analysis. Less ventilation (odds ratio/OR: 4.747; 95 % confidence interval/CI: 1.875–12.022), no in-house sunlight (OR: 5.219; 95 % CI: 2.040–13.355), existence of in-house smoking pollution (OR: 3.067; 95 % CI: 1.240–7.584) as well as existence of in-house TB contact (OR: 10.688; 95 % CI: 3.792–30.121) are TB infection risk factors. In conclusion, TB control program should be highlighted the concerned variables in order to accelerate TB incidence reduction, especially in countries with poor housing conditions.

Keywords: *housing condition; tuberculosis; risk factor*

INTRODUCTION

Indonesia is a country with the third tuberculosis (TB) incidence in the world. The number of TB incidence in 2016 was 1,020,000 (660,000 – 1,460,000)¹, increased 122% compared to TB incidence in 2012 which was 460,000 (380,000 – 540,000)². Bandar Lampung is one of the cities in Indonesia with a high TB incidence. Moreover, TB incidence in the city also increased about 80% during four years period. TB incidence in 2012 was 1,195 cases, increased to 2,056 cases in 2016³. Bandar Lampung also a city in Lampung province, a fifth

poorest province in Indonesia. One of indicators of poor province is poor housing condition⁴.

Housing condition is socio-economic indicator of health and welfare related to the environment⁵. Poor housing condition is linked to poverty, which increase vulnerability to disease⁶. Poor housing condition includes such as poor air ventilation, poor in-house sunlight and existence of in-house smoking pollution⁷. Poor air quality in the house as a result of insufficient ventilation and the presence of cigarette smoke contribute to decreased respiratory health and have impact to TB transmission. Moreover, poor air quality caused by in-house smoking pollution can disrupting the mucociliary defense function of airways, impair alveolar pulmonary macrophages function and make the lung vulnerable to infection, including TB⁸. This condition is deteriorated by the presence of in-house TB contact, which will increase the probability of in-house TB transmission⁹. This study aimed to study whether TB incidence in Bandar Lampung is associated with an increasing poor housing condition.

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METHOD

This study was a case control study, conducted at Sukaraja and Panjang Community Health Centre (CHC), which had the highest TB incidence in Bandar Lampung. Population of this research consisted of case and control population. Case population was TB smear positive patients during period of January – April 2016 in the study sites, which were 35 TB smear positive patients. Meanwhile, control population was TB suspect which have been confirmed did not suffer TB in the same study sites and period, which was 147 patients. Case sample was all population which was eligible, those was 31 TB smear positive patients. Meanwhile, control sample was twice as case samples, those were 62 patients.

Research variables in this study consisted of ventilation, in-house sunlight, in-house smoking pollution, in-house TB contact and TB infection. Ventilation was measured by percentage of ventilation area of house width (less ventilation: <20%, adequate ventilation: ≥20%)¹⁰. In-house sunlight was observed by existence of sunlight in-house (there was no in-house sunlight, there was in-house sunlight)¹⁰. In-house smoking pollution was indicated by existence of family member who smoke inside the house (there was in-house smoking pollution, there was no in-house smoking pollution)¹¹. In-house TB contact was indicated

by existence of TB contact inside the house (there was in-house TB contact, there was no TB contact).

In this research, data was collected through in-depth interview, observation and measurement. Data was then analyzed using bivariat analysis Chi-Square to identify the significance (p value) and significant influence (odds ratio/ OR) of each independent variable to dependent variable.

RESULTS AND DISCUSSION

This result shows that there are more respondents in case group (smear positive TB respondents) who most live in a house with less ventilation (56.2%), no in-house sunlight (58.1%), existence of in-house smoking pollution (50.0%) as well as existence of in-house TB contact (70.4%); compared to respondents in control group (respondents with no TB infection). Respondents in control group most live in a house with adequate ventilation (78.7%), have in-house sunlight (79.0%), have no in-house smoking pollution (75.4%) and have no in-house TB contact (81.8%) (table 1). Based on the bivariat analysis using Chi Square, it is also shown that all of research variables have p value of less than 0.05. In addition, existence of in-house TB contact is categorized as variable with the highest OR (OR: 10.688; 95% Confidence Interval/ CI: 3.792 – 30.121) among the other variables (table 1).

Table 1: Bivariat Analysis of Housing Condition to TB

Variables	TB Infection		p value	OR (95% CI)
	Yes	No		
Less ventilation				
Yes	18 (56.2%)	14 (43.8%)	0.001	4.747 (1.875–12.022)
No	13 (21.3%)	48 (78.7%)		
No in-house sunlight				
Yes	18 (58.1%)	13 (41.9%)	0.001	5.219 (2.040–13.355)
No	13 (21.0%)	49 (79.0%)		
Existence of in-house smoking pollution				
Yes	16 (50.0%)	16 (50.0%)	0.025	3.067 (1.240–7.584)
No	15 (24.6%)	46 (75.4%)		
Existence of in-house TB contact				
Yes	19 (70.4%)	8 (29.6%)	< 0.001	10.688 (3.792–30.121)
No	12 (18.2%)	54 (81.8%)		

OR: Odds ratio

CI: Confidence interval

In this research, existence of in-house TB contact is the strongest risk factor to TB infection. TB contact is the source of TB transmission. The transmission risk is greater when index case is sputum smear positive¹². Research result in Pakistan showed that in-house smear positive TB contact has probability of 11.73% to transmit smear positive TB to in-house family member. In addition, he also has probability of 9.6% to transmit smear negative TB to in-house family member⁹. Family members who have more intimacy and contact duration to in-house TB contacts have greater risk to have TB infection rather than family member who have less intimacy and contact duration of family member to in-house TB contacts¹². Research in India showed that a husband with smear positive TB rarely transmits his disease to his wife but more to his mother, due to social structure relationship which refer to intimacy. The disease can get most manifested in in-house family member within the first four months of the active disease of the smear positive in-house TB contacts. Although, the disease also can get manifested during the active disease of in-house TB contacts or even after 4 – 24 months of successfully treating the smear positive TB contacts¹².

In this research, in-house TB contact influences TB infection together with less ventilation, no in-house sunlight as well as existence of in-house smoking pollution, which refer to poor housing condition, especially poor in-house air quality. Previous research showed that most of TB patients in Bandar Lampung, Indonesia, clustered in areas with poor housing condition⁴. Moreover, in Bandar Lampung, Indonesia, among other TB infection risk factors (food security and health access), poor housing condition is the greatest risk factor^{13,14}.

Based on observation, most of case sample's respondents live in slum areas which are densely populated residential areas and crowded houses. Moreover, most of their houses are small houses with fewer windows or even cannot be opened windows due to crowded houses surrounding their houses. This condition caused the houses have less ventilation and less or even no in-house sunlight. The condition also makes worse in-house air quality if there is in-house smoking pollution.

Tuberculosis was spread via respiratory tiny particles droplets containing *Mycobacterium tuberculosis*, which would rapidly evaporated, leaving droplet nuclei. These

tiny particles would remain suspended on in-house air until either inhaled or ventilated out of the house. Therefore, in a house with less ventilation, droplet nuclei might remain suspended in the in-house air for prolonged periods, which mean will increased risk to be more inhaled¹⁵. However, droplet nuclei would not remain on in-house air with good in-house air circulation and adequate ventilation. In the other hand, most of respondent's case sample houses in this research have less ventilation which will increase the risk of transmission and infection, with OR: 4.747 (95% CI 1.875–12.022). This result concurs with research in Canada showing that more than two-third of 153 houses in endemic and epidemic TB areas had poor ventilation system¹⁶.

Droplet nuclei are also susceptible to ultraviolet light, including sunlight. Therefore, sufficient in-house sunlight is needed to control *M. tuberculosis*⁷. In a house with have less or even no in-house sunlight, risk of droplet nuclei to be inhaled will increase which also increase TB transmission and infection probability¹⁷. In this research the risk of no in-house sunlight to TB infection is 5.219 (95% CI 2.040 – 13.355).

In this research, TB infection is also influenced by in-house smoking pollution. Smoking pollution will impaired the normal mucociliary clearance of tracheal bronchial secretions and alveolar macrophage function, therefore it will weakening resistance to *Mycobacterium tuberculosis* and increasing of risk infection¹⁸. In this research, the probability of existence in-house smoking pollution to increase risk of infection is 3.067 (95% CI 1.240 – 7.584).

CONCLUSIONS

This research shows that poor housing condition consisted of: less ventilation, no in-house sunlight, existence of in-house smoking pollution as well as existence of in-house TB contact are TB infection risk factors. Therefore, TB control program should be highlighted the concerned variables in order to accelerate TB incidence reduction, especially in countries with poor housing conditions.

ACKNOWLEDGMENT

We would like to thank to Ministry of Research Technology and Higher Education, Indonesia for the research funding. We would also like to thank to

TB taskforce of Sukaraja and Panjang CHC Bandar Lampung, for their support during data collection.

Conflict of Interest: The authors declare that there are no conflicts of interest.

Ethical Clearance: Ethical clearance for this research was obtained from Faculty of Medicine University of Lampung. Moreover, the respondents in this study has received informed consent prior to the study and participated on voluntary basis.

REFERENCES

1. World Health Organization. Global Tuberculosis Report 2017. Geneva: WHO; 2017.
2. World Health Organization. Global Tuberculosis Report 2013. Geneva: WHO; 2013.
3. Wardani, D. & Wahono, E. Prediction Model of Tuberculosis Transmission Based on Its Risk Factors and Socioeconomic Position in Indonesia. *Indian J. Community Med.* 2018;43(2):204-208.
4. Wardani, D., Lazuardi, L., Mahendradhata, Y. & Kusnanto, H. Clustered Tuberculosis Incidence in Bandar Lampung, Indonesia. *WHO South-East Asia J. Public Heal.* 2014;3(2):123-195.
5. Rauh, V. A, Landrigan, P. J. & Claudio, L. Housing and Health: Intersection of Poverty and Environmental Exposures. *Ann. N. Y. Acad. Sci.* 2008;1136:276–288.
6. Lönnroth, K., Jaramillo, E., Williams, B. G., Dye, C. & Raviglione, M. Drivers of Tuberculosis Epidemics: The Role of Risk Factors and Social Determinants. *Soc. Sci. Med.* 2009;68:2240–2246.
7. World Health Organization. International Workshop on Housing, Health and Climate Change: Developing guidance for health protection in the built environment mitigation and adaptation responses. Geneva: WHO; 2010.
8. Woldesemayat, E. M., Datiko, D. G. & Lindtjørn, B. Use of biomass fuel in households is not a risk factor for pulmonary tuberculosis in South Ethiopia. *Int. J. Tuberc. Lung Dis.* 2014;18(1):67–72.
9. Khan, T., Ahmed, Z., Zafar, M., Nisar, N., Qayyum, S., Shafi, K. Active case finding of sputum positive pulmonary tuberculosis in household contacts of tuberculosis patients in Karachi, Pakistan. *J. Assoc. Chest Physicians.* 2014;2(1):25–31.
10. Canadian Tuberculosis Committee. Housing Condition that Serve as Risk Factors for Tuberculosis Infection and Disease. *Canada Commun. Dis. Rep.* 2007;33.
11. Slama, K., Chiang, C. & Enarson, D. A. Tobacco Cessation and Brief Advice. *Int. J. Tuberc. Lung Dis.* 2007;11(6):612–616.
12. Singh, J. Shankar, M.M., Kumar, S., Gopinath, K., Singh, N., Mani, K., et al. Incidence and Prevalence of Tuberculosis among Household Contacts of Pulmonary Tuberculosis Patients in a Peri-Urban Population of South Delhi , India. *PLoS One.* 2013;8(7):1–11.
13. Wardani, D. Social Determinants and Risk Factors for Tuberculosis Patients : A Case Control Study at Health Services Applying Directly Observed Treatment Shortcourse (DOTS) in Bandar Lampung, Indonesia. in 2nd Int. Meet. Public Heal. 2016. *KnE Life Sciences.* 2018: 522–531.
14. Wardani, D., Lazuardi, L., Mahendradhata, Y. & Kusnanto, H. Structured Equation Model of Tuberculosis Incidence Based on Its Social Determinants and Risk Factors in Bandar Lampung , Indonesia. *Open J. Epidemiol.* 2014;4(2):76–83.
15. Yates, T. A., Tanser, F. & Abubakar, I. Plan Beta for tuberculosis : it’s time to think seriously about poorly ventilated congregate settings. *Int. J. Tuberc. Lung Dis.* 2016; 20(1):5–10.
16. Larcombe, L., Nickerson, P., Singer, M., Robson, R., Dantouze, J., McKay, L., et al. Housing Conditions in 2 Canadian First Nations Communities. *Int. J. Circumpolar Health.* 2011;70(2):141–153.
17. Guterres, J. S., Wulandari, L., Wirawan, D.N. Risk Factors of Pulmonary Smear Positive Tuberculosis Incidence in Dili District Timor Leste 2014. *Public Heal. Prev. Med. Arch.* 2014;2(2):219–224.
18. Davies P, Yew W, Ganguly D, Davidow A, Reichman L, Dheda K, et al. Smoking and tuberculosis: the epidemiological association and immunopathogenesis. *Trans. R. Soc. Trop. Med. Hyg.* 2006; 100(4):291–298.

Early Marriage In Adolescent Opinion

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ABSTRACT

Background: Indonesia is a developing country with high percentage of young age marriage in the world. Female citizens who married with first marriage in 16 years old about 14.35%. Education association vocational senior high school Samarinda located on Samarinda Ilir. On 2014-2015 it was noted that teenagers who married aged 13-16 years old at 9 cases and become at 19 cases. The young marriage can effect for youths healthy.

Method: This research was qualitative study used descriptive approach. Research subject were male and female students class X in education association vocational Senior High School Samarinda, consisted of 6 informants, 1 support informant, and 1 key informant. Data collecting technique used snowball sampling.

Results: According the informant, early marriage in adolescent opinion in male and female students in education association vocational Senior High School Samarinda, early marriage in adolescent opinion is something scary and nothing special in this time, in the other hand, the other opinion showed the early marriage as something challenging and must try in their life.

Conclusion: There were 2 different opinions about early marriage. 2 informants disagree about early marriage because they want focusing on study and want to make parent happy, the other 4 informants agree about early marriage due to avoid the Zina and their can apply it after graduation school. The differences of opinion informants about early marriage in adolescents. There are those who agree to some who disagree with the reasons they expressed view of the current conditions.

Keywords: *Early Marriage, Adolscent, Sexual Behaviour Oppinion*

INTRODUCTION

Teenager is period full of konflik, because in this section is change period that change of body, behavior and character that expected by social groups, to search indentity for lifting theirsself as an individual. The Change for teenager sometimes has terribel change by the teenager and always cause the problems¹.

Teenager problems always appear both of out of county and in the country , however goverment always trying to keep in cooperation on some the best institution

from education indtitution, family or organisation who involves teenager on their program, for every teenagers always in teenager goodline and far from the activity or bad behavior. Social problem and academic are problems that always emerge and make big attention by the teenager. The real example that always in real life are so many fight accidents between teenagers who caused simple problems, teenagers who do suiciding because had konfilk with their boyfriends, or people around them, teenagers who have stress because their achievement down, then turn to drug, alcohol and freesex and so many teenagers who victimize their period wasted without supervision.

Marriage at a young age currently have become so many things that happen, especially after they finishing their education in top level, then many from teenagers are not continue their school and will marriage. And also, there is marriage by teenager who still study in school, so many dropouts because their marriage if that marriage

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based because they have pregnant before marriage, one of the shape of the responsibility that will their do is quit from their school.

Based on Bappenas projection, total number of the teenagers in 2014 is 66 million people or about 27% from total 255 million people in Indonesia and about 142 million girls or 14,2 million per/year marriage before 18th. According Survey Data Demografi and Indonesia residency (SDKI) in 2007 there are 9,1% or almost about 9 milion women who pregnant that not their want because their free association. Harm condition and harm the soul that experienced by the teenagers that become teenagers decided to getting marriage at a young age³.

Marriage at young age in the last 30 that make decline from 33% become 26%, however, the prevalence of marriage in age under 15 years still konstan from in the year 2000 untill in the year 2010. And teenagers who marriage in the 18th still very high.

Teenagers who Marriage at a young age can impact in teenagers health, both of physically and psychic. Marriage in young age impact to some of the things, there are : premature child birth BBLR (berat badan lahir rendah), violence to the children, abandonment to the children, low of self esteem, not harmonious in household, divorce⁴. In Indonesia on of the developing country with percentage of high marriage in young age (rank 37), the second highhestin ASEAN after Kamboja. In the year 2010, there are 158 countries with over 18th legal age minimum marriage, and Indonesia still in out of it. The young women Indonesian with age 10-14 years marriage were 0.2% or more than 22000 young women in the age 10-14 years in Indonesian who have to marriage. The total from young women in the 15-19 years who marriage more than if comparison with young man in the 15-19 years(11,7%P:1,6%L)⁵.

One of the provinces in Indonesia, that entering the top 10 figures of marriage at young age there is East Borneo was in third place after South Borneo and West Java, with population of women that ever marries according to their first marriage at 16 years as many as 14,35%, did their first marriage at the age of 17-18 years as many as 21,48%, and did the first marriage at 19-24 years as many as 15,68%⁵. Getting marriage at a young age is the one causes of disruption of reproductive health. If the younger the age to getting marriage that the more long range of the time to production.

Based on the result of Susenas at 2014 the most of the women at the age over 10 years that have been marriage and birthing with the number of children born alive there is 1 person as much as 28,9%, with 3 children that born alive as much as 19,53%, and with 4 children who born alive as much as 9,52%, but there are also never had children born alive as much as 6,62%⁶.

Not only in the matter of the world, data about getting marriage at a young age recorded until a smaller area, as in these areas. We can access education institution to find teenagers, which 100% contains teenagers at risk who getting marriage at a young age. Almost all areas have number of early marriage, this data never decreased each year, but always have an increased, so need to find out how the the teenager's vision about marriage at a young age among adolescents themselves.

METHOD

This Research use kualitatif research with using Descriptive approach which aims to the full picture about the object that researched. In this case research's subject there are students that study in SMK Yayasan Pendidikan in Samarinda. This research using snowball sampling technic, using the technique of triangulation of sources.

RESULTS AND DISCUSSIONS

The perception of getting marriage at a young age on students from the research result obtained different from students about their perception of marriage at a young age. There were 2 informants said, do not agree to marriage at young age for the reason they want to make their parents happy and focus for their school. They said that getting marriage at young age that can hinder their education and can't make their parents happy. There are 4 another informants that agree to marriage at young age for the reason marriage at young age better to avoid from zina and they assumed marriage at young age is a challenge and can provide new experience in informant's life.

Even so, the both of this informant ended with the same answer , all of teenagers that in the one top level school desirous to marriage at young age after they have graduation from Senior High School and at 20 years.

The influence of the environment against the phenomenon of marriage at young age for students. In

the research at the top level school for students who want to getting marriage at young age because the informants are surrounding people who had made a marriage at young age . the most of the informants said, they have neighbors, friends, family or person who close to their that have marriage at young age. This line depends on the soekarno's research (2011), that environment, place and level of education influential to increases the age to first marriage⁷.

According with Green's theory in Notoatmojo⁷ who exposed *Precede-Proceed* theory . Green analyzed behavior using *Preeced*. The behavior in this research can be defined as the perception of students of marriage at young age. This Precede model described that the behavior specified or form of 3 factors. The factors are predisposisi is the factor that factor to simplify to occurrence of behavior, there are knowledge, attitude, conviction, tradition, reliance, perception, and so on. The second factor is Enabling factor is factors facilitate behavior or action such as the facilities and infrastructure (Puskesmas, place to live, school). The last factor is encourage or reinforce the occurrence of a behavior.

In this research there is factor that has the same with one of factor in green's theory there is Enabling Factor, in this case that mean the environment of neighborhood and school that affect the student's desire for getting marriage at young age. The view towards of peers have marriage and *Role model* be an inspiration. Almost all of the informants said they have peers who have marriage at young age, the viewed all of the informants are different. Some of the informants assume that the peer who have marriage at young age was the scary thing because almost all of informant's friends marriage because Marriage by accident and end on divorce.

All of informants said they ever hear marriage at young age by electronic media and print media, as Facebook and instagram, and magazine. This shows that students who study at top level are not previous from progress of the technology information that know all happen quickly in community, include marriage at young age. Each informant has one figure that marriage at young age that obtained through facebook and Instagram and be role model in desire to marriage at young age, figures that be role model from various backgrounds there are artist, selebgram, and their own family.

The different viewed from the informants about peer who marriage at young age they have the same desire

marriage at young age and become artist, selebgram and their own family as the informant inspiration to marriage. The role of the parents very needed in teens view of marriage at young age, will happen the good synergy by the teenagers, institution of education, and also family, as the firs house from teenager to shedding all of their problems. If parents have attention to the development of adolescents, of course the parents will give a strong fortress scientific that the good and bad action by teenagers. But it is unfortunate if parents very let their teenagers to explore their life in outside by herself without the real guidance, then in teenagers who can sorting out the good association that will make the teenagers be the good person without do bad measure that can damage teenager's future, but it the teenagers can not restrain solicitation the bad association, ascertained the teenagers will entry into the group and it will be difficult to return them in the right way¹¹.

The corellation of marriage a young age with health From the research results at top level school showed that only 2 informants who know the relation of marriage a young age with health, 1 informant said the marriage a young age there is no connection with health, but the informant said getting marriage at young age can impact to trouble of economy because not yet established and the other informants said they didn't know the relation between marriage a young and health.

This in confirmed with the support informants that said students in top level school don't get a lesson of reproductive health. If teenagers do the marriage a young age, then after marriage of course there is process of pregnancy, in the process of pregnancy the teenager's body that should still do the growth process than should divide it to a fetus conceive, because the fetus will always developing until 9 months pregnancy the fetus is ready to born and be a baby¹⁰. On the process of the birth indirect causes of the mom death is too young, it also as evidence basically on the young body haven't been able to two life, both of for herself or the prospective life her son.¹² For baby is at risk born in the weight less than 2500gr condition that can the occurrence of various diseases at risk as the cause of the baby death in a year for baby's first life.

CONCLUSIONS

Based on the research of teen views to the marriage at young age in the top level school with the conclusion

that the teen opinion of marriage at young age is the the scary thing at the same time also deemed challenging by some of teenagers.

There are 2 different views between the perception of marriage according by female students and male students. The male students are not agree with the reason if marriage at young age can block the desire to make parents happy, while the perception of marriage at young age by female students they are agree to marriage at young age in order to avoid from zina.

Each informants have one figure who marriage at young age that from facebook and instagram and be role model of the desire to get marriage at young age, the figures that become role model from various backgrounds there are artist, selebgram, and the family who close to them. The different view from informants about peer who marriage at young age it ends with a desire to marriage at young age and make the figures, selebgram and family as inspiration person of the informant to marriage.

The right provide information to teenagers in top level school will delivering the teenager to choose their future direction without a sense of regret in the later, so the sense of responsibility that teenagers had can passed by wholeheartedly. The good cooperation between family, school, friend the neighborhood teenagers as well as private teen self be the strong handle of teenager to choose their future well and maximum.

ACKNOWLEDGMENT

Thanks to Universitas Muhammadiyah Kalimantan Timur, Indonesia and Sekolah Menengah Kejuruan Yayasan Pendidikan Samarinda.

Conflict of Interest: There is no conflict of interest in this research

Ethical Clearance: In this study will begin by going through the permission stage by the school first, then the selected respondents are given an informed consent as the first explanation in the research flow where they will be involved in it.

Source of Funding: This Research is independently by researcher

REFERENCES

1. Hurlock,E.B. Child development. Interpretation by Meitasari Tjandra. Yogyakarta. Erlangga (1997)
2. Badan Pusat Statistik Indonesian Population Projection BPS Catalog: 2101018 (2015).
3. SDKI Indonesian Demographic Health Survey. (2007).
4. Sabi,A Yulianti (2012). Overview of Health Status and Factors for the Causes of Early Marriage in Adolescents in Lio Gerong Village, Muroti Island District, North Maluku. Jurnal online. (Http://www.Repository.usu.ac.id.pdf.)
5. BKKBN. Early Marriage in Several Provinces in Indonesia (2012).
6. Badan Pusat Statistik. BPS Samarinda catalog in Figures (2014)
7. Soekarno. Effect of Socio-Economic Factors on Fertility and Age of First Marriage. Scientific Journal of KB Research and Development Center and K . Volume 5, No.1. (2011)
8. Notoatmodjo . *Public Health, science and art* Jakarta. Rineka Cipta (2011)
9. <http://psycnet.apa.org>.
10. Bunting, A. . “*Stages of Development: Marriage of Girls and Teens as an International Human Rights Issue.*” *Social and Legal Studies* 14 (1): 1738.10.1177/0964663905049524 [Crossref], [Web of Science ®] [Google Scholar] 2017
11. Bunting, A., B. Lawrance, and R. Roberts.. “*Introduction: Something Old, Something New? Conceptualizing Forced Marriage in Africa.*” In *Marriage by Force? Contestation over Consent and Coercion in Africa*, edited by A. Bunting, B. N. Lawrance and R. Roberts, 1–42. Athens, OH: Ohio University Press. [Google Scholar] 2017
12. Halley, M. . “*Negotiating Sexuality: Adolescent Initiation Rituals and Cultural Change in Rural Southern Tanzania.*” PhD diss., Case Western Reserve university. https://etd.ohiolink.edu/rws_etd/document/get/case1327594508/inline>. [Google Scholar] 2017

The Effect of Narcotics Anonymous Meeting toward Relapse Prevention among Prisoners

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ABSTRACT

Narcotics has been becoming transnational problem which was involving many sectors, include prison. Increasing of drugs abuse and criminalities caused increasing of prisoners. This problem was not only a social problem, but also health problem, especially mental health problem in prison. In fact, prison and punishment did not effectively heal their criminalities and also their addiction toward narcotics. Unfortunately, it precisely made a hidden movement of narcotics inside prison. It was necessary to build a program to prevent bad practice among prisoner and heal their addiction. One of the effective ways to solve the problem is rehabilitation in prison. But, rehabilitation could not sustain without desire to prevent relapse. This research aimed to know the effectiveness of NA meeting toward relapse prevention among the prisoners. This research is an experimental study which was initiated in Samarinda Narcotics Prison, East Kalimantan. NA meeting were held among 30 participants, divided over 2 groups. The meeting has been conducted once a week for 3 months. Data collected by pre and post-test. Results show that participants have a different level of attitude about relapse prevention of drugs abuse. According to statistical test, this study presenting the value of $p=0.0001$, which we can conclude that there is significant effect of NA Meeting toward relapse prevention among prisoner. In addition, there is fair enough correlation ($r=0,660$) between NA meeting with relapse prevention among prisoner. Interventions focusing on support group, education and rehabilitation may improve relapse prevention among prisoner.

Keywords: *prisoner, narcotics anonymous, relapse prevention*

INTRODUCTION

Narcotics are one of the most problems in almost all countries. Narcotics crime has been becoming transnational crime which involving many factors, such as trafficking crimes, financial crimes, and high-tech crimes¹. Increasing of criminalities of drug abuse is linear with increasing amount of prisoners and also the problem inside it. In many case, prison have been over capacity of prisoners, even more than 300% in

Samarinda, Indonesia². Some solutions were performed to solve the problem, once of the most preferable is rehabilitation within prison.

As in Indonesia, National Narcotics Board have been already successfully rehabilitating around 18.311 addicts (include in prison) and reached 7.829 ex-addict which was given therapy trough aftercare program³. Not many therapy methods are effectively healing the addiction, but there are several methods based on evidence which successfully give clean period much longer, such as Therapeutic Community (TC) and Narcotics Anonymous (NA), both of them are self-help therapy. TC needs more professional in residential program and also more firm in new behavioral forming. NA has the free system with meeting as a media to help addicts grow their desire to stop using drug or at least have fewer tendencies of using drug⁴.

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Narcotics Anonymous is a global community-based organization with various membership which was established in 1953. For the first twenty year, the membership is still insignificant, but after the publication of Basic Text in 1983, the number of members and meetings has increased significantly. Based on membership survey in 2016, NA members hold nearly 67,000 meetings weekly in 139 countries. NA provides recovery from the effects of addiction through working a twelve-step program, including annual attendance at group meetings. The environment of group provides help from peers and presents an ongoing support network for addicts who have a willingness to pursue and maintain a drug-free lifestyle. Narcotics Anonymous is not meant to advice a focus on any particular drug; NA's approach makes no difference between drugs including alcohol. NA has no affiliation with government, faith-based organization, law enforcement groups, or medical and psychiatric associations⁵. The meeting can be held independently, but in Indonesia, mostly the meeting is facilitated by Community-based organization which conducting a rehabilitation program for addicts.

Relapse is a condition where people fall into drugs after recover. Preventing relapse can affect in preventing more unlawful behavior, increasing mental health and also prevent from unwell-being life. One of program of relapse prevention is mindfulness and spiritual-based program, which is a good way to increase psychological well-being⁶, include in prison. However, it is important to know the effectiveness of NA meeting towards relapse prevention for sustainable rehabilitation among prisoners.

METHOD

This research is an experimental study which was conducted in Samarinda Narcotics Prison, East Kalimantan. Participants were recruited purposively because of special nature of a prison, participants had to be selected by the staff first to ensure our safety, only drug users who had experience of rehabilitation were included. Nevertheless, to avoid a potential selection bias, we required the staff which had no direct interactions with drug users to select participants and considering about their length of drug crime sentence.

A total 57 participants (divided into 4 groups) were involved in this study, but only 30 participants (in 2 groups) which completed the baseline (pre), intervention (complete 12 meetings) and end-line

(post) test. The treatment to participants was delivering guidance how to conduct the meeting, the steps, and traditions. Furthermore, every meeting was facilitated by a complete NA guidance, so the participants could conduct the meeting independently. Every group has the chairman of meeting to lead the participants for sharing and support each other. Only addicts could talk in this meeting and the topic should be about hope, strength and experience of abstinence from drug. Each group was observed while meeting conducted. The meeting was conducted once a week for 3 months. Data collected by pre and post-test.

Descriptive statistics was used to measure all variables: age, level of education, drug of choices, lengths of use drugs. Therefore present by frequency, and percentages. Wilcoxon signed rank test was used to measure different between pre-test and post test scores. The significant different was define as p value < 0.05.

RESULTS AND DISCUSSION

This study is presenting some data about participant's characteristics which is categorized by age, level of education, drug of choice and length of use. Below is the result of study:

Table 1: Participants' Characteristics in Samarinda Narcotics Prison

Respondent's Characteristic	F	%
Age (years old)		
<20	1	3,3
20-25	2	6,7
26-30	6	20,0
31-35	9	30,0
>35	12	40,0
Level of Education		
Elementary School	3	10,0
Junior High School	10	33,3
Senior High School	15	50,0
University	2	6,7
Drug of Choice		
Methamphetamine/Shabu	23	77,7
Amphetamine	1	3,3
Marijuana	1	3,3
Ecstasy	4	13,3
Inex	1	3,3

Conted...

Length of Use (year)		
<1	6	20,0
1-3	7	23,3
3-5	3	10,0
> 5	14	46,7
Total	30	100

Source: Primary Data, 2017

Based on table 1, the most age of participants is >35 years old (40%). 50% of participants are completed education at senior high school level. Methamphetamine is noted as the most drug of choice (77,7%) and majority length of use drugs among participants are more than 5 years (46,7%).

According to baseline survey before the intervention, some data are collected about internal factors which initiate someone to use drug even if they have already recovered. Below is the result:

Table 2: Participant's Distribution based on Internal Factor Causing Relapse

Internal Factors	Yes		No	
	F	%	F	%
Fear	14	46,7	16	53,3
Lack of care	6	20,0	24	80,0
Angry	18	60,0	12	40,0
Feeling guilty	13	43,3	17	56,7
Timidity	24	80,0	6	20,0
Sadness	20	66,7	10	33,3
Stress	12	40,0	18	60,0

Source: Primary Data, 2017

Table 2 shows that there are many conditions which lead participant to use drug again, such as Timidity (80,0%), Sadness (66,7%), angry (60,0%), fear (46,7%), feeling guilty (43,3%), stress (40,0%), lack of care (20,0%). Besides, the attitude towards relapse prevention shows the different score before and after intervention. Below is the result:

Table 3: Participant's Distribution based on Attitudes toward Relapse Prevention Before and After NA Meeting

Attitude toward Relapse prevention	Before		After	
	F	%	F	%
Positively prevent relapse	13	43,3	22	73,3
Negatively prevent relapse	17	56,7	8	26,7
Total	30	100	30	100

Source: Primary Data, 2017

Table 3 indicates that attitudes toward relapse prevention are increasing positively. Before the intervention, there is 13 participants (43,3%) which positively prevent relapse and after intervention the amount of people is significantly increase become 22 participants (73,3%). In opponent, the people who give negative attitude toward relapse prevention are decreasing after intervention. The effect of NA Meeting toward relapse prevention is analyzed by Wilcoxon Signed Rank Test based on pre-test and post-test score. Below the result of analysis:

Table 4: The Effect of NA Meeting Toward Relapse Prevention among Participants

Result of Pre-test and Post-test	F	p-value	ρ/rSp
Positive	23	0,0001	0,660
Negative	3		
Ties	4		
Total	30		

Source: Primary Data, 2017

Table 4 shows that after measurement of score pre-test and post-test, there is 23 participants who experience increasing of attitude about relapse prevention (from negative to positive), 3 participants who experience decreasing score of attitude toward relapse prevention and 4 participants do not change their attitudes. Based on statistical analysis, this study obtain p-value 0.0001, which is mean that there is a different attitudes before and after intervention (NA Meeting). The correlation coefficient shows the number of 0.660, it means that there is strong enough influence of NA Meeting toward relapse prevention.

Addiction, Recovery and Relapse: Based on the results, all participants are in the productive age with length of

use drug are more than 5 years, which is indicate that first time of using drug in the young age. Addiction is the condition for someone where they could not control their drug use. Once they stop, it will cause an effect for their physical and psychological. The most dangerous situation is it can cause the hidden movement within prison. To hand over this situation, some programs are performed, such as reducing demand, restricting supply and building recovery, include in prison⁷. In case of recovery program, it is easy enough to make addicts clean physically, but it is difficult enough to make addicts stay clean physically and psychologically. Another research found that recovery is fragile. Recovery was described as being unsure and temporary as well as somewhat never-ending⁸. This will lead to a statement that addiction is a chronic disease, which can perform relapse after abstinence. That is why, recovery is both attainable and sustainable with proper support to prevent relapse⁹.

Also according to results, there are several conditions which lead someone to relapse, such as timidity, sadness, angry, lack of care, feeling guilty, stress and another unpleasant feeling. It suitable with prison's condition, whether stay in prison or after release, prisoners have a stressful condition such as jobless, facing stigma, lack of housing and another challenge of recovery. A previous study showed that the most common type of reason given for relapse was negative emotion states. The elements of negative emotions are low mood or sadness, frustration, anger, anxiety, and resentment that all are responsible for causing relapse¹⁰. Another study also presents that low internal motivation and helplessness will effect to lower control over drug use¹¹.

Effect of NA Meeting toward Relapse Prevention: The attitudes about relapse prevention are different before and after NA meeting. The scores of attitude are increase significantly. It also shows that there is a will of prisoners to improve their life into a drug free lifestyle. NA well-known as a support group which main prerequisite are willingness of abstinence by encourage member to heal their self by sharing each other. Moreover, mutual self-help program, have been proven to be efficacious in promoting abstinence¹². Abstinence is also indicate that the participants can control their craving of drug or prevent relapse.

As a support group, there are many things which have to be deal with, such as attendance of NA meeting.

In this study, NA meeting produce more positive effect toward relapse prevention among participants. There is increasing of willingness to avoid trigger factors to relapse. Although they will release from prison, they have desire to connect with the meeting outside prison. This finding is in line with literature where presence at NA self-help group has continuously been proven as related to, or predictive of abstinence and better outcomes post-treatment, include preventing relapse^{13,14,15}. Involvement in NA meeting is also contribute to lower psychological distress, psychiatric symptoms and made patient more likely to be abstinent one year after formal treatment¹³.

This study found that attending NA meeting once a week gave a significant change of attitude toward relapse prevention. This finding is in line with previous study, which attending groups meeting 1-2 times a week had an abstinence rate of 66,67%, while those attending 3-5 per week showed an abstinence rate of 76,5%, and those attending daily reported the highest abstinence rate of 85,7%. This study also present a significant association between attendance of drug monitoring group and abstinence ($p=0,001$)¹⁶. Although this study present the positive result to relapse prevention after 3 months of intervention, it is valuable to develop a comprehensive program within prison, which focusing on support group, education, and rehabilitation.

CONCLUSIONS

Relapse prevention is an important skill to maintain abstinence. Prison should have paid more attention to the health of prisoner, especially mental health. This finding suggests interventions focusing on support group, education and rehabilitation may improve relapse prevention among prisoner. Prison can provide some capacity building to the prisoners about relapse prevention and support them with group counseling regularly.

ACKNOWLEDGEMENTS

The author would like to thank to the head and also staff of Samarinda Narcotics Prison, Indonesia for their encouragement, support and good cooperation during this study

Conflict of Interest: There is no conflict of interest in this research.

Ethical Clearance: The study was accepted after a

complete internal review of proposal that adjudicate to involve some staffs of prison to control the interventions. Participants were informed about the objective of the research and that they were free to participate or leave the research at any point which will not prohibit their rights. Written informed consent was obtained from all participants before data collection.

Source of Funding: The funding of this research is supported by LPPM of STIKes Muhammadiyah Samarinda (Research and Service Board of STIKes Muhammadiyah Samarinda)

REFERENCES

1. UNTOC, *Conference of the Parties to the United Nations Convention against Transnational Organized Crime*; Vienna (2014)
2. Prison Data-based System <http://smslap.ditjenpas.go.id/public/grl/detail/daily/upt/f40aefb0-006b-106b-d0ce-303930343033> (2018)
3. Public Relation of BNN, End Year Press Release 2017 “*Work together Fight Against Drug*”. Jakarta, 27 December 2017. B/PR- /XII/207/ HUMAS (2017)
4. G.T. Abbas, P. Maliheh, H. Majid, A. Hadi, H. Hashem. The Impact Of Client’s Education In The Narcotics Anonymous Meetings On Tendency To Use Drugs. *Journal of Torbat Heydariyeh University of Medical Sciences (Journal of Health Chimes) Winter. 2:17-22* (2015)
5. NA World Services. Information about NA. Accessed at 12 July 2018 2.11 pm Public Relations <https://www.na.org/?ID=PR-index> (2016)
6. J. Gu, C. Strauss, R. Bond, K. Clin Cavanagh. How Do Mindfulness-based Cognitive Therapy and Mindfulness-based Stress Reduction Improve Mental Health and Wellbeing? A Systematic Review and meta-Analysis of Mediation Studies. *Psychol 37:1-12* (2015)
7. PA. Hearty, E Wincup, orcid.org/0000-0001-543-073X and Wright, NMJ The Potential of Prisons to Support Drug Recovery. *Drugs and Alcohol Today, 16* (1). Pp. 49-58. (2016)
8. S. Senker, G. Green. Understanding Recovery; the Perspective of Substance Misusing Offenders. *Drugs and Alcohol Today* <http://repository.essex.ac.uk/17021/1/Submission%203%20pre%20pub.pdf> (2016)
9. <http://www.cclt.ca/Eng/topics/addiction-recovery/Pages/default.aspx>
10. M. M. Rahman, M. M. Rahaman, J. D. Hamadani, K. Mustafa & S. M. S. Islam. Psycho-social factors associated with relapse to drug addiction in Bangladesh. *Journal of Substance Use* (<http://dx.doi.org/10.3109/14659891.2015.1122099>) (2016)
11. Y. Zhang, B. Feng, W. Geng, L. Owens, J. Xi. “Overconfidence” versus “helplessness”: A qualitative study on abstinence self-efficacy of drug users in a male compulsory drug detention center in China. *Substance Abuse Treatment, Prevention, and Policy 11:29* (2016) (<https://doi.org/10.1186/s13011-016-0073-2>)
12. RG Atkin, JE Hawdon Religiosity and Participation in mutual-aid support groups for addiction. *J Subst Abuse Treat 33: 321-331*(2007)
13. RH Moos, JW Finney, PC Ouimette, RT Suchinsky A Comparative Evaluation of Substance Abuse Treatment: I treatment orientation, amount of care, and 1 year outcomes. *Alcohol Clin Exp Res 23: 529-536*, (1999)
14. M Gossop, D Stewart, J Marsden. Attendance at Narcotics Anonymous and Alcoholic Anonymous meetings, frequency of attendance and Substance Use Outcomes After Residential Treatment for Drug Dependence: 5 Year Follow Up Study. *Addiction 103: 119-125*(2008)
15. C Laffaye, JD McKellar, MA Ilgen, RH Moos Predictors of 4-year outcome of community residential treatment for patients with substance use disorders. *Addiction 103: 671-680*(2008)
16. C McPherson, H Boyne, R Waseem Understanding the Factors that Impact Relapse Post-Residential Addiction Treatment, a Six Month Follow-up from a Canadian Treatment Centre. *J Alcohol drug Depend 5: 268*. (2017)

The Analysis of the Factors affecting Medication Adherence in Patient with SLE (*Systemic Lupus Erythematosus*) at Yayasan Tittari Griya Kupu Solo

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ABSTRACT

The prevalence of systemic lupus erythematosus (SLE) in Indonesia was considered high (approach 100.000/year). Medication adherence was essential for the control of symptoms and progression of SLE. This study aimed to measure the prevalence of medication adherence and analyze associations between socio-demographic, duration disease, number of currently used medicines and side effects of medication adherence in patients with SLE. The research used descriptive, analytic method held from February 2018 to April 2018 with the total of 41 respondents. The data were collected through questionnaire and individual interviews. Medication adherence was assessed by interviews based on the Morisky Green Levine Scale (MGLS), and the associated factors (gender, age, level of education, occupation, income, duration of disease, number of currently used medicines, and side effect) were analyzed using chi-square test. Twenty-two patients (53,65%) were using combination drug while 19 patients (46,34%) were using a single dosage form. The percentage of patients classified as non-adherence to treatment was 36.6%. The chi-square analysis of characteristics of the patient and medication adherence showed that there was a significant relationship between side effect (*p-value* 0,025) with medication adherence. There was no significant relationship between medication adherence with gender, age, level of education, occupation, income, duration of disease and number of currently used medicines ($p>0,05$). It can be concluded that the incidence of side effect is a significant predictor of medication adherence for a patient with SLE.

Keywords: *Systemic Lupus Erythematosus, adherence, Morisky Green Levine test.*

INTRODUCTION

Systemic Lupus Erythematosus (SLE) is an autoimmune disease characterized by widespread inflammation and has multiple manifestations. The clinical manifestations of SLE are very extensive including the skin and mucosa, joints, blood, heart, lungs, kidneys, the central nervous system (CNS), immune system, and ear¹. The exact number of patient with SLE in the world is unknown. The prevalence of SLE varied from 4-250 per 100.000 population².

The treatment of SLE is aimed to obtain a long remission period, reduce the activity of the disease, reduce pain and maintain organ function. The standard medications include glucocorticoids, immunomodulatory drugs, and NSAID (Non-Steroid Antiinflammatory Drugs). Patients with SLE require adherence to long-term treatment to remain in remission³.

Adherence to a medication regimen refers to whether a patient takes a prescribed medication according to the provider's instructions⁴. The lack of adherence is the most common problem among patients with chronic diseases. The lack of adherence may lead to increased treatment costs, decreased quality of life, increased complications of illness and risks of hospitalization⁵. The World Health Organization (WHO) has identified the factors affecting adherence were health-care systems, provider relationships, disease, treatment, patient characteristics and socioeconomic characteristics⁶.

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The rate of medication adherence in a patient with SLE has varied from 54% to 93%^{7,8}. A previous study in Brazil showed that only 31.7% was adhere to drug treatment⁹.

Factors that may be associated with adherence in patients with SLE including age¹¹, level of education, income, duration of disease¹³, number of medicines¹⁰ and side effect⁷.

This study aimed to measure the prevalence of medication adherence and analyze associations between socio-demographic, duration disease, number of currently used medicines and side effects of medication adherence in patients with SLE.

METHODOLOGY

This was a descriptive and analytic study of SLE patients during the period from February 2018 to April 2018. The study was approved by the ethics committee of Faculty Medicine of Sebelas Maret University with ethical certificate number: 106 / II / HREC / 2018, and written informed consent was obtained from all participants.

The study population was selected from the Yayasan Tittrasi Griya Kupu Solo. The inclusion criteria were (1) patient diagnosed SLE who are registered as a member of Yayasan Tittari Griya Kupu Solo, (2) in use of at least one specific drug for treatment of SLE, and (3) willing to be a participant in the research by signing the informed consent sheet. The exclusion criteria were patients who did not answer the question completely.

Patients' information regarding their demographic and socioeconomic characteristics, duration of disease, number of currently used medicines and side effect were collected by using a structured questionnaire. Adherence behavior was assessed by interviews based on the Morisky Green Levine Scale (MGLS) by asking four questions: (1) Do you ever forget to take your medicine?; (2) Are you careless at times about taking your medicine?; (3) When you feel better, do you sometimes stop taking your medicine?; and (4) Sometimes if you feel worse when you take your medicine, do you stop taking it?¹⁹

Descriptive statistics were used for the demographics and patient characteristics. The categorical data were summarized as numbers and percentages. The Chi-squared test and Fischer's exact test were used for bivariate analysis to investigate the association between

adherence and the other covariates (gender, age, level of education, occupation, income, duration of disease, number of currently used medicines, and side effect). All data were analyzed using statistic.

RESULTS

A total of 41 patients were interviewed between February 2018 – April 2018, most of them were female (95.1%), aged between 26-45 years (61%), high educated (51.2% > 12 years education), the most frequent monthly total family income was >1.500.000 IDR/140 USD (80.5%) with duration of disease was ≤ 5 years (63.4%), and number of currently used medicines was < 5 drugs (73.2%) . Participant' characteristics are shown in table 1.

The SLE medication taken by patients consist of single medication and combination drug. The single medication and combination drugs are taken by patients were methylprednisolone (34,1%) and methyl prednisolone + mycophenolate mofetil (36.6%). Other SLE drugs included methyl prednisolone + cyclosporine (17.1%), azathioprine (4.9%), mycophenolate mofetil (2.4%), mycophenolate acid (2.4%) and leflunomide (2.4%).

Table 1: Characteristics of participants

Variables	n	%
Gender		
Men	2	4.9
Female	39	95.1
Age		
< 15 years	1	2.4
15–44 years	35	85.4
> 44 years	3	12.2
Level of Education		
≤ 12 years	7	17.1
> 12 years	34	82.9
Occupation		
No	23	56.1
Yes	18	43.9
Income		
≤1.500.000IDR/104USD	8	19.5
>1.500.000IDR/104USD	33	80.5
Duration of disease		
≤ 5 years	26	63.4
> 5 years	15	36.6

Conted...

Number of currently used medicines		
< 5 drugs	30	73.2
≥ 5 drugs	11	26.8
Side effect		
No	19	46.3
Yes	22	53.7

Based on the data analysis and using the MGLS, the prevalence of non-adherence was 36.6% in the sample of patients (n=15). The answers to each question in the MGLS were examined individually (Table 2). The fewest patients adequately answered the question regarding taking medicine at the right time (n=15, 36.6%), followed by stopping medicine when feeling worse (n=18, 43.9%) and stopping medicine once asymptomatic (n=18, 43.9%), and forgetting to take medicine (n=25, 60.9%).

Table 2: The frequency of answer “yes” to question in MGL questionnaire

Questions	n	%
Do you ever forget to take your medicine?	25	60.9
Are you careless at times about taking your medicine?	15	36.6
When you feel better, do you sometimes stop taking your medicine?	18	43.9
Sometimes if you feel worse when you take your medicine, do you stop taking it?	18	43.9

Adherence to drug treatment was significantly associated (*p-value*=0.025) with the side effect. No association between medication adherence and gender (*p-value*=1.000), age (*p-value* =0.615), level of education (*p-value* =0.390), occupation (*p-value* =0.550), total family income (*p-value* =1.000), duration of disease (*p-value* =0.506) and a number of currently used medications (*p-value* =1.000) was observed in this study (Table 3).

Table 3: Associations between covariates variables and prevalence of medication adherence

Variables	P-value
Gender	
Men	1.000 ^a
Female	

Conted...

Age	
< 15 years	0.615 ^a
15 – 44 years	
> 44 years	
Level of Education	
≤ 12 years	0.390 ^a
> 12 years	
Occupation	
No	0.550
Yes	
Income	
≤ Rp 1.500.000	1.000 ^a
> Rp 1.500.000	
Duration of disease	
≤ 5 years	0.506
> 5 years	
Number of currently used medicines	
< 5 drugs	1.000 ^a
≥ 5 drugs	
Side effect	
No	0.025
Yes	

Notes: ^aFischer’s exact test.

DISCUSSIONS

This is the first study about medication adherence in a patient with SLE in Indonesia using MGLS. In this study, we assessed the frequency of medication adherence, as well as; we examined the association between medication adherence and other covariates. Factors that may be associated with adherence in patients with SLE including gender, age, level of education, occupation, total family income, duration of disease and number of currently used medications and side effect.

There is no standard method to measure medication adherence. Medication adherence can be evaluated by direct methods such as biological assay of body fluids, tracer drug compound, and biological markers. There are also indirect methods for evaluating the medication adherence such as self-report, pill counts, rates of prescription refills and questionnaires¹⁸. The Pill count method is one of the most widely used methods for determining the level of medication adherence, but this method provides no information on other aspects of taking medications. Therefore, there is an alternative method that can be used that is using a self-report questionnaire. Frequently used questionnaire is MGLS.

According to the results obtained 36.6% of respondents are non-adherence to treatment. This is in contrast to the previous study using MMAS-4, indicating that the adherence level in SLE patients was 31.7%⁹ whereas according to other study mentioned that the level of adherence in SLE patients ranged from 48-93% depending on the method used¹¹. In this study, the main reason for not taking their medicine: forgetting to take medication (93.3%) and feeling good (93.3%), followed by had problems taking pills at specified times (73.3%) and avoiding side effects (73.3%).

In this study examined the relationship between demographic and socioeconomic characteristics, duration of disease, number of currently used medicines and side effects with medication adherence. According to the results of the study, it was found that gender and age were not significantly associated with medication adherence. This finding is similar to other studies suggesting that age and sex were not significantly associated with medication non-adherence^{4,10} but other studies have shown that younger age is a factor that significantly affects medication adherence¹¹.

The level of education was not associated with medication adherence in the current study. This finding is similar to another study, the level of education was not affected medication adherence¹². In contrast, other study showed that the level of education was associated with medication adherence. Lupus patient with a higher level of education may be more aware of their disease and treatment option and are capable of making better decisions in drug use because a patient with high level of education might be more likely to research about their disease and medications with great detail¹³.

In the current study, occupation was not associated with medication adherence. Our finding similar to the previous study which mentioned that occupation was not associated with medication adherence³. Lupus patients were given up their job because of the difficulty of completing the work with their physical conditions¹⁴.

In the current study, income was not associated with medication adherence. This result in agreement with the previous study in SLE⁹ and contrast with another study, the higher amount of income tends to be more adhere to their medication¹³. Similar to previous studies in SLE patients, duration of disease was not associated with medication adherence^{12,15,16}.

Number of currently used medicines was not associated with medication adherence. Our finding similar with the previous study which concluded that the number of currently used medicines was not associated with medication adherence⁹ but in contrast with other studies, the number of currently used medicines was associated with medication adherence^{8,10}. Many patients with SLE have comorbidities such as hypertension, dyslipidemia, depression, coagulopathies, and osteoporosis, each of which may require one or more drugs for adequate control. This prescription medication burden can result in impact patient adherence¹⁰.

There was a significant association between medication adherence and side effect. This is in agreement with previous studies that side effect is significant predictor of medication adherence for patient with SLE^{7,9,17}. Side effects occurred in a considerable percentage of patients (53.7%). Approximately 73.3% of patients reduced the dose or stopped taking their medication when they noted some side effects. Based on interviews found that the most common side effect is moonface (36.4%) and followed by osteoporosis (22.7%), nausea (18.2%), vomiting (13.6%), gain weight (13.6%), hypertension (4.6%) and cataracts (4.6%). These side effects can not be ascertained because the use of lupus drugs. In this study, there were no specific studies of side effects.

This study has some limitations. First, the study sample was small. Second, the design of this study limits the ability to determine temporal relationships between risk factors and medication adherence.

CONCLUSIONS

This study found that there were 36.6% of respondents are non-adherence to treatment. Gender, age, education, occupation and income were not associated with medication adherence ($p > 0.05$). The duration of disease and the number of currently used medicines also were not associated with medication adherence ($p > 0.05$). There was a significant correlation between side effects with medication adherence in patient with SLE ($p = 0.025$).

ACKNOWLEDGMENT

We would like to thank Yayasan Tittari Griya Kupu Solo and Sebelas Maret University which funded with PKLP PNB2018 Grants Scheme.

Conflict of Interest: There is no conflict of interest

Ethical Clearance: The study was approved by the ethics committee of Faculty Medicine of Sebelas Maret University with ethical certificate number: 106 / II / HREC 2018.

REFERENCES

1. Cojocaru, M., Cojocaru, I. M., Silosi, I., and Vrabie, C. D. Manifestations of Systemic Lupus Erythematosus. *Medica - a Journal of Clinical Medicine*. 2011; 6: 330–336
2. Habibi, S., Masaleem, and Ramanan, A. Juvenile Systemic Lupus Erythematosus: Review of Clinical Features and Management. *Indian Pediatrics*. 2011; 48: 879–887.
3. Prudente, L. R., Diniz, J. D. S., Almeida, T. X., Ferreira, M., Lima, D. M., Silva, N. A., et al. Medication Adherence In Patients In Treatment For Rheumatoid Arthritis And Systemic Lupus Erythematosus In A University Hospital In Brazil. *Dove Press Journal*. 2016: 863–870
4. A.B. Abdul-Sattar and S.A Abou El Magd. Determinants of Medication Non-Adherence In Egyptian Patients with Systemic Lupus Erythematosus: Sharkia Governorate. *Rheumatol Int*. 2014
5. Duvdevany, I., Cohen, M., Valtzer, M., and Lorber, M.. Psychological Correlates of Adherence to Self-Care, Disease Activity and Functioning In Persons with Systemic Lupus Erythematosus *Lupus*. 2011 ; 20: 14–22.
6. WHO. 2003. Adherence to Long-Term Therapies. Switzerland: WHO
7. Chambers, S., Raine R., Rahman A., Hagley K., Ceulaer K.D., and Isenberg D. Factors Influencing Adherence to Medications In A Group Of Patients With Systemic Lupus Erythematosus In Jamaica. *Lupus*. 2008; 17: 761–769
8. Julian L. J., Yelin E., Yazdany J., Panopolis P., and Trupin L. Depression, Medication Adherence, and Service Utilization in Systemic Lupus Erythematosus. *Arthritis Rheum*. 2009; 61: 240–246.
9. Santos, O.M., Verani, J.F.S., Klumb, E.M., and Albuquerque, E.M.M. Evaluation of adherence to drug treatment in patients with systemic lupus erythematosus in Brazil. *Lupus*. 2011; 20: 320-329.
10. Marengo, M.F., Waiman, C.A., Achaval, S., Zhang, H., Garcia-Gonzalez, A., Richardson, M.N., et al. Measuring therapeutic adherence in systemic lupus erythematosus with electronic monitoring. *Lupus*. 2012; 21: 1158-1165.
11. Dalebout G.M., Broadbent E., McQueen F., and Kaptein A.A. Intentional and unintentional treatment nonadherence in patients with systemic lupus erythematosus. *Arthritis Care & Research (Hoboken)*. 2011; 63:342–50.
12. Alsowaida, N., Alrasheed, M., Mayet, A., Alsuwaida, A., and Omair, M. A. 2017. Medication Adherence, Depression and Disease Activity among Patients with Systemic Lupus Erythematosus. *Lupus*. 2017; 0: 1-6
13. Gross, R., Graybill, J., Wahezi, D., Jordan, N. C., Putterman, C., and Blanco, I. Increased Education Is Associated With Decreased Compliance in an Urban Multi-Ethnic Lupus Cohort. *J Clin Cell Immunol*. 2014; 5: 1–15.
14. McElhone, K., Abbott, J., Gray, J., Williams, A. and Teh, L-S. Patient perspective of systemic lupus erythematosus about health-related quality of life concept, a qualitative study. *Lupus*. 2010;19: 1640–1647
15. Voulgari, P., Katsimbri, P., Alamanos, Y., and Drosos, A. Gender and age differences in systemic lupus erythematosus. A study of 489 Greek patients with a review of the literature. *Lupus*. 2002; 11: 722–729A.
16. Garcia-Gonzales, A., Richardson, M., Popa-Lisseanu, M. G., Vanessa, C., Kallen, M. A., Janssen, N., et al. Treatment Adherence In Patients With Rheumatoid Arthritis And Systemic Lupus Erythematosus. *Clin Rheumatol*. 2008; 27: 883–889.
17. Garcia Popa-Lisseanu M.G., Greisinger A., and Richardson M. Determinants of treatment adherence in ethnically diverse, economically disadvantaged patients with rheumatic disease. *J Rheumatol*. 2005; 32: 913–919.
18. Osterberg, L., and Blaschke, T. Adherence to Medication. *NEJM*. 2005; 353: 487–497
19. Morisky, D.E., Green, L.W., dan Levine, D.M. 1986. Concurrent and Predictive Validity of a Self-Reported Measure of Medication Adherence. *Medical Care*. 1986; 24: 67-74.

Adverse Childhood Experiences and Depression among Indonesian University Students

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ABSTRACT

The prevalence of mental health problems, including depression, among university students was high. Previous studies showed that adverse childhood experiences was among factors that contribute to the course of depression. Individuals with more adverse childhood experiences had more vulnerability to have depression symptoms in their later life. This study was aimed to describe the adverse childhood experiences and depression among university students and to investigate the role of adverse childhood experiences to depression. Data were collected from 419 students of Diponegoro University. The subjects filled the Adverse Childhood Experiences Questionnaire and Beck Depression Inventory II (BDI-II). Data were analyzed using descriptive and correlation analysis as well as Receiver Operating Curve (ROC) and odds ratio computation. The result showed that subjects had zero to seven adverse childhood experiences and the average score of depression is 13,22 ($SD=6.998$). Using cut-off score at 17, the data showed that the prevalence of depression among subjects was 27.7%. Both variables in the study were significantly correlated (*Spearman's rho* = .266; $p < .0001$), supporting previous studies in general population. The Area Under the Curve (AUC) of adverse childhood experiences as predictor of depression was 61.9%. Odds ratio of individuals with minimum one adverse childhood experience was 2.481 (95% CI; 1.602 – 3.843). The result offers an additional understanding to mental health problems, particularly depression, among university student. Further implication of this findings for mental health program in university is discussed.

Keywords: *adverse childhood experiences, depression, mental health problems, university students*

INTRODUCTION

Mental health problems at the developmental transition from adolescence to adulthood was prevalent. In particular, previous studies showed high prevalence of mood disorders, anxiety disorders, and substance use disorders among adolescents^{1,2} and young adults. Depression becomes one among other mental health problems which needs special attention because of its risk to suicide attempt and other health-related problems³. College students as individuals experiencing transition from adolescence to adulthood also prone to mental health problems, including depression⁴⁻⁷. The depressive symptoms used to be expressed through

social media like facebook⁸. Depression among college students could negatively affect not only health-related condition but also academic development.

Several factors were associated with the course of depression, including adverse childhood experience⁹⁻¹¹. Adverse childhood experience (ACE) was a commonly used indicator in public health surveillance. It consisted of but not limited to experience of abuse (emotional, physical, sexual); neglect (emotional, physical); witnessing domestic violence, having family members abuse alcohol or drugs or have mental illnesses, parental separation or divorce, or having family members with criminal behaviors¹². ACE could be an obvious marker to develop early prevention to foster children for having more severe effect in their later life.

Many studies were done regarding association between ACE and depression. It showed that having more adversity experiences during childhood increases the risk of having depressive symptoms^{13,14} or depressive

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disorder^{9,10} or risky behavior related to depression such as alcohol or drug abuse, smoking, risky sexual behavior, self-injurious behavior, and suicide attempt¹³⁻¹⁶ in later developmental stage. Most of those studies involved adult participants. The study on younger samples such as adolescence or younger adult was available but still limited^{11,14}, particularly in developing countries setting¹⁵⁻¹⁷. Considering the importance of passing through developmental transition and succeeding the academic process in college or university, study about the role of ACE to the emergence of depressive symptoms and depressive disorder with college students sample was needed.

This study aimed to describe the ACE and depressive symptoms among university students and examine the risk level of having depression among those experiencing adversities during their childhood. The hypothesis of the study is the more adversities experienced during childhood, the more probability or risk for having depression.

METHOD

Subjects and procedures: The subjects comprised 419 undergraduate students from Diponegoro University, Semarang, Indonesia. The subjects were from four faculties in the university. Prior to data collection, the researchers sent a letter for asking permission to the dean of each faculty to conduct the research. Approval from the dean was then followed by coordination with academic vice dean about which class was able to be involved in the study. Subjects consented to participate in the study filled the questionnaires classically with guidance from researchers' team. Of the sample, the age of the subjects range from 18 to 20. Majority of the sample were female (73%).

Measures: Adverse Childhood Experiences Questionnaire was used to measure the type and number of adversities experienced by subjects during their childhood. It consisted of 12 items, asking about childhood adversities during respondent's first 18 years of life. The twelve items were representing childhood adversities, including abuse (emotional, pphysical, and sexual), neglect (emotional and physical), domestic violence, parental separation or divorce, alcohol or substance abuse problems in family, mental health problems in family, incarcerated family members, bullying, and loss of parent(s). The ACEs Questionnaire

was administered in self-report technique and scored by 0 or 1, resulting in total score ranging from 0 to 12. Zero indicating subject was not experiencing the adversity and 1 indicating subject had that kind of adversity experience. The samples of the items were "Were you bullied?" and "Did your parents (father/mother) die?".

Beck Depression Inventory-II/BDI-II was self-reported questionnaire used to measure depression level of individuals. It consisted of 21 items. The BDI-II was among most frequently used questionnaire to measure depression around the world, both in general and clinical setting. The subject were asked to choose among groups of statements (multiple choice) that best describe their condition for the last two weeks. Each item scored from 0 to 3. The total score were summative score of all items, ranging from 0 to 63 which indicate the level of depression. The BDI-II had been adapted in many language. This study used Bahasa Indonesia version of BDI-II with satisfactory reliability and validity. Cronbach's alpha in this study was .83. The cut-off used in this study was 17 to detect clinical level of depression, as recommended by study in Indonesia. The sample item of BDI-II was "I am sad all the time" and "I feel my future is hopeless and will only get worse".

DATA ANALYSIS

The data in this study were analyzed using Statistical Package of Social Science (SPSS) for Windows version 20.0. Descriptive and non-parametric correlational analysis were employed. In addition, t-test, odds ratio and Receiver Operating Curve (ROC) were computed.

RESULTS AND DISCUSSIONS

The demographic data of the subjects were presented in Table 1. It showed that most of the subjects were female (73%), Javaness ethnic group (76%). The age of the sample ranged from 18 to 20 with mean age 18.61 ($SD = .607$). The GPA ranged from 1.89 to 4 with mean 3.39 ($SD = .37$) for 4 point grade. The number of adversity experienced by subjects ranged from 0 to 7. Most of the subjects claimed to have none of adverse childhood experiences (54.2%), followed by one adverse childhood experiences during the first 18 years of life (30.1%). The score of depression level using BDI-II was ranged from 1 to 39 ($M = 13.22$; $SD = 6.998$). Using cut-off 17, a number of 118 (28.2 %) of the subjects were found to have clinical depression.

A t-test and One-Way ANOVA or Kruskal-Wallis test were conducted to see the differences on variables of interest based on demographic data. The differences based on gender were observed on ACEs score ($t[416] = -2.959$; $p = .03$), but not in BDI-II score ($t[416] = -.120$; $p = .904$). Male students had higher average ACE score than female students. Based on ethnicity, there were significant differences in BDI-II score ($F[2] = 5.116$; $p = .006$), but not in ACEs score ($\lambda^2[2] = 4.518$; $p = .104$). The multicultural group was found to have highest depression score, followed by non javanese ethnic group, and javanese ethnic group. The differences was observed in ACEs score based on study major ($\lambda^2[3] = 25.995$; $p < .0001$), but not in BDI-II score ($\lambda^2[3] = 6.190$; $p = .103$). Non-parametric correlational analysis then employed between variables of interest and age. There was no correlation between both ACEs score and BDI-II score with age (*Spearman's rho* = $-.007$; $p = .665$; *Spearman's rho* = $-.021$; $p = .892$). The correlation was also not found between BDI-II score with GPA (*Spearman's rho* = $-.063$; $p = .209$). But, the correlation was observed between ACEs score and GPA (*Spearman's rho* = $-.121$; $p = .015$).

Regarding adversity type, the most common adversity experienced by subject was bullying (33.2%), followed by emotional abuse (8.8%), physical abuse (6.9%), and parents passed away (6.9%). The most common depression symptoms observed in the subjects was change in sleep pattern, followed by guilty feelings, self-criticalness, agitation, and change in appetite. The complete descriptive data for adverse childhood experiences and depression were displayed in Table 2 and Table 3.

Table 1: Demographic data (gender, ethnicity, faculty), ACEs score, and depression score of samples (n = 419)

Category	f	%	ACEs Mean (SD)	BDI-II Mean (SD)
Gender				
Female	305	73	.67 (1.11)	13.19 (6.97)
Male	113	27	1.04 (1.21)	13.28 (7.12)
Missing data	1			
Ethnicity*				
Javanese	316	76	.72 (1.13)	13.04 (6.83)
Non Javanese	87	20.9	.78 (1.07)	13.06 (7.09)
Bicultural or multicultural	13	3.1	1.54 (1.56)	19.31 (8.75)
Missing data	3			

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Study major				
Psychology	93	22.2	1.38 (1.56)	15.29 (8.43)
Engineering	59	14.1	.56 (.95)	12.75 (6.49)
Sains and mathematics	157	37.5	.64 (.99)	12.57 (6.43)
Public health	110	26.3	.53 (.82)	12.65 (6.44)

*Ethnic group were divided into three categories to simplicize the data. Non javanese ethnic group consists of many ethnic groups other than Javanese and was computed together because of the small number of each.

The non-parametric correlational analysis using Spearman rho test was employed to examine the relation between ACE and depression. The result showed that there was positive correlation between adverse childhood experiences and depression (*Spearman's rho* = $.266$; $p < .001$). Therefore, the more adversity experiences by subjects during their childhood, the more depression level was observed among subjects. In terms of sesitivity and specificity, the ROC analysis showed that measurement of ACEs had Area Under Curve (AUC) of $.626$ (95% CI; $.566 - .687$), meaning that 62.6% prediction using ACE score was correct. The recommended cut-off point was $.5$ (or rounded to 1). Using the recommended cut-off points, ACEs questionnaire could predict correctly 61.9% of subject with clinical depression as having depression (sensitivity level) and 39.5 % of subjects without clinical depression as having normal depression level (spesificity level). Odds ratio of individual with at least one adverse childhood experience to have depression in their early adulthood was 2.481 (95% CI; $1.602 - 3.843$). It could be interpreted that individual with adversity experience during their childhood, even only one, would have 2.5 times risk higher than others to have depression in their later life.

Table 2: Prevalence of adverse childhood experiences' types among samples (n = 419)

ACE	f	%
Emotional abuse	37	8.8
Physical abuse	29	6.9
Sexual abuse	9	2.1
Emotional neglect	24	5.7
Physical neglect	6	1.4
Living in family with parents separated or divorced	12	2.9

Conted...

Living in family with domestic violence	7	1.7
Living with family member with alcohol or substance abuse problem	5	1.2
Living with family member with mental health problems	13	3.1
Having incarcerated family member	10	2.4
Bullying	139	33.2
Parent(s) passed away	29	6.9

Table 3: Prevalence of depressive symptoms among samples (n = 419)

Items	Score 0	Score 1-2-3
Sadness	196 (46.8%)	223 (53.2%)
Pessimism	293 (69.9%)	126 (30.1%)
Past failure	251 (59.9%)	169 (40.1%)
Loss of pleasure	230 (54.9%)	189 (45.1%)
Guilty feelings	60 (14.3%)	359 (85.7%)
Punishment feelings	250 (59.7%)	169 (40.3%)
Self-dislike	262 (62.5%)	157 (37.5%)
Self-criticalness	124 (29.6%)	295 (70.4%)
Suicidal thoughts or wishes	385 (91.9%)	34 (8.1%)
Crying	295 (70.4%)	124 (29.6%)
Agitation	129 (30.8%)	290 (69.2%)
Loss of interest	239 (57%)	180 (43%)
Indecisiveness	213 (50.8%)	206 (49.2%)
Worthlessness	325 (77.6%)	94 (22.4%)
Loss of energy	170 (40.6%)	249 (59.4%)
Changes in sleep pattern	39 (9.3%)	380 (90.7%)
Irritability	229 (54.7%)	190 (45.3%)
Changes in appetite	131 (31.3%)	288 (68.7%)
Concentration difficulty	182 (43.4%)	237 (56.6%)
Tiredness or fatigue	137 (32.7%)	282 (67.3%)
Loss of interest in sex	351 (83.8%)	68 (16.2%)

Note: Five most common symptoms were displayed in bold

The results of this study supported previous study both in developed and developing country settings that ACE became a risk factor for mental health problems during adolescence and early adulthood^{10-15,17}. When individual with history of ACE was experiencing chronic stress during adolescence, there would be

higher response on hipotalamus pituitary adrenal (HPA), resulting more elevated and prolonged cortisol³. This enhanced HPA activity become one factor of the emergence of depression among uniersity students.

The most common childhood adversities experienced by subjects in this study was bullying. It supported previous study about the high prevalence of bullying at school¹⁸, and showed the dangerous effect of it. Bullying, especially during childhood and early adolescence was like a crisis situation for children because peer acceptance was very essensial for them. The second common childhood adversities found in this study was emotional abuse. The example of emotional abuse was insult, humiliation, and action in the way which put children down or make children afraid of physically hurt. Those kinds of behavior were often observed among parents. They might not aware of the effect of their behaviors. Children experiencing emotional abuse had their trust to the very closed person in their life broken. With their basic trust broken, it would be more difficult to trust another people, resulting in difficulty to relate with other. Children experiencing emotional abuse would also had low self-esteem and easy to blame themselves for failure.

In line with the findings about ACE, the most common depressive symptoms found in this study were chenge in sleep pattern, guilty feelings, self-criticalness, agitation, and change in appetite. The first common symptom was about sleep disturbance, representing somatic symptoms. This symptom indicated that subjects was very tense and stressed. The disturbace in sleeping patter could expressed in hypersomnia or insomnia. Both of them were indicators of tension and stress. This findings was similar to study among US young adults which showed 57% prevalence of sleep disturbance¹⁹. The later depressive symptoms were highly associated with low self-esteem. Individuals with low self-esteem were very easy to feel guilty eventhough they were not guilty. The guilty feeling was usually accompanied by self-critical, such as doing overevaluation to themselves all the time. This overevaluation also made individuals agitated. Change in appetite as another somatic symptom could also appear when individuals in tese and stress.

The prevalence of clinical depression among university students in this study was 28.2%. The depression level did not differ across gender or study major, but differed by ethnicity. The students with

multicultural ethnic and non javanese ethnic were shown to have higher level of depression. This could be because they need cultural adaptation when study in Central Java with javanese ethnicity as majority. This finding was different from previous study that usually found gender differences on depression.

The difference based on gender was observed in ACE score with higher score on male. It was also different with previous study that usually showed female as more vulnerable to have childhood adversity because of gender inequality. Further study was needed to explore this finding.

The main result in this study was about the correlation between ACE and depression the odds ratio based on the recommended cut-off from ROC analysis. The odds ratio found in this study was similar to the study among adults⁹. The positive correlation found between both variables was supported by previous study that ACE was a risk factor of depression. The more childhood adversities experienced by individuals, the more depression level individuals would have. This finding confirmed that the risk was exist even since adolescence.

The higher risk of having depression among university students with at least one ACE implies the need for all kinds of intervention, including preventive, curative, and rehabilitative. The preventive action was compulsory in childhood stage. Effective programs need to be implemented to prevent more children experiencing adversities and prevent more adversities experienced by children¹². The curative and rehabilitative programs could be done by university through counseling and mental health promotion programs²⁰.

Despite the important findings in this study, it has several limitations. First, this study used convenient sampling with representation from several faculties or study majors. Further study could use random or systematic sampling to get more representative prevalence and odds ratio. Second, this study was a cross-sectional study with ACE measured retrospectively. Although retrospective method was recommended for population-based study¹², there was a risk of bias based on the dispositional condition of the subjects²¹. Prospective method to measure ACE could be used to get a more objective result. Third, further study could expand the investigation by involving more variable, including predictor variables and outcome variables.

CONCLUSIONS

The ACE and depression were common among university student. Having at least one adverse childhood experience could increase the risk of having depression to 2.48 times. With this risk, students would need more support and guidance in dealing with both academic and non academic stressors during their study in university.

ACKNOWLEDGEMENTS

This study was funded by Faculty of Psychology Diponegoro University. The authors thank to all participants and research assistants.

Conflict of Interest: The authors declares that there is no conflict of interest.

Ethical Clearance: All participants were signed the informed consent prior to the data collection.

REFERENCES

1. Merikangas KR, He J, Burstein M, Swanson SA, Avenevoli S, Cui L, et al. Lifetime Prevalence of Mental Disorders in U.S. Adolescents: Results from the National Comorbidity Survey Replication-Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*. 2010 Oct;49(10):980-9.
2. Merikangas KR, Nakamura EF, Kessler RC. Epidemiology of mental disorders in children and adolescents. *Dialogues Clin Neurosci*. 2009;11(1):14.
3. Rao U, Hammen C, Ortiz LR, Chen L-A, Poland RE. Effects of early and recent adverse experiences on adrenal response to psychosocial stress in depressed adolescents. *Biol Psychiatry*. 2008;64(6):521-6.
4. Hunt J, S M, Eisenberg D, Ph D. Mental Health Problems and Help-Seeking Behavior Among College Students. *J Adolesc Heal [Internet]*. 2010;46(1):3-10. Available from: <http://dx.doi.org/10.1016/j.jadohealth.2009.08.008>
5. Bruffaerts R, Mortier P, Kiekens G, Auerbach RP, Cuijpers P, Demeyttenaere K, et al. Mental health problems in college freshmen: Prevalence and academic functioning. *J Affect Disord*. 2018;225(December 2016):97-103.

6. Zivin K, Eisenberg D, Gollust SE, Golberstein E. Persistence of mental health problems and needs in a college student population. *J Affect Disord* [Internet]. 2009;117(3):180–5. Available from: <http://dx.doi.org/10.1016/j.jad.2009.01.001>
7. Cranford JA, Eisenberg D, Serras AM. Addictive Behaviors Substance use behaviors , mental health problems , and use of mental health services in a probability sample of college students. *Addict Behav* [Internet]. 2009;34(2):134–45. Available from: <http://dx.doi.org/10.1016/j.addbeh.2008.09.004>
8. Moreno MA, Jelenchick LA, Egan KG, Cox E, Young H, Gannon KE, et al. Feeling bad on Facebook: depression disclosures by college students on a social networking site. *Depress Anxiety*. 2011 Jun;28(6):447–55.
9. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. 2004;82:217–25.
10. Danese A, Moffitt TE, Harrington H. Adverse Childhood Experiences and Adult Risk Factors for Age-Related Disease: Depression , Inflammation, and Clustering of Metabolic Risk Markers. 2009;
11. Schilling EA, Jr RHA, Gore S. Adverse childhood experiences and mental health in young adults : a longitudinal survey. 2007;10:1–10.
12. Anda RF, Butchart A, Felitti VJ, Brown DW. Building a Framework for Global Surveillance of the Public Health Implications of Adverse Childhood Experiences. *AMEPRE* [Internet]. 2017;39(1):93–8. Available from: <http://dx.doi.org/10.1016/j.amepre.2010.03.015>
13. Felitti VJ, Anda RF. The Relationship of Adverse Childhood Experiences to Adult Medical Disease, Psychiatric Disorders, and Sexual Behavior: Implications for Healthcare. In: *The Hidden Epidemic: The Impact of Early Trauma on Health and Disease* (Eds R Lanius & E Vermetten). 2009.
14. Mersky JP, Topitzes J, Reynolds AJ. Impacts of adverse childhood experiences on health, mental health, and substance use in early adulthood: A cohort study of an urban, minority sample in the U.S. 2013;37(11):917–25.
15. Tresno F, Ito Y, Mearns J. Self-Injurious Behavior and Suicide Attempts Among Indonesian College Students. 2012;
16. Ramiro LS, Madrid BJ, Brown DW. Adverse childhood experiences (ACE) and health-risk behaviors among adults in a developing country setting. *Child Abuse Negl*. 2010;34:842–55.
17. Tran QA, Dunne MP, Vo T Van. Adverse Childhood Experiences and the Health of University Students in Eight Provinces of Vietnam. 2015;
18. Arseneault L, Bowes L, Shakoor S. Bullying victimization in youths and mental health problems: ‘Much ado about nothing’? *Psychol Med*. 2010 May;40(05):717.
19. Thomée S, Härenstam A, Hagberg M. Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults - A prospective cohort study. *BMC Public Health*. 2011;11.
20. Lipson SK, Ed M, Speer N, Ph D, Brunwasser S, Ph D, et al. Gatekeeper Training and Access to Mental Health Care at Universities and Colleges. *J Adolesc Heal* [Internet]. 2014;55(5):612–9. Available from: <http://dx.doi.org/10.1016/j.jadohealth.2014.05.009>
21. Reuben A, Moffitt TE, Caspi A, Belsky DW, Harrington H, Schroeder F, et al. Lest we forget: comparing retrospective and prospective assessments of adverse childhood experiences in the prediction of adult health. *J Child Psychol Psychiatry Allied Discip*. 2016;57(10):1103–12.

Maternal Care among Madurese through the Form of Culture

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ABSTRACT

To overcome the maternal's health problem, preventive action based on the culture's perspective was chosen compared to the medical's perspective. Madurese still believe in the myth about food and action which affect their pregnancy. Based on the theory of A.L Kroeber, there is 3 form of culture to identify a community's culture. This study aim is to identify maternal care among Madurese through the form of cultural: 1) ideas; 2) activities and 3) artefact. This study was a descriptive research with the qualitative approach. This study conducted in the area of Puskesmas Trageh (Bangkalan) and Puskesmas Omben (Sampang) in Madura. The total main informant was 18 persons that consist of 3 pregnant women for each area and the key informants consist of 1 midwife coordinator, 1 local midwife, 1 shaman and 1 family member of each pregnant women. The maternal care towards the form of cultural ideas: 1) They should have a good intention towards other people; 2) increase their worships through reading Holy Qur'an; 3) avoid the distraction of the spirits by pray and use a talisman. The maternal care towards the form of cultural activities: 1) have a celebration to show the gratitude feeling towards God; 2) drink herbal medicine and do massage at stomach by the shaman; 3) avoid several foods based on myth. The maternal care towards the form of the cultural artefact uses the talisman to avoid misfortune. It showed phenomena that Madurese still do traditional maternal care which often contradictory to the modern medicine.

Keywords: Maternal care, Madurese, Three form of culture, Culture's perspective

INTRODUCTION

Based on a research by Devy (2013), the cause factors of maternal health problems are including maternal health knowledge, poverty and culture¹. Meanwhile, a factor that is often overlooked is the culture of society. Discussing culture means also relating to values, beliefs, behaviours, myths and even something magical / mystical and contrary to modern medical science. Society does not prioritise preventive efforts that fit the medical view, such as routine check pregnancy and eat nutritious food. However, the preventive efforts undertaken are more inclined to the cultural view, which is to eat taboos to eat certain foods and behaviours. However, these behaviours often endanger the health of pregnant women.

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Identifying the culture of society can be done by referring to the three cultural manifestations of A.L.Kroeber. Three-forms of culture are: 1.) Form of ideas, 2.) Form of activity, 3.) Form of artefact². The statement is in accordance with Malinowski's opinion in Ihromi (1981), on the view of functionalism towards culture, stating that every pattern of habitual behaviour, every belief and attitude that is part of the culture in a society, fulfils some fundamental functions in the culture concerned³. Based on the explanations that have been described, it is necessary to do mapping on maternal care on Madurese culture. This study refers to Dunn's theory, which states that behaviour is formed through 3 factors: culture, social and psychology⁴. In this study focused on cultural factors only. The results of this study are expected to be baseline for special health promotion activities in the field of MCH, and indirectly contribute to the quality of health education materials for pregnant women. The aim of this study is to identify and develop the mapping of maternal care in Madurese culture using the three form of culture.

METHOD

This study used descriptive research design with qualitative approach. The study conducted in area of Bangkalan District (Puskesmas Trageh) and Sampang District (Puskesmas Omben) in Madura Island. The duration of this study was 4 months (August-November 2016). Informant that included in this study were pregnant women who already selected based on inclusion criteria. The inclusion criteria for the informant who were 1) willing to be a research subject; 2) originally from Madura Island; and 3) local people who live at the location of the study.

The total number of informants for each area was 3 pregnant women. While, the key informants for each district was consisted of a midwife coordinator, a midwife district, a shaman and a family member of each pregnant women. In-depth interview and observation were using for collecting the data from the informants. Traditional maternal care is defined as health-related activities conducted traditionally during pregnancy in Madurese society, covering 3 forms of culture that is Ideas (values, norms, beliefs), Activities (activities performed during pregnancy) and Artefacts (health-related equipment used during pregnancy). To obtain valid data in this study, credibility of data or info was obtained with doing data triangulation, conducting member check and doing observational persistence in informants.

RESULTS AND DISCUSSIONS

Mapping of Maternal Care in Bangkalan District:

Maternal care is an activity that plays an important role for the health of mother and baby. Based on the research data, obtained information that the utilisation of maternal health services is good. Based on the results of in-depth interviews with the midwife coordinator and the village midwife, the following quotation excerpt:

“Health services in pregnant women already in maximum level, for example: go to the pregnant women’s house. Integrated antenatal care has been done routinely through pregnant women’s classes (i.e 6 months once in 2016). The classes directly conducted in some villages “(Midwife Coordinator, Z).

“... pregnant women want to receive prenatal care & want to go to Polindes (Village Maternity Hut)“ (Local Midwife, Ch).

The average number of antenatal care visit is 4 times during the pregnancy. In general, pregnancy tests performed by pregnant women in modern and traditional way. At the beginning of feeling their pregnancy, the mothers check to ensure her pregnancy to midwife. Having tested positive pregnant, on the advice of the family, the mothers choose treatment to the shaman for the massage. After 4 to 5 months of pregnancy, pregnant women come to the midwife to check their pregnancy. As stated by the local midwife in the following interview:

“When they know about their pregnancy, they directly checked to a shaman. If their pregnancy getting bigger, they check their pregnancy to midwife. Antenatal care is not purely do by pregnant women because they just do it from 2nd trimester, like check to Midwife. There are elements of taboo at the age of 1 to 9 months that the baby will be eaten by “dhilep” (ghost), so that in 5 months of pregnancy, the new pregnant mother conduct examination to midwife” (Local Midwife, Ch)

“If the shaman usually massaged her stomach, the benefits is the baby position will downward. So many are troubled because it is even massage upheld by the shaman so that pregnant women are not in pain. ...the reason why pregnant women go to the shaman because of her family (mother-in-law, mother and grandmother) who asks to go to the shaman to be massage upheld” (Local midwife, Ch)

From the interviews, it was found that there is several activities related to the three form of culture that was did by pregnant women and her husband during the pregnancy to avoid misfortune. Pregnant women and her husband believed that the activities have some benefits for her and her baby, the collection of activity could be seen in the Table 1. The maternal care activities in the 1st trimester is still negative because there are still many myths trusted even though there is no scientific proof. The maternal care in the 2nd trimester still not involving health worker. The activity of maternal care in trimester 3 there is still myth trusted by society even though there is no scientific proof about it.

Table 1: The Maternal Care based on the three form of culture in Bangkalan District

Trimester	Pregnancy Care Activity	Benefits
1 st Trimester	The Form of Ideas:	
	Pregnant women have dietary restriction	To avoid the baby condition is not the same as the food's properties
	Must recite Holy Qur'an, especially Surah Maryam and Yusuf after prayer	The baby becomes handsome and beautiful
	The Form of Activities:	
	Drink the herbal drink and young coconut water	The baby will have fair skin
	The Form of Artefact:	
	Use talisman in her stomach	To avoid the distraction of bad spirit's power
2 nd Trimester	The Form of Ideas:	
	Eating eggs should be divided into two	To avoid baby born with conjoined twin's condition
	The Form of Activities:	
	The pregnant women regularly doing massage by the shaman	To fix the baby's position
	The Form of Artefact:	
	Have a celebration (<i>selamatan</i>) in the 4 th month of pregnancy and giving food to the God with white and red porridge	Doing celebration because the spirit of the baby recently enters the its body
3 rd Trimester	The Form of Ideas:	
	Should not drink much ice and should not eat high fat food, for example: beef, bone marrow, instant noodle and meatballs	To avoid the baby condition is not the same as the food's properties and become bigger
	The Form of Activities:	
	The pregnant women regularly doing massage by the shaman	To fix the baby's position
	The Form of Artefact:	
	Use talisman in her stomach	To avoid the distraction of bad spirit's power

Mapping of Maternal Care in Sampang District:

Based on the result of in-depth interview and observation with the informants in Puskesmas Omben, the utilisation of maternal health services is quite good in that area. The midwife said that the coverage of maternal health service is already good through Posyandu that hold every month in the 2nd week. The average number of visits for antenatal care is more than 4 times during the pregnancy. While the problem is the first visit (K1) among pregnant women is still mixed between visiting shaman and also the midwife. The local midwife called that this condition as the impurity of maternal care. There are several reasons underlying this impurity, such as living wandering, unaware of being pregnant, underestimating pregnancy examination in the first trimester, and being ashamed of having too many children. The following

statement was obtained from in-depth interviews with the midwife coordinator and the local midwife, here is the quotation excerpt:

"The pregnant women do the antenatal care regularly; the majority is more than 4 times. A small number do the pure K1, the majority is impurity K1" (Midwife Coordinator, Hf)

"K1 is not pure because of living wandering, unconscious pregnant (the reason is using birth control), underestimate during the first trimester because they considered that it is still early stage of pregnancy, shy, too much child ..." (Local Midwife, Ard)

Results of interviews with local midwife, midwife coordinator and shaman as the subject, showed there

are still pregnant women who are undergoing maternal care and giving birth in shaman. Society believes that pregnant women who are giving birth with the help of health worker is considered have difficulty of doing birth. Maternal care which provided by the shaman is include massage and herbal medicine. There are the quotes of interview.

“There is still a small number who gave birth in the shaman ...” (Midwife Coordinator, Hf)

“... The perception towards health worker is negative” (Local Midwife, Ard)

“Massage and herbal medicine are still done” (Midwife Coordinator, Hf)

“Herbal medicine is given for healthy babies. Massage for position repair ...” (Local Midwife, Ard)

“Massage, treatment of pregnant women at the age of 7-9 months ... they pay as they want” (Shaman, R)

Pregnant women and her husband believed that the activities have some benefits for her and her baby, the collection of activity could be seen in the Table 2. In the 1st trimester, maternal care activities are more on traditional treatments. In the 2nd trimester, maternal care activities based on the local traditions or cultures. In the 3rd trimester, maternal care activities are still based on the myth that does not have a certain truth, and there are still elements of culture derived from the ancestors.

Table 2: The Maternal Care based on the three form of culture in Sampang District

Trimester	Pregnancy Care Activity	Benefits
1 st Trimester	<p>The Form of Ideas: Should not eat pineapple, fermented cassava (<i>tape</i>) and squid</p> <p>The Form of Activities: Should not chewing eggs and oil (swallowed directly)</p>	<p>To avoid the miscarriage and difficulties during baby’s birth</p> <p>To avoid the miscarriage</p>
2 nd Trimester	<p>The Form of Ideas: wear clothes should not be wrapped</p> <p>The Form of Activities: The pregnant women regularly doing massage by the shaman</p>	<p>so that the child is not wrapped around the umbilical cord</p> <p>To fix the baby’s position</p>
3 rd Trimester	<p>The Form of Ideas: wear clothes should not be wrapped</p> <p>The Form of Activities: Wear straps which wrapped around the belly</p> <p>The Form of Artefact: Should not wearing a talisman</p>	<p>so that the child is not wrapped around the umbilical cord</p> <p>To avoid the distraction of bad spirit’s power during baby’s birth</p>

Pregnancy Care On Madurese Culture: The utilisation of maternal health services is quite good among Madurese in both districts. The remained problem is the impurity of first visit (K1) among pregnant women. They still do their K1 in shaman, not in midwife. The average number of visits for doing the antenatal care is more than four times during the pregnancy, around 8-9 times. In general, pregnant women perform their maternal care in a medical and traditional way.

According to the pregnant women and her family’s perception, midwives and shamans have different

abilities and mutual support. The shaman has the ability to know and organise the baby’s position. While midwives have the ability to know the health conditions of pregnant women, for example: giving injection, measure the blood pressure level, check the baby’s heartbeat and giving vitamins. In fact, pregnancy care performed by pregnant women is still dominated by traditional treatments. Because pregnant women have no authority in that regard. Authority is on the mother figure or mother-in-law. She decides all matters related to pregnancy care and determines birth attendants. The traditional treatment aims to maintain the health and

safety of mother and baby in the womb. However, it is often contrary to modern medical provisions.

Concept of Society's View of Traditional Knowledge as a Culture of Maternal Care: Overall traditional knowledge is said to be "traditional" because this knowledge is created in a way that reflects the traditions of its people with the culture that exists in their neighborhoods. More explicitly, Correa (2001) concludes that Traditional Knowledge is a collection of various information and functions, developed in the past, but adaptable and subject to contemporary development⁵. Traditional Knowledge is disclosed in documented and undocumented forms and it can have commercial value depending on its potential and real use. So it can be said that the traditional knowledge that exists in the community will be influenced by local culture or customs. The cultural value system is made up of conceptions that live in the minds of most citizens, about the things they have to value in life⁶.

Similarly, the types of traditional medicine in the process of maternal care in Madurese culture, most pregnant women are very obedient to what their mother-in-law instructs because they are afraid to happen anything with their womb and fear of blame, so they prefer to do pregnancy treatment traditional, such as doing massage and taking herbal medicine to care for their pregnancy to a midwife instead of having their pregnancy checked into the village midwife. It happens because of low mother-in-law education and paradigm that still believe in the myth or beliefs that exist in the community. This is in line with the results of Devy's (2013) study, stating that some of the other reasons why pregnant women do not deliver to a health worker are because the cost of delivery to a health worker is considered expensive, the family interfering in decision making, fear of surgery and medication, health knowledge of pregnant women⁷. In addition, there are various taboos and suggestions that must be done by a pregnant woman, like the myth that developed in the community. While the results of surveys conducted by health workers such as midwives and nurses show, doing the massage as maternal care by the shaman will lead to swelling, and the habit of doing scratching the back (*kerokan*) can damage the skin and blood vessels. So the high infant mortality rate in Indonesia can also be caused by the illegal practice of shaman.

CONCLUSIONS

Maternal care in Madurese culture refers to three-forms of culture, it showed phenomena that Madurese still do traditional maternal care which often contradictory to the modern medicine, especially drinking herbs, activity and dietary restrictions. Mapping of maternal care in Madurese culture refers to three cultural forms, as the description of the phenomenon is sourced from 2 districts on the island of Madura. The development of pregnant class material specially concerning about the effect of drinking herbs and food taboos that refer to the dietary restriction contrary to medical rules is important. Using religious forums in the community (*pengajian*) as a medium to explain the inappropriate public perception of maternal care is the best approaching method.

ACKNOWLEDGMENT

The authors would like to thank Kemenristek DIKTI to give the funding for this study. The authors also would like to thank Dinas Kesehatan Sampang, Dinas Kesehatan Bangkalan and the public health facility's team, the participants and key informants who were involved in this study.

Conflict of Interest: The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

Ethical Clearance: Ethics approval for this study was received from the Faculty of Public Health in Airlangga University (reference number: 496-KEPK). During recruitment, potential participants were given verbal and written information about the study. Verbal and written inform consent were obtained during the first session of the study. Participants are free to withdraw from the study at any time without negative consequences.

REFERENCES

1. Devy, SR. Modifikasi *Community Development* Guna Peningkatan Perawatan Kehamilan Pada Tenaga Kesehatan. *Jurnal Promosi dan Pendidikan Kesehatan Indonesia* 2013. 1(1)
2. Koentjaraningrat. *Pengantar Ilmu Antropologi*, Edisi Revisi 2009. Jakarta: Rineka Cipta. 2009:-.

3. Ihromi, T.O. Pokok-pokok Antropologi Budaya. Jakarta:Gramedia. 1981:-
Geneva:Quaker United Nations Office Geneva. 2001.
4. Kalangie NS. Kebudayaan dan Kesehatan (Pengembangan Pelayanan Kesehatan Primer melalui Pendekatan Sosial Budaya), Jakarta : PT Kesaint Blanc Indah Corp. Manuaba, IBG. 2001:-
5. Carlos Correa by M, Ruiz M, Sahai S, Twarog S, Vellvé R, Vossenaar R, et al. Traditional Knowledge and Intellectual Property. 6. Kasnodiharjo, dan Lusi Kristiana. Praktek Budaya Perawatan Kehamilan di Desa Gadingsari Yogyakarta. Jurnal Kesehatan Reproduksi 2012; **3**(3): 113 – 123.
7. Devy, SR. Partisipasi Semu Ibu Hamil di Posyandu. Jurnal Kesehatan Masyarakat Nasional 2013. **7**(10)

Implementation of Premenstrual Gymnastics on Intensity of Pain dan Level of Anxiety

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ABSTRACT

Background: Premenstrual syndromes (PMS) is a group of symptoms and signs related to the physical and psychological changes happen before women is getting period. PMS reffers to less of economic productivity, lazyness, and lack of activity daily living. The aim of this study is to identify the implementation of the premenstrual gymnastics related to intensity of pain and level of anxiety for young teenagers, late teenagers, and adult women.

Method: This study was a quasi-experimental with pre-test post-test controlled group design. The sample consist of 360 women, with 235 as an intervention and 125 women as control group. The group were devided into young teenagers, late teenagers, and young adult women. The level of pain and anxiety were taken before and after the premenstrual gymnastics. This was done 30 minutes for 5 days at 6 to 10 days before getting period. The Data was analised by an independent t test.

Results: The prevalence of premenstrual syndrome is 80.6%. The time of menarche is getting early a year in the last two decades. Consuming herbal medicine is the most choices for overcoming PMS. Most subjects have a PMS history from their mother. The mean of pain intensity and anxiety level at pretest of three intervention groups are higher than of thats at three control groups. Premenstrual gymnastics decreases the intensity of pain and the level of anxiety. There are relationships between premenstrual gymnastics with intensity of pain and level of anxiety with p value at 0.001 and p 0.001 respectively.

Conclusion: Premenstrual gymnastics might be applied on young teenagers, late teenagers, and young adult women in order to reduce premenstrual syndrome.

Keywords: *Premenstrual syndromes, gymnastics, pain, anxiety*

INTRODUCTION

Premenstrual syndrome (PMS) is a set of symptoms of psychological changes, physical and the behavior occurs 7 to 10 days before menstruation in women of reproductive age.^(1,2) The incidence of PMS vary widely. The prevalence of PMS from mild to moderate is more than 75%.^(3,4) As many as 30-60% of young women in Iran who have PMS getting interference significant

daily activities.⁽⁵⁾ According to the American College of Obstetrics and Obstetricians (ACOG) at least 80% of American women of reproductive age experienced at least one or more symptoms of PMS.⁽⁶⁾ PMS beginning at age 14 years or 2 years post-menarche. PMS can be persistent until menopause or the age of 50 years or similar with a 480 menstrual cycle. PMS happen most severe in decades of age late 20's and early 30's. ⁽⁷⁾ PMS usually starts in adolescence to menopause. PMS contributes to the rise in cases of postpartum depression. The exact cause of premenstrual syndrome until now uncertain. According to Taylor, 2005⁽⁸⁾, there were several factors that cause PMS, which is related to biological and hormonal changes. Highest percentage of interference they are experiencing is a decrease in mood, irritability, anxiety, emotional instability, and lazy to do physical activity.

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PMS usually happens during the luteal phase and disappears after the first day of menstrual blood out. The intensity of the disorder vary between individuals from one another, including in each menstrual cycle.⁽⁹⁾ The diagnosis of PMS is enforced through the stages of the assessment process, which includes a complete history of the health status relevant to the physical examination, to rule out the existence of psychiatric symptoms which can be identified from prospective rating PMS questionnaire, and check the pattern and severity.^(10,11) Diagnosis of PMS might be screened in several ways. The diagnosis of PMS can be measured through indicators issued by WHO in 1996, the American College of Obstetricians and Gynecologists (ACOG), the American Psychiatric Association, the DSM-IV in 2000, or the US National Institute of Mental Health (NIMH). DSM IV is the most often questionnaire used to diagnose PMS.^(2,11)

Effects and symptoms of PMS vary and could be individually. Tamaki Matsumoto in 2013⁽¹²⁾ mentions the existence of mood disorders and behaviors which include irritability, anxiety, tension, mood instability, prone to tears, expressions of anger, depression or felling blue, lost of controll, difficulty of concentration, confusion, forgetfulness, social isolation or withdrawal. Physical symptoms such as bloating, mammary tension, fatigue, headache, swollen extremities, muscle and joint pain, acne, increased appetite, weight gain, hypersomnia or insomnia.^(13,7)

The effects of PMS attack occurred during the productive majority. Where their activity is to learn and work. Research in Southern California by Dean 2006 involving women aged 18 to 45 years reported cases of PMS significantly associated with increased rates of absenteeism and daily learning activity. This effect on the decline in labor productivity, the quality of education, and household activities. The results of the economic analysis in the United States was given a diagnosis of PMS significantly associated with an increase of government funding per year for direct medical costs which include outpatient, laboratory tests, and radiology. In addition, there was an increase of United State on an indirect costs associated with decreased productivity and working hours flown, the value equivalent to 3-16% of labor productivity⁽¹⁴⁾.

Handling PMS were done through pharmacology, psychology, diet modification, exercise, or herbal remedies. However, very few studies related to the

effectiveness of such treatment. Moreover, another handling of non-pharmacological were done by modifying behavior.⁽¹⁵⁾ Some studies mention that dietary modification and supplementation of food, relaxation, and sports programs might be one choice to reduce PMS. Dietary modification includes control cofein intake, alcohol, salt, carbohydrates, and non of refined sugar have a positive effect.^(16,17) Relaxation exercises and exercise is also beneficial in cases of PMS, but still very little research on this. Study conducted by Sabaei stated that physical activity might decrease the symptoms of PMS. It is a crucial research and newly scientific evidence related to sports and exercise on PMS.⁽⁴⁾

Research by Sri Sumarni, 2015⁽¹⁸⁾ found that exercise increased the levels of hormon beta endorphins from an average 197.02 before exercise to 234, 28 after the exercise in the intervention group. Premenstrual gymnastics reduced intensity f pain from the average 5.84 to 1.58 before gymnastics activity in intervention group. There was a significantly differences in the levels of beta Endorphins hormone between the intervention and control group with p value 0.003. There is a significant difference on the intensity of pain between the intervention and control group with p value 0.001.

The purpose of this study was to identify the implementation of the premenstrual gymnastics related to intensity of pain and level of anxiety for young teenagers, late teenagers, and young adult women.

METHOD

This study was a quasy experimental study with non-randomized pretest-posttest control group, design which do not randomization in the sample and there is a control group.^(19,20) Subjects as an intervention was given a premenstrual gymnastics series performed for 30 minutes per day for 5 days before the menstrual period. Treatment group was measured at the beginning and end of the intervention. The treatment group and the control group consisted of three groups. The early teenager group was similar to Junior High School students. The second group was late teenagers same as Senior High School students. The third group was young adults women similar to college students.

Subjects were all women who experienced premenstrual syndrome. The subjects were screened by DSM IV questionnaires from the last 3 months menstrual

period. They weren't have any reproductive disorders such as endometriosis and cystic abnormalities through interview. Early teenagers interested in this study as many as 186 people, who suffered of PMS 165 (89%), dropped out was 32 people (19.3%). Subjects who completed the study were 133 people. These divided into 90 as treatment and 43 as a control.

The late teenagers who were interested in this research were 194 peopl. They were 156 people (80.4%) who experienced premenstrual syndrome. There were 12 people (7.6%) who dropped out. They were 144 people, which consisted of 89 as a treatment and 55 as a control.

The young adult women were 168 people, who experienced premenstrual syndrome was 121 people (72.0%), dropped out was 25 people (26%). Young adult women who finished the study were 95 people (56 and 39 as treatment and as the control group respectively).

The independent variable is premenstrual gymnastics and the dependent variable were the intensity of pain and level of anxiety. The tools using in this study were DSM IV questionnaires (²), age of the subject, age of menarche, history of PMS from the biological mother, physical daily activity, habits for overcoming PMS, numeric rating scale (NRS), and the Hamilton Anxiety Rating Scale.

Subjects were given an explanation about this study before taking informed consent. Pre-test was done in the beginning of the study for those groups (intervention and control groups). Intervention in the form of premenstrual gymnastics for 30 to 45 minutes has performed for 5 times in the treatment group. The gymnastics was organized by an expert as gymnastics instructor. Post-test which

measured intensity of pain and level of anxiety was taken after premenstrual gymnastics was performed in the last day of luteal phase. The institutions participating in this study is the Junior High School, Senior High School, and university at Semarang, District of Kendal, and District of Jepara at Central Java Province, Indonesia.

RESULTS

The data collected during four months from August until November 2016. Data collection was conducted by researchers, enumerators, and gymnastics instructors. The result of the study in details are presented in the table below.

Table 1: Characteristic of subjects based on the age of menarche

Group		The age of menarche		
		Mean	Min	Max
Young Teenagers	Treatment	11.34	9	14
	Control	11.95	10	14
Late Teenagers	Treatment	12:41	10	16
	Control	12.62	10	15
Young adults women	Treatment	13:04	10	18
	Control	12.91	11	16

From the table above it was known that the minimum age of menarche for all respondents 9 years and the maximum age of menarche was 18 years old. The average age of menarche approximately was at the age of 12 years in all age groups. The age of menarche of young teenagers was at 11 years old. Moreover, the age of menarche for the late teenagers and young adults were 12 and 13 years respectively.

Table 2: Characteristic of respondents based on the habits in overcoming premenstrual syndrome

Habits to cease PMS	Early teenagers		Late Teenagers		Young adult Women	
	Treatment	Control	Treatment	Control	Treatment	Control
Herbal Remedies	34 (37.7)	4 (9.3)	40 (44.4)	12 (21.8)	12 (21.4)	9 (23.0)
Sleeping	14 (15.5)	9 ((20.9)	8 (8.9)	8 (14.8)	7 (12.5)	4 (10.2)
Watching TV	2 (2.2)	1 (2.3)	3 (3.3)	1 (1.8)	4 (7.1)	2 (5.1)
Warm Compress	2 (2.2)	1 (2.3)	2 (2.2)	6 (10.9)	2 (3.5)	3 (7.6)
Medicine	4 (4.4)	2 (4.6)	12 (13.4)	2 (3.6)	10 (17.8)	4 (10.2)
Sports	3 (3.3)	2 (4.6)	4 (4.4)	5 (9.1)	10 (17.8)	5 (12.8)
Relaxation	15 16.0)	10 (23.2)	14 (15.7)	12 (21.8)	11 (19.6)	12 (30.7)
Others	16 (17.7)	14 (32.5)	6 (6.7)	9 (16.4)	0	0
n	90	43	89	55	56	39

The table above shows that the fewest percentage of subjects who treating PMS was watching television and using Water Warm Zack on stomach. Consuming analgesic or Aspirin was the most consuming medicine for reducing pain during PMS. All of young adult

women reported that they took an action for overcoming the symptoms of premenstrual syndrome, no one do “not do anything”. It could be said that young adult women were more aware about their selves.

Table 3: Characteristic of subjects based on the mother’s history of premenstrual syndrome

Variabel	Mother’s history of premenstrual syndrome			
	Yes	No	Not know	n
Groups	n (%)	n (%)	n (%)	
Early Teenagers				
Treatment	27 (30)	18 (20)	45 (50)	90
Control	17 (39.5)	4 (9.3)	22 (51.1)	43
Late Teenagers				
Treatment	15 (16.8)	12 (13.4)	62 (69.6)	89
Control	19 (34.5)	10 (18.2)	26 (47.3)	55
Young Adult Women				
Treatment	21 (37.5)	17 (30.3)	18 (32.1)	56
Control	12 (30.7)	10 (25.6)	17 (43.5)	39

The table shows that the high cases of premenstrual syndrome might be contributed to the history of it with their mother. In addition, the early teenagers and late teenagers do not aware the history of their mother. It was showed by the highest percentage of the number “do not know the history of PMS of their mother”. However, the young adult women were the highest group who know the history of their biological mother about PMS.

The table above shows that most groups decreased level of pain. On the other hand, the control group of young adult women increased the level of pain intensity. The highest decreasing of pain intensity was at group of young adult woman which was at 4.38 point. This was from 5.33 at pre-test to 0.95 at post-test. However, young adult women groups in the control group experienced improvement in pain intensity at 0.59 point, from 4.54 to 5.13.

Table 4: Distribution of subjects based on the intensity of pain during premenstrual syndrome

Variable	Mean of Pain Intensity	Mean of Pain Intensity	Difference of mean
	Pre-test	Pot test	
Early teenagers			
Treatment	5.23	2.38	2.85
Control	3.13	2.87	0.26
Late teenagers			
Treatment	5.92	3:59	2:33
Control	4.87	4.64	0:23
Young adult women			
Treatment	5.33	0.95	4.38
Control	4.54	5.13	0.59

Table 5: Distribution of subjects based on the level of anxiety during premenstrual syndrome

Variable	Mean Anxiety		Difference of mean
	Pre-test	Post-test	
Early teenagers			
Treatment	16.6	14.74	1.86
Control	15.4	15.59	-0.19
Late teenagers			
Treatment	18.59	11.92	6.67
Control	14.97	13.97	1.00
Young Adult Women			
Treatment	14.23	7.05	7.18
Control	13.28	12.92	0.36

It showed that in all group at treatment and control groups decreased the level of anxiety. However, it is an exception that control group of early teenagers increased the level of anxiety at 0.19 point. The highest point of decreasing anxiety was in treatment group of young adult women at 7.18. It was from 14.34 to 7.05.

Table 6: The effect of premenstrual gymnastics toward intensity of pain

Variable	Mean	SD	95% CI	P value
Early teenagers				
Treatment	2.35	2.00	1.93 - 2.77	0.001
Control	0.27	1.38	-0.14 - 0.70	0.194
Late teenagers				
Treatment	-1.92	1.83	1.53- 1.15	0.001
Control	0.29	0.89	0.04 - 0.53	0.100
Young Adult women				
Treatment	4.50	3.15	3.65 – 5.34	0.001
Controls	0.59	1.69	1.14 - 0.04	0.360

Table above shows that there was a significant influence of premenstrual gymnastics against intensity of pain in all treatment groups. There were same p values at 0.001. There do not influence in intensity of pain as evidenced by the p value more than 0.05 in all control groups.

Table 7: Effect of premenstrual gymnastics toward the level of anxiety

Variable	Mean	SD	95% CI	P value
Early teenagers				
Treatment	-0.321-2.86	3.02	1.80-2.86	0.001
Control	-0.89-0.2390	1.83	-0.89-0.239	2.23
Late Teenagers				
Treatment	4.73	6.46	3.36 – 6.09	0.001
Control	0.54	2.42	-0.11- 1.20	0.101
Young Adult Women				
Treatment	5.55-8.73	5.94	5.55-8.73	0.001
Control	-0.08-0.800	1.36	-0.08-0.80	7.14

The table above shows the significant effect of premenstrual gymnastics against the level of anxiety in all treatment groups with p value of 0.001. In all control group premenstrual gymnastics were not influenced with the p value more than 0.05.

DISCUSSIONS

The prevalence of women who suffered premenstrual syndrome case was varied in all three groups. The total number of subject who interested in this study was 548 women. The prevalence of women who suffered premenstrual syndrome was 442 (80.6%). The drop out number of subject participating in this study was a quite high. It was 70 (12%) from all women who counted in the post-test. The highest number of drop out was the women who were in the young adult women groups. It might be they were having a lot of daily crucial activities. Moreover, it might be also because of the length of the treatment (premenstrual gymnastics) was a five continuous days. In addition, some schools have different program such as days off, clinical practice activity, and examination time.

The average age of menarche in the early teenagers, late teenagers and young adult women in the treatment group and the control group are almost the same. The women experienced the age of menarche approximately at 12 years old. The minimum and maximum ages of menarche were at 9 and 18 years respectively. In addition, it is assumed from the study that the age of menarche became earlier a year within the last two decades. The study showed that average age of menarche of early teenagers was at 11 years. Moreover, the average age of menarche for late teenagers and young adult women were 12 and 13 years respectively.

However, some study concluded that the minimum age of menarche was at 11 years the last decade. In this study, the currently minimum age menarche is at 9 years old. This is likely caused by internal factors and external factors that affect the maturation of reproductive age individually, such as nutritional status, activity daily living, Basal Mass Index/ BMI, and psychological status. (21) The external influencing factors contributed with this issue were exposure for media social, lack of external supports, and environmental atmosphere (22)

The habit to overcome the negative effect of symptoms on premenstrual syndrome were varied. The highest percentage was consuming herbal medicine. This is probably caused by increasing of awareness of society culture and local wisdom utilization. Moreover, supported by a wide range of information that encourages the use and benefits of herbal medicine scientifically through books, journals, and internet. Besides, most young adult

women aware on PMS by aerobic exercise, jogging, run, and other physical activities. Watching television, warm compresses and pharmacology medicine were less used in all groups both in treatment and control groups.

The history of the mother about PMS varied in all groups. The data obtained that the more mature is the more awareness to know the medical history of premenstrual syndrome experienced by the mother. Moreover, the less percentage of groups who did not know about the history of PMS was young adult women. Most women, who knew her mother medical history, stated that more than the majority of subjects have a biological mother with a history of premenstrual syndrome. It is suitable with the research that the mother menstrual history may heritage to the children ^(23,6).

The average intensity of pain in the pre-test treatment was higher than of that in the control group. While, the average intensity of pain in the post test treatment group was lower than of that in the control group. This happened in the early teenagers, late teenagers, and young adult women.

The average levels of anxiety in the pre-test treatment group were higher than of that in the control group. Instead, the average levels of anxiety post test treatment group were lower than its in the control group. This occurs at early teenagers, late teenagers, and young adult women. On the other hand, none had severe anxiety level at the post-test treatment group. However, there were some women who suffered severe anxiety in all control group. This is proved by the level of anxiety was more than 28 score.

Normality data was done with Kolmogorov Smirnov. The data which were not normal was done with transformation data. The mean of pain intensity and anxiety level at pretest of three intervention groups were higher than of that at three control groups. Premenstrual gymnastics decreased the intensity of pain and the level of anxiety. There was a relationship between premenstrual gymnastics with intensity of pain and level of anxiety with p value at 0.001 and p 0.001 respectively. Premenstrual gymnastics does not affect the intensity of pain in the control group at early teenagers, late teenagers, and young adult women. This is evidenced by the p-value at 0.194, 0.100, and 0.360 respectively.

The premenstrual gymnastics affect the level of anxiety in the experimental group at early teenagers, late

teenagers, and young adult women with p-value at 0.000 all age groups. Gymnastics does not affect the level of anxiety in the control group at early teenagers, late teenagerse, and young adult women. This is evidenced by the p-value at 0.251, 0.101, and 0.109.

CONCLUSION

The prevalence of premenstrual syndrome is 80.6%. The age of menarche is getting early a year in the last two decades. Consuming herbal medicine is the most choices for overcoming PMS. Exercise improves the women lifestyle. Most subjects have a PMS history from their mother. The mean of pain intensity and anxiety level at pretest all intervention groups are higher than of that at three control groups. Premenstrual gymnastics decreased the intensity of pain and the level of anxiety. There are relationships between premenstrual gymnastics with intensity of pain and level of anxiety with p value at 0.001 and p 0.001 respectively

ACKNOWLEDGMENT

The authors would like thanks to the subjects, gymnastics instructor, enumerator, head, and students of Junior High School, Senior High School, and University at District of Kendal, District of Jepara, City of Semarang, whom facilitated and contributed on this study.

Conflict of Interest: The authors have no conflict of interest to the activity and coverage of this study.

Ethical Clearance: The study was supported by Health Polytechnic of Indonesia Ministry of Health. The research received permission of ethical clearance from the Health Research Ethics Committee of Poltekkes Kemenkes Semarang number 044/KEPK/Poltekkes-Smg/EC/2015.

REFERENCES

1. Halbreich, Backstrom T EE. Clinical Diagnosis Criteria for Premenstrual Syndrome and Guidelines for Their Qualification for Research Studies. *Gynecol Endocrinology*. 2007;23 (3) (March):123-130.
2. (ACOG) AC of O and G. ACOG Practice Bulletin. Clinical Management Guidelines for Obstetrician-Gynecologist. *Premenstrual Syndrome American Journal Obstetric Gynecology*. 2000;95(15 April 2000):1-9.

3. Steiner M. Premenstrual syndrome and premenstrual dysphoric disorder: guidelines for management. *Journal of Psychiatry Neuroscience*. 2000;25(5):459-468.
4. Sabaei Y, Sabaei S, Khorshidi D, Ebrahimipour S, Rostami FF. The Association between Premenstrual Syndrome and Physical Activity and Aerobic Power in Female High School Students. 2015;2(2):53-58.
5. Tamjidi A. The prevalence and severity of premenstrual syndromes symptom in 15 - 45 year old women in Tehran. *Nurs Midwifery, Shahih Behesti Univ Med Sci*. 1996.
6. Heinemann, LAJ; Do Minh T; Filonenko A et al. Explorative Evaluation of the impact of premenstrual Disorder on daily Functioning and Quality of Life. *Patient Patient centered Outcomes Res*. 2010;3:125-132.
7. Rapkin AL WS. Premenstrual syndrome and Premenstrual Dysphoric Disorder, Quality of life and Burden of Illness. *Expert Rev Pharmacochon Outcomes Res*. 2009;9:157-170.
8. Taylor D. Perimenstrual symptoms and syndromes. Guidelines for symptoms managemen and selfcare. *J Obstet Gynecol*. 2005;5:228-241.
9. Harden KP, Ph D, Kretsch N, Moore SR, Mendle J, Ph D. Descriptive Review : Hormonal Influences on Risk for Eating Disorder Symptoms During Puberty and Adolescence. *Int Eat Disord*. 2014;47:718-726. doi:10.1002/eat.22317
10. Spitzer. Diagnostic and Statistical manual of Mental Disorders. *J Med Assoc*. 1994;278:1740-1758.
11. Connolly M. Premenstrual syndrome : an update on definitions , diagnosis and management. 2001;7.
12. Matsumoto T, Asakura H, Hayashi T. Biopsychosocial aspects of premenstrual syndrome and premenstrual dysphoric disorder. 2013;29(1):67-73. doi:10.3109/09513590.2012.705383
13. Stephanie Collins Reed, Frances R. Levin and SME. Change in Mood, Cognitive Performance and Appetite in the Late Lutheal and Follicular Phases of the Menstrual Cycle in Women With and Without PMDD (Premenstrual Dysphoric Disorder). *June*. 2008;54(1):185-193.
14. Dean, BB; Borenstein J. A Prospective Assessment Investigating the Relationship between work productivity and impairment with premenstrual syndrome. *J Occup Environ Med*. 2004;46:649-656.
15. Hourani LL, Yuan H, Bray RM. Psychosocial and Lifestyle Correlates of Premenstrual Symptoms among Military Women. 2004;13(7).
16. Bender T, Nagy G, Barna I, Tefner I, Kádas É, Géher P. The effect of physical therapy on beta-endorphin levels. 2007:371-382. doi:10.1007/s00421-007-0469-9
17. Khayat S, Kheirkhah M, Moghadam ZB, Fanaei H, Kasaeian A, Javadimehr M. Clinical Study Effect of Treatment with Ginger on the Severity of Premenstrual Syndrome Symptoms. 2014;2014:9-14. doi:10.1155/2014/792708
18. Sumarni, Sri, Khafidhoh, Nur, Umaroh, Munayaroch, Rajiani I. Menstrual Gymnastics on Beta Endorphin Level and Intensity of Pain in Premenstrual syndrome. *Indian J Public Heal Res Dev*. 2018;9(6):80-85. <http://www.indianjournals.com/ijor.aspx?target=ijor:ijphrd&volume=9&issue=6&article=015>.
19. Sastroasmoro, Sudigdo, Ismael S. *Dasar Dasar Metodologi Penelitian Klinis*. 5th ed. Jakarta: Penerbit Sagung Seto; 2014.
20. Dahlan MS. *Statistik Untuk Kedokteran Dan Kesehatan, Deskriptif, Bivariate, Dan Multivariate Dilengkapi Dengan Menggunakan SPSS*. 3rd ed. Jakarta: Penerbit Salemba Medika; 2011.
21. Emilia O. Premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD) in Indonesian women. *J Med Sci (Berkala ilmu Kedokteran)*. 2015;40(3). <https://jurnal.ugm.ac.id/bik/article/view/3003/0>. Accessed March 7, 2017.
22. Cunningham J, Yonkers KA, Brien SO, Eriksson E. Update on Research and Treatment of Premenstrual Dysphoric Disorder. 2009. doi:10.1080/10673220902891836
23. Skrzypulec-plinta V, Drosdzol A, Nowosielski K, Plinta R. The complexity of premenstrual dysphoric disorder - risk factors in the population of Polish women. 2010:1-7.

Dietary Diversity in Agricultural and Coastal Area as Potential Source for the Prevention of Child Stunting in Sidoarjo District

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ABSTRACT

Stunting is one of public health nutrition problem in Indonesia that will likely reduce the potential human resources capacity in the near future. However, Indonesia could have prevented the problem since it has the potential food sources from the agricultural and coastal region. This study aimed to analyze the relationship between dietary diversity in the agricultural and coastal area with the prevalence of child stunting.

The design of the study was cross sectional involving 55 under five years old children and their mother. Dietary diversity was measured using the Individual Dietary Diversity Score (IDDS) and stunting was determined using height-for age index using the WHO 2005 standard. Statistical analysis used to test the hypothesis was logistic regression. The results showed that the prevalence of child stunting was 28%. Food groups consumed in the agricultural as well as coastal area were dominated by starchy food, meat, fish and egg. There was significant correlation between child stunting and dietary diversity in agricultural and coastal area in Sidoarjo District (p-value=0,019; OR=5,49; 95% CI=1,32-22,93). Compare to children living in a household with good dietary diversity, those who live in a poor dietary diversity household have 5 times risk of being stunted. In conclusion, the significant correlation between good dietary diversity in the agricultural and coastal area of Sidoarjo District and child stunting indicated potential diet to reduce stunting. The majority of the diet in the study involved consumption of starchy food, fish and egg.

Keywords: *dietary diversity, stunting, agriculture, coastal area*

INTRODUCTION

Children need sufficient food to support the process of growth and development both physically and motoric⁽¹⁾. Growth and development during childhood will be optimal with the right amount and good quality food⁽²⁾. Nutrients deficiency in children causing decreased physical growth and motor development⁽¹⁾. According to the Indonesian Ministry of Health, malnutrition in infant causes a higher risk of chronic illness when they grow⁽³⁾.

Problems of malnutrition and excessive nutrients can be prevented by socializing balanced-nutrition messages. Consuming a variety of food consisting of staple food, side dishes, vegetables, and fruits and with considering the amount and type according to the needs, is the principle of balanced nutrition⁽³⁾. Introducing and providing a variety of food items for children can complement the nutrients needed because each food contains different nutrients⁽²⁾.

Based on the Ministry of Agriculture in 2016, adequate food fulfillment can be reflected from the availability of food. Indonesia as an agrarian and maritime country has the potential to provide food sources. The fulfillment of food still rely on agricultural resources, yet empower other resources such as fisheries⁽⁴⁾. Rice consumption in 2015 is 98.39 kg/cap/year and this figure shows an increase of 1.22% from 2014⁽⁵⁾.

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Research on the diversity of food as measured by *Dietary Diversity Score* (DDS) in Ghana shows that the

diversity of food consumption can significantly increase the energy, nutrient intake, and nutritional status of children ($p < 0.05$)⁽⁶⁾. Other studies suggest that there is a relationship between food diversity and *stunting* in children. This is related to the consumption of low protein-containing food groups, showing that there is a significant relationship between protein intake and *stunting* in children⁽⁷⁾.

Another study mentioned that children with low energy intake were significantly associated with low nutritional status according to weight-for-age⁽⁸⁾. The relationship of protein intake and nutritional status of children under five also showed significant results, which means that children with low protein intake had low nutritional status according to weight-for-age and weight-for-height⁽⁸⁾. Dietary Diversity Score is calculated by summing the food groups consumed using the 24-hour food recall method. The results of IDDS can be grouped into three categories of low food diversity if ≤ 3 food group, medium if 4-5 food groups, and high if ≥ 6 food groups⁽⁹⁾.

Undernutrition conditions in infants reflect poor eating habits because at this age, most children only want to consume one type of food alone⁽¹⁰⁾. The diversity of food consumption is influenced by various factors such as knowledge of nutrition, number of household members, socioeconomic, and food availability. The diversity of food consumption can also be used as an indicator of food insecurity⁽¹¹⁾.

Based on data from the Central Bureau of Statistics (BPS), the use of land in Sidoarjo regency in addition to residential areas for agricultural land is 17,205 hectares⁽¹²⁾ and aquaculture is 15,729 ha. The agricultural sector is a strategic sector because it provides the people with food needs. Enterprises in the agricultural sector to meet food needs, among others, by increasing production and biodiversity⁽¹³⁾.

Agriculture is closely related to the consumption of food for the community because agriculture is able to provide adequate nutrition from food processing and unprocessed foods (14). If food produced by the agricultural sector is available in sufficient quantities and varies at different levels of society, there will be no malnutrition. A healthy peasant family will produce good labor and agricultural output. Poverty and low household food consumption will lead to malnutrition⁽¹⁵⁾. Increased production of crops will affect the availability

of local food and food prices⁽¹⁴⁾. The excellent potential of Sidoarjo Regency in agriculture sector consists of various commodities such as rice, soybean, and lowland vegetables (spinach, kale, and mustard).

Ponds are able to produce a variety of typical fishery resources in the form of fish and other brackish water animals such as shrimp, crab, and shellfish⁽¹⁶⁾. Aquaculture can meet the needs of fish and can meet the food and nutritional community in particular to meet the needs of protein consumption society⁽¹⁶⁾.

Leading commodities from the fishery sector are shrimps and milkfish. In addition, the existence of ponds is an abundance of the availability of biological natural resources that can meet the needs of animal protein⁽¹⁷⁾. Indonesia is included in 17 countries from 117 countries that have three nutritional problems such as *stunting*, *wasting*, and *overweight*⁽¹⁸⁾. Aquaculture activities in addition to having benefits for the availability of food sources of protein, is also a fishery cultivation that can be a source of livelihood and income for the community.

According to the Food Security and Extension Counseling Agency (BKP3), Sidoarjo Regency has not fulfilled food consumption diversity the principles of diverse, nutritious, balanced and safe food⁽¹⁹⁾. This can be seen from the score of Food Pattern Expectations (PPH) of Sidoarjo regency that has not met the target. PPH scores on agricultural agroecology area was 83.95 and in fishery agroecology area was 87.32, while for the target of own PPH score was 95⁽²⁰⁾.

The prevalence of under-five children under five in Sidoarjo Regency in 2015 is 4.9%, whereas malnourished children under five are 0,022%⁽²¹⁾. Therefore, researchers want to see the diversity of food in agricultural areas and ponds to prevent the occurrence of stunting in Sidoarjo.

MATERIAL AND METHOD

This study is observational analytic research with *cross sectional* design. The population of this research was household whom has children aged under five in Wonokasian and Kalanganyar Village. The area was selected because it is the area that has the potential in agriculture and the largest pond in the region of Sidoarjo district.

The samples were children aged 2-5 years old in the village area with the mother/caregiver as respondents. The sample in this research was 55 and

selected using *proportional random sampling*. Data collection was conducted through interviews with questionnaires, food diversity using IDDS, food recall 2x24 hours, weight weighing using digital scales and height using microtoise. The questionnaire contains the characteristics of families and children. For the start, researchers measured children’s weight and height then interviewing children’s mother or caregiver and for food diversity, IDDS was used.

Table 1: Children’s Dietary Diversity in Sidoarjo District

No.	Dietary Diversity	Agroecology			
		Agricultural		Coastal	
		n	%	n	%
1.	Low	10	33,3	4	16
2.	Moderate	14	46,7	14	56
3.	High	6	20	7	28
Total		30	100	25	100

Table 2: Children’s Nutrient Intake Distribution

No.	Dietary Intake		Agroecology			
			Agricultural		Coastal	
			n	%	n	%
1.	Energy	Low	19	63,3	14	56
		Adequate	10	33,3	10	40
		High	1	3,3	1	4
2.	Carbohydrate	Low	28	93,3	21	84
		Adequate	2	6,7	3	12
		High	0	0	1	4
3.	Protein	Low	2	6,7	2	8
		Adequate	11	36,7	6	24
		High	17	30,9	17	68
4.	Fat	Low	9	30	8	32
		Adequate	16	53,3	11	44
		High	5	16,7	6	24

Table 3: Children’s Nutritional Status

No.	Nutritional Status	Agroecology			
		Agricultural		Coastal	
		n	%	n	%
1.	Severe stunted	4	13,3	3	12
2.	Stunted	4	13,3	4	16
3.	Normal	22	73,3	18	72
4.	High	0	0	0	0
Total		30	100	25	100

FINDINGS

In this study, there was significant correlation between child stunting and dietary diversity in agricultural and coastal area in Sidoarjo District (p-value = 0,019; OR = 5,49; 95% CI = 1,32-22,93). As can be seen in table 1, the average value of dietary diversity in agricultural groups and coastal are in the medium group. In agriculture

group there are 14 children (46.7%) and coastal there are 14 toddlers also (56.0%). Groups of food consumed by children in agricultural and coastal area dominated by starchy food, milk and dairy products. Other food groups that widely consumed by children in agricultural areas and ponds are meat, fish and eggs. Consumption of green vegetables is higher in the coastal area while vegetables and fruits is higher in agricultural areas.

Fulfillment of nutritional intake in children can be determined from the quality and quantity of food consumed. Energy and protein intake is assessed using *food recall 2 × 24 hour* and then converted with *Nutrisurvey*. Further analysis was done by comparing the *output of nutrisurvey* with Nutritional Sufficiency (AKG).

Can be seen in table 2, the results showed that energy sufficiency in both agriculture and coastal area are mostly in low category with 19 children (63.3%) and 14 children (56%) consecutively. Equal with carbohydrate

adequacy, in both areas are mostly in low category with 28 children (93,3%) and 21 children (84%). Meanwhile, in protein adequacy in both areas are mostly in high category with 17 children (30,9%) and 17 children also (68%). For fat adequacy, in both areas are mostly in moderate category with 16 children (53,3%) and 11 children (44%).

The higher the result of dietary diversity in children illustrates that they tend to consume more varied foods compared to them with low result. The more varied we consumed then the better nutrients that will enter the body. As we know, one type of food does not contain all the nutrients therefore we need to consume a variety of food so nutritional needs will be met.

As can be seen in table 3, majority children's nutritional status in both areas were in normal with 22 children (73,3%) and 18 children (72%) consecutively. Infants and young children is in critical age for growth and development. They need energy- and nutrients- dense foods in order to grow and develop both physically and mentally⁽²²⁾. Our study revealed that there is positive association between dietary diversity and stunting in children. Households with food insecurity showed higher prevalence in child stunting. Low varied foods consumption tends to effects conditional growth in children height. In line with study from Busert et al who examined dietary diversity and expected height in rural areas in Nepal. Her study found that dietary diversity had positive association with growth height in children. Children with low dietary diversity, the expected height were not met⁽²³⁾.

Study from Arimond who investigated dietary diversity and child nutritional status in 11 different country, showed that country with highest prevalence of stunting tend to had lower mean dietary diversity score⁽²²⁾. Study in Kenya also showed household with severe food insecurity and poor dietary diversity had higher number in stunting children⁽²⁴⁾.

Dietary diversity is associated with child nutritional status, which interacted with several factor such as geographical factor⁽²²⁾. In this study, high-protein adequacy mainly caused by the geographical factor. Our participants lived in agriculture and coastal area which had high availability in protein-dense foods including fish and prawns. Thus, children in these areas tend to consumed protein-dense food as daily consumption. Areas with high agricultural biodiversity improves

household food security and dietary diversity⁽²⁴⁾. A more diverse diet has the potential to provide a more abundant supply both macro- and micronutrient therefore would ensure greater food and nutrition security⁽²⁴⁾.

CONCLUSION

One factor contributes in dietary diversity is geographical factor. A more diverse geographical factors will improve dietary diversity and furthermore will prevent child stunting. Several factors contribute in agricultural and costal products' sustainability including weather, economy, climate change, pollution and soil degradation. Thus, it is necessary to maintain agricultural and coastal productivity to maintain food availability which in long term will reduce children stunting prevalence.

Conflict of Interest: Authors have no any conflict interest with other researcher nor institutions

Source of Funding: This research is self-funded

Ethical Clearance: This study is approved by The Health Research Ethics Committee at Faculty of Public Health Universitas Airlangga (reference number: 166-KEPK)

REFERENCES

1. Widjaja. Gizi Tepat untuk Perkembangan Otak dan Kesehatan Balita. Jakarta: Kawan Pustaka; 2008.
2. Adriani M, Wirjatmadi B. Peranan Gizi dalam Kehidupan. Jakarta: Kencana; 2012.
3. Kemenkes RI. Pedoman Gizi Seimbang. 2014;
4. Herdiawan D. Kedaulatan Pangan Maritim: Dinamika dan Problematika. Jakarta; 2016.
5. Kementrian Pertanian RI. Statistik Pertanian 2016. Jakarta; 2016.
6. Christina NA. Dietary Diversity is Associated with Nutrient Intakes and Nutritional Status of Children in Ghana. *Asian J Med Sci* [Internet]. 2011 Sep 27 [cited 2018 Jul 17];2(2):105–9. Available from: <http://nepjol.info/index.php/AJMS/article/view/4179>
7. Mahmudiono T, Sumarmi S, Rosenkranz RR. Household dietary diversity and child stunting in East Java, Indonesia. *Asia Pac J*

- Clin Nutr [Internet]. 2017 Mar [cited 2018 Jul 17];26(2):317–25. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28244712>
8. Supriyanti N. Hubungan Kecukupan Zat Gizi dan Dietary Diversity Score (DDS) dengan Status Gizi Balita Usia 12-59 Bulan di Desa Baban, Kecamatan Gapura, Sumenep. Airlangga; 2014.
 9. FAO. Guidelines for Measuring Household and Individual Dietary Diversity. 2013.
 10. Arisman M. Gizi dalam Daur Kehidupan: Buku Ajar Ilmu Gizi. Jakarta: EKG; 2003.
 11. Baliwati YF, Briawan D, Melani V. PENGEMBANGAN INSTRUMEN PENILAIAN KUALITAS KONSUMSI PANGAN PADA RUMAH TANGGA MISKIN DI INDONESIA. GIZI Indones [Internet]. 2015 Mar 31 [cited 2018 Jul 18];38(1):63–72. Available from: https://ejournal.persagi.org/index.php/Gizi_Indon/article/view/168
 12. BPS. Sidoarjo dalam Angka 2016. Sidoarjo; 2016.
 13. Sumastuti E. PROSPEK PENGEMBANGAN AGRIBISNIS DALAM MEWUJUDKAN KETAHANAN PANGAN. JEJAK J Ekon dan Kebijakan [Internet]. 2011 [cited 2018 Jul 18];4(2). Available from: <https://journal.unnes.ac.id/nju/index.php/jejak/article/view/4650>
 14. Heddy S. Agroekosistem: Permasalahan Lingkungan Pertanian. Jakarta: Rajawali Pers; 2010.
 15. Suhardjo, Laura JH, Brady JD, Judy AD. Pangan, Gizi, dan Pertanian. Jakarta: Penerbit Universitas Indonesia (UI-Press); 2009 p.
 16. Puspita LE, Ratnawati I. Lahan Basah Buatan di Indonesia. Bogor: Wetlands International; 2005.
 17. Tohir W. Peran Peternak dan Nelayan serta Organisasinya dalam Penyediaan Produk Pangan. 2007 [cited 2018 Jul 18]; Available from: <http://www.litbang.pertanian.go.id/special/HPS/ktna.pdf>
 18. Zaini M. Ikan Untuk Ketahanan Pangan dan Gizi Nasional. 2017; Available from: <http://gizi.depkes.go.id/wp-content/uploads/2015/02/IKAN-UNTUK-KETAHANAN-PANGAN-DAN-GIZI-NASIONAL-Bag-II.pdf>
 19. BKP3. Urusan Ketahanan Pangan. Sidoarjo; 2014.
 20. BKP3. Laporan Akhir Penyusunan Skor Pola Pangan Harapan Kabupaten Kabupaten Sidoarjo Tahun 2016. Sidoarjo; 2016.
 21. Dinkes Sidoarjo. Laporan Akuntabilitas Kinerja Instansi Pemerintah Dinas Kesehatan Kabupaten Kabupaten Sidoarjo Tahun 2015. Sidoarjo; 2015.
 22. Arimond M, Ruel MT. Dietary Diversity Is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys. J Nutr [Internet]. 2004 Oct 1 [cited 2018 Jul 18];134(10):2579–85. Available from: <https://academic.oup.com/jn/article/134/10/2579/4688437>
 23. Busert LK, Neuman M, Rehfuess EA, Dulal S, Harthan J, Chaube SS, et al. Dietary Diversity Is Positively Associated with Deviation from Expected Height in Rural Nepal. J Nutr [Internet]. 2016 Jul 1 [cited 2018 Jul 18];146(7):1387–93. Available from: <https://academic.oup.com/jn/article/146/7/1387/4585704>
 24. M’Kaibi FK, Steyn NP, Ochola SA, Du Plessis L. The relationship between agricultural biodiversity, dietary diversity, household food security, and stunting of children in rural Kenya. Food Sci Nutr [Internet]. 2017 Mar [cited 2018 Jul 18];5(2):243–54. Available from: <http://doi.wiley.com/10.1002/fsn3.387>

Eating Patterns and Physical Activity to Reduce Diabetes Melitus Type 2

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ABSTRACT

Diabetes mellitus type 2 is a hyperglycemic disease caused by insensitivity of cells to insulin. Prevalence of diabetes mellitus in Indonesia by doctor diagnosed there are 2,1% and the biggest fourth of people with diabetes mellitus disease in the world. The objective are to explain the effect of eating patterns and physical activity to diabetes mellitus type 2. This study used case control study with 70 people sample who were patients in RSUD Dr. Doris Sylvanus Palangka Raya. The sample was divided into two groups: 35 respondents case group (type 2 DM patients) and 35 respondents control group (not people with type 2 diabetes). Data analysis in this study used univariate analysis, bivariate analysis (chi square) and multivariate analysis (logistic regression). The variables affecting of DM type 2 happen were eating patterns value = 0,016 (OR = 3,33; CI95% = 1,235-8,997) and physical activity value p = 0,006 (OR = 5,16; CI95% = 1,493-17,883). The variables that have no effect are age, type, education, obesity, blood pressure and family history (p > 0.05). Physical activity is the most influential variable effect of type 2 diabetes happen. The People who doing physical exercise less than three times a week have the risk five times exposed to get type 2 diabetes mellitus disease than the people with physical activity at least three times a week after good eating patterns controlled. The recommendation study are need counseling and nursing discussion about physical activity and eating patterns especially with diabetes mellitus patients.

Keywords : *physical activity, type 2 diabetes mellitus, eating pattern*

INTRODUCTION

Diabetes mellitus is a world health problem that is considered one of the five main causes of morbidity and mortality among people^{1,2}. Diabetes mellitus is a symptom that arises in a person due to an increase in blood sugar (glucose) chronically due to insulin deficiency both quantitatively and qualitatively².

The prevalence of diabetes in adults aged 18–99 years was estimated to be 8.4% in 2017 and predicted to rise to 9.9% in 2045. The high prevalence of diabetes has important social, financial and development implications especially in low and middle-income countries³. Indonesia the ranks fourth in 10 countries with the highest number

of patients diabetes mellitus. Basic Health Research (Riskesmas) in 2013 shows the prevalence of diabetes mellitus in Indonesia which is diagnosed by doctor or symptom 2,1%⁴. According to the World Health Organization (WHO) data, Indonesia in the number of people with diabetes mellitus that is 7%⁵.

Some factors is caused diabetes mellitus include genetic or hereditary factors, viruses and bacteria, toxic and toxic substances, nutrition, lifestyle. Environmental factors and unhealthy lifestyles, such as overeating, fat, lack of activity and stress play a huge role as a trigger diabetes mellitus^{6,7}.

Diet is a good role for influencing of diabetes mellitus indicate. Moreover, diet related with lifestyle. The diet in the cities has shifted from the traditional diet that contains lots of fiber, vitamins and minerals, to an all-round modern diet, with the composition of foods that contain too much protein, fat, sugar, and little fiber^{8,12,13}.

Physical activity is a physical movement of the body and its supporting system, in the DM disease physical

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activity becomes the determinant part of the glucose index because in a person doing physical activity either mild, moderate, or heavy will require calories or energy. Energy or calories in the human body is a process of cell metabolism, the main source of energy in the human body, among others, glucose, glycogen and triglycerida. Human physical activity requires calories, while the material from calories is glucose so that the heavier the activity level the more blood glucose it uses. Physical activity is very influential in diabetes mellitus type 2 patients because blood glucose can enter the cells with high metabolism in the cell. Physical activity for people with diabetes type 1 should be noted the signs of hypoglycemia because glucose in the blood can not enter and make insulin not produced by pancreatic beta cells that function to deliver glucose as an energy material. Physical exercise is one of the pillars in diabetes management^{9,10,11}.

Based on Health Profile, Central Kalimantan Province is also faced with double burden problem where there are increasing cases of degenerative diseases such as hypertension and diabetes mellitus. Infectious disease cases are still high, but on the other hand degenerative diseases also increase. In the province of Central Kalimantan in 2012 amounted to 3.855 cases and increased in 2014 to 4,167 cases.

Based on the background that has been described above, it appears that diabetes mellitus type 2 is a serious health problem that must be overcome by controlling risk factors. So the problem formulation in this research is DM in Central Kalimantan is high, as evidenced from medical record data in RSUD dr. Doris Sylvanus Palangka Raya. DM incidence from 2013 (1.4%) increased to (1.5%) by 2015 and DM became the first in 10patient diseases. One of the factors of DM is diet and physical activity, diabetes type 2 can still be controlled or managed and more suffered because the body does not produce sufficient hormone insulin or insulin can not be used properly again (insulin resistance). Can be caused of lack attention to good diet and lack of physical activity such as exercise can cause diabetes mellitus type 2.

METHOD

The research design used was case control. In this study the researchers differentiated into 2 ie the case group was all patients diagnosed with diabetes type 2 (n = 35) and the control group was a patient he did

not diagnosis as patients with type 2 diabetes (n = 35). Sampling technique for case group with total population and for sampling control using accident sampling. In this research the researcher is assisted by 1 nurse who served in polyclinic disease in dr. Doris Sylvanus to assist researchers in explaining the research objectives and participation of respondents in this study. The data were collected by interviewing the variables of age, sex, education, family history, diet, and physical activity. BMI variable premises measure height and weight. The pressure and resistance variables of diabetes mellitus type 2 were obtained from the medical record.

The inclusion criteria of the case groups were: DM type 2 patients who had been examined in the polyclinic of internal medicine (medical record) based on doctor’s diagnosis in RSUD Doris Sylvanus; age ≥45 years; able to communicate well; willing to be a respondent. The inclusion criteria for the control group were in-patients with undiagnosed type 2 diabetes; age ≥45 years; able to communicate well; willing to be a respondent.

Data analysis in this study used 3 stages: univariate analysis, bivariate analysis using chi square and multivariate analysis using logistic regression.

RESULTS AND DISCUSSIONS

Respondents in the case and control group had similar characteristics, including: age, sex, education, BMI, eating pattern, blood pressure and family history, physical activity (table 1). There are only two variables that are significantly associated with diabetes: eating pattern and physical activity. Respondents who do not eat well in the diabetes group more three times bigger than control group (p = 0,016, OR = 3,33). Respondents in diabetes group with less activity have five times more risk diabetes than in the control group (p = 0.006, OR = 5.16).

Table 1: Distribution of age, sex, education, BMI, eating pattern, blood pressure, family history, physical activity in case group (Type 2 DM) and control group (non-diabetic)

No.	Variabel	Case		Control		P
		n	%	n	%	
1.	Age					0,806
	≥ 60 Years	13	37,1	14	40,0	
	45-59 Years	22	62,9	21	60,0	

Conted...

2.	Sex					1,00
	Female	19	54,3	19	54,3	
	Male	16	45,7	16	45,7	
3.	Education					0,629
	Low	14	40,0	16	45,7	
	High	21	60,0	19	54,3	
4.	BMI					0,811
	Obesity	16	45,7	17	48,6	
	Not Obesity	19	54,3	18	51,4	
5.	Eating Pattern					0,016
	Not good	20	57,1	10	28,6	
	Good	15	42,9	25	71,4	
6.	Blood Pressure					0,473
	abnormal	20	57,1	17	48,6	
	Normal	15	42,9	18	51,4	
7.	Family History					0,621
	Derivative	21	60,0	23	65,7	
	Underivative	14	40,0	12	34,3	
8.	Physical Activity					0,006
	Less Exercise	14	40,0	4	11,4	
	Moderate Exercise	21	60,0	31	88,6	

Relation of age with Type 2 DM: The age proportion of respondents in this study showed that from 35 respondents case group (diabetes mellitus type 2 patients) aged 45-59 years there are 22 people (62.9%) rest aged ≥ 60 years. Based WHO data on diabetes country profile for Indonesia the prevalence of diabetes was higher in older age groups^{2,5}. Person (≥ 45 years old) has an increased risk of developing DM and glucose intolerance caused by degenerative factors that decrease body function¹⁴. Diabetes mellitus was the second leading cause of death in the 45-54 age group in urban areas (14.7%) and the six times higher in rural areas (5.8%)¹⁵. Diabetes often appears after a person has entered this prone age, especially after the age of 45 years. Data from Riskesdas 2013 also showed a correlation between the increased age and the incidence of diabetes mellitus⁴.

The results of this study is relatively the same as that proposed by the International Diabetes Federation (IDF), for 90-95% of people with diabetes type 2 usually aged more than 40 years. There is a relationship between age and the incidence of DM¹⁶.

Respondents of case group that is suffer of DM Type 2 aged ≥ 60 years of proportion is smaller than the age of

45-59 years. This is because the number of patients with diabetes type 2 aged not more than 60 years.

Relation of gender with DM Type 2: Male has a risk of diabetes increases faster. Scientists from the University of Glasgow, Scotland revealed it after observing 51,920 men and 43,137 women. All are people with diabetes type 2 and generally have a body mass index (BMI) above the limit of overweight or obesity. Men exposed to diabetes on BMI averaged 31.83 kg / m² while new women experienced it in BMI 33.69 kg / m². This risk difference was influenced by body fat distribution. In men, fat accumulation is concentrated around the abdomen, which triggers central obesity risking more metabolic disorders^{9,10}. The proportion of respondents' gender in this study were female respondents in both case and control group, 19 (54,3%) responder same as male respondent both case and control were equal to 16 (45,7%) respondent.

This is different from some previous research because the results of this study men and women have not too much different in the case there are 19 female respondents and 16 male respondents. Although the patients at Doris Sylvanus Hospital of Palangka Raya were dominated by female patients, the sex were not significantly related to the occurrence of diabetes type 2. However, the results of Awad research (2013) in Endocrine Polyclinic RSU Prof. Dr. R. D. Kandou Manado prove that patients diabetes type 2 are women¹⁷. This may explain the fact that women are more sensitive to insulin than men. The function of the hormone insulin produced by a group of pancreatic beta cells that play a role in the metabolism of glucose for the body's cells. When the fat content in the blood increases due to dietary factors that contain cholesterol, then the hormone insulin is more widely used to burn fat. As a result the body lacks the hormone insulin to facilitate the metabolism of sugar in the blood. Thus any person with sex of both men and women have the same risk of exposure to DM if the diet is not good.

Relation of education with DM Type 2: This study showed that from 30 respondents with low education there were 14 (40,0%) respondents in case group and 16 (45,7%) respondents in control group. Statistically the difference in proportions is 40.0% and 45.7% is not significant, corresponding to the p value of 0.629 ($p > 0.05$). There is no relationship between the level of education with the incidence of diabetes mellitus type 2 in RSUD Doris Sylvanus Kota Palangka Raya.

This is clearly different from the research conducted by Fatmawati (2010)¹⁸ that people with high school and college education (SMA) are at higher risk of diabetes than people with primary and junior secondary education ($p = 0.002$, $OR = 0.325$). This can happen because increasing levels of education, a person more interesting to accept himself as a sick person when he or she experiences certain symptoms than a more primitive group of people and thus seen from a study in control case of 21 respondents with higher education is seen more likely to check himself to the hospital. They are also reported to be quicker to seek medical help than people with lower social status. Lower educational level is a predictor of incident type 2 diabetes¹⁹.

Relation of BMI with DM Type 2: Obesity is a major risk factor for diabetes mellitus type 2 and also causes sleep disorders such as obstructive sleep apnea (OSA), studies of the last few decades suggest an independent relationship between the two²⁰. The proportion of respondents who are obese and not obese is very different. This is also seen from the calculation of body mass index (BMI) in this study that the proportion of respondents who most often exist at normal weight (18.5-22,9) (41.4%). The proportion of respondents in obesity I (25.0-29,9) was also quite high, from 70 respondents there were 28 (40%). This can happen because the higher of income level a person, the level of food consumption is less attention, so tend to experience obesity. The more fat tissues, body tissues and muscles will become more resistant to insulin resistance, especially when body fat or overweight accumulates in the central obesity. This fat will block the work of insulin so that glucose can not be transported into cells and accumulate in the bloodstream. Body fat tend to store more body fat and unburned fat, there is a deficiency of insulin hormone for carbohydrate burning, so more likely to happen diabetes mellitus type 2.

In general, this study showed that from 33 obese respondents there were 16 (45,7%) respondents in case group and 17 (48,6%) in control group. Statistically the difference of the proportion is 45.7% and 48.6% is not significant, according to the p value of 0.811 ($p > 0.05$). There is no significant relationship between obesity (obesity) with the incidence of DM type 2 in RSUD Doris Sylvanus Kota Palangka Raya.

This is different from the research conducted by Fatmawati (2010)¹⁸ that obesity 3.3 times the risk of the

incidence of diabetes mellitus type 2. This can happen because of income level of a person, the level of food consumption is less attention, so tend to experience obesity and also because of the high their income is not paying attention when body fat or overweight is a very dangerous problem for themselves. Body mass index has a strong relationship to diabetes and insulin resistance. In obese individuals, the amount of nonesterified fatty acids, glycerol, hormones, cytokines, proinflammatory markers, and other substances that are involved in the development of insulin resistance, is increased²¹.

Relation of eating pattern with DM Type 2: Diet has a major role in influencing of diabetes mellitus. Moreover, diet is also very closely related with lifestyle. The diet in the cities has shifted from the traditional diet that contains lots of fiber, vitamins and minerals, to an all-round, modern diet, with the composition of foods that contain too much protein, fat, sugar, and little fiber. The composition of food, especially in the ready-to-eat foods of late is very popular^{12,13}.

The respondents' diet in this study varied greatly when viewed from the source of daily intake of carbohydrates, proteins and fats. Source of carbohydrate most respondents per day is rice, ie as many as 38 (54.3%) of respondents consume rice 3 times per day. The source of animal protein of respondents per day is fish (29,4%) consume fish 3 times per day. For the source of fat intake per day is palm oil is 41 (58.6%) of respondents use palm oil 2 times per day.

Meanwhile, for the source of intake per week is not much different from the source of intake per day. The highest source is animal protein of respondents was 53 fish (75.7%) and skinless chicken (42%), while vegetable protein was 57 (81.4%) and 55 (78.6%). For the source of fat intake of the week, respondents mostly used palm oil 57 (81,4%), and all respondents in this research no one use margarine and butter. Because the selection of foods containing fat increases the risk of diabetes or diabetes mellitus caused by hormone imbalance in the body. In consuming sweet foods and the use of sugar in the diet is actually allowed if the portion is not excessive for diabetics and non-diabetics. Foods with simple carbohydrates will tend to cause a spike in blood sugar levels so excessive consumption of carbohydrates should be avoided, especially carbohydrates in rice and white bread. In simple carbohydrates will be more likely to increase the release of sugar into the bloodstream.

The release of sugar into the blood will then stimulate the release of insulin by pancreatic beta cells this can stabilize blood sugar levels. However, if the intake of carbohydrates increases then the release of sugar into the bloodstream will continue to rise. As a result, insulin secretion will continue to occur so that the increased risk of damage to beta cells of the pancreas (pancreatic beta cell fatigue index increased). In this kind of damage we should be able to prevent by consuming low carbohydrates or start consuming brown rice, black rice and wheat instead of rice and bread.

In this study, it was found that from 30 respondents with bad diet there were 20 (57.1%) respondents in case group and 10 (28,6%) in control group. Statistically there is significant correlation proportion not good in case 57,1% and proportion not good at control 28,6% hence, difference of proportion is 28,5% significant so that show there is relation between diet with incidence of DM type 2. Value OR indicated that people with poor diet had a 3.33-fold risk of type 2 DM incidence compared to a non-DM type 2 diet (control case) at Doris Sylvanus Hospital Kota PalangkaRaya ($p = 0.016 < 0.05$) (CI95% = 1,235-8,997). An obese individual should either diet or control his diet to reduce caloric intake until his weight drops to an ideal level. A moderate decrease in calories (500-1000 kcal / day) will result in slow but progressive weight loss (0.5-1 kg / wk). Weight loss of 2.5-7 kg will improve blood glucose levels^{22,23,24}. This is in line with the research conducted by Sudaryanto et al. (2014)²⁵ that respondents with poor diet have 10 times more risk of developing type 2 diabetes mellitus. Sumangkut et al., (2013)²⁶ also indicates the association between diet and the incidence of type 2 diabetes mellitus.

Relation of blood pressure with DM Type 2: Increased blood pressure on hypertension is closely related to improper storage of salt and water, or increased pressure from the body on peripheral blood vessel circulation (Fatimah, 2015)²⁷. The estimated prevalence of hypertension in adults with diabetes is 20–60%, which is 1.5–3 times higher than that in age-matched individuals without diabetes²⁸.

The proportion of respondents in this study found that of 37 respondents with abnormal blood pressure there were 20 (57.1%) respondents in the case group and 17 (48.6%) in the control group. Statistically the difference of the proportion is 57.1% and 48.6% is not significant, according to the p value of 0.473 ($p > 0.05$).

Thus, there is no significant relationship between blood pressure with the incidence of type 2 diabetes in RSUD Doris Sylvanus Kota Palangka Raya.

Relation of family history with DM Type 2: A person with diabetes mellitus is suspected of having the diabetes gene. It is suspected that the diabetic talent is a recessive gene. Only people who bersifat homozigot dengan such recessive genes who have diabetes mellitus (Fatimah, 2015)²⁷. Genetic factors are an important factor in Diabetes Mellitus which can affect beta cells and alter its ability to recognize and spread insulin secretory excitatory cells. This increases the susceptibility of these individuals to environmental factors that alter the integrity and function of pancreatic beta cells. The proportion of respondents indicates that of the 44 respondents who had a family history of DM, there were 21 (60.0%) respondents in the case group and 23 (65.7%) in the control group. Statistically, the difference of 60,0% and 65,7% is not significant, according to p value 0,621 ($p > 0,05$). Thus, there is no significant relationship between family history with the incidence of type 2 diabetes mellitus in dr. Doris Sylvanus Kota Palangka Raya.

This study was different from the research of Wicaksono (2011)²⁹ which stated on 30 patients in Internal Medicine Polyclinic Dr. Kariadi Semarang, where the family history of DM is a significant factor of DM Type 2 which has a statistical significance and has an effect on the incidence of DM Type 2 by 75% that people with a family history of DM 42.3 times are more at risk of DM. Sudaryanto et al. (2014)²⁵ also proves that people who have a family history of DM 25 times more likely to develop DM than people who do not have a history of DM. It can be caused of lack of information or respondent knowledge also related to diabetes history owned her parents

Relation of physical activity with DM Type 2: Disease DM is also related with physical activity of a person. Increased weight and lack of physical activity caused of insulin resistance. Regular physical exercise can improve blood vessel quality and improve all aspects of metabolism, including increasing insulin sensitivity and improving glucose tolerance¹⁷. According to research conducted in China some time ago, if a person in his life less exercise or moderate exercise, the reserves of glycogen or fat will remain stored in the body, this is what triggers the occurrence of various degenerative

diseases such as diabetes mellitus type 2²⁵. The pattern of life may be a big risk factor as a factor that exacerbates the condition of diabetes mellitus type 2. Such behaviors include excessive body mass index and lack of physical activity. Physical activity converts glucose into energy so that blood sugar levels can be controlled. Physical activity leads to increased insulin so that blood sugar levels will decrease. People who less exercise, food substances of the body will not be burned but dumped in the body as fat and sugar. The longer the insulin becomes less effective in changing glucose, then insulin resistance occurs

In this study, it was shown that from 18 respondents who did not perform sports activity there were 14 (40,0%) in case group and 4 (11,4%) in control group. Statistically, there was a significant correlation of non-exercise proportion in case of 40.0% and non-exercise proportion in control 11,4% hence difference of proportion was 28,6% significant so that show there is relation between physical activity with diabetes mellitus type 2 OR showed that people who did not exercise activity in the case had a risk of 5.16 times against the incidence of diabetes mellitus type 2 than people who did not do sports activities that are not DM type 2 (control cases) in RSUD dr. Doris Sylvanus Kota Palangka Raya ($p = 0,006 < 0,05$), (CI95% = 1,493-17,883). This research is in line with the research conducted by Fatmawati (2010), there is a relationship between sports activity with the incidence of diabetes mellitus type 2 (OR = 0.391; $p = 0.005$). Because if we do less physical activity then consumed sugar will also be more used, consequently the prevalence of elevated blood sugar levels will also be the higher the lack of activity is one factor that contributes in causing insulin resistance in DM type 2.

Dominant variable influence of DM Type 2: The independent variable used as the candidate in this *regresi logistic* is the variable with value ($p < 0.25$). The method used in this analysis is *the stepwise* method. The first modeling method there is no independent variable whose value ($p > 0.05$). From the eight independent variables have related with DM type 2 there are two variables have relation with the diabetes mellitus type 2 patient in dr. Doris Sylvanus Palangka Raya is dietary variables and physical activity variables. However, the two most influential variables on the occurrence of diabetes mellitus type 2 are physical activity variables as seen from OR (5,244) bigger than dietary variables.

This can be interpreted that the lack of physical activity has a chance of 5,244 times most to the occurrence of diabetes mellitus type 2 compared with non-DM type 2 (case control).

CONCLUSION

Characteristics of respondents who more risk diabetes mellitus type 2 are age 45-59 years, female, high education, obese, hypertension and respondents who have a family history of DM.

This research has proved that dietary pattern and physical activity are associated variables to diabetes mellitus type 2. The greatest influence for DM type 2 is physical activity.

Source of Funding: This study done by self funding from the authors.

Ethical Clearance: This study approved and received ethical clearance from the Committee of Public Health Research Ethics of University of Respati Indonesia.

Conflict of Interest: The authors declare that they have no conflict interest.

REFERENCES

1. Etienne GK. Trends in diabetes: sounding the alarm. *The Lancet*. 2016; 387 (10027):1485-1486.
2. Yu Xu, Limin Wang, Jiang He, Yufang Bi, Mian Li, Tiange Wang, Linhong Wang, et al. Prevalence and Control of Diabetes in Chinese Adults. *JAMA*. 2013;310(9):948-958. doi:10.1001/jama.2013.168118.
3. N.H. Cho, J.E. Shaw, S. Karuranga, Y. Huang, J.D. da Rocha Fernandes, A.W. Ohlrogge, B. Malanda. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes research and clinical practice*. 2018.;138: 271 – 281.
4. Ministry of Health of Republic Indonesia. Basic Health Research. 2013
5. World Health Organization (WHO). Diabetes country profile. 2016
6. Diego GC, Joel OJQ, Jose AGG, and Hector MG. Liver cirrhosis and diabetes: Risk factors,

- pathophysiology, clinical implications and management. *World J Gastroenterol.* 2009; 15(3): 280–288.
7. Alexandra KW, Jürgen H, and Giovanni P. Sex and Gender Differences in Risk, Pathophysiology and Complications of Type 2 Diabetes Mellitus. *Endocr Rev.* 2016;37(3):278–316.. doi: 10.1210/er.2015-1137
 8. Nuraini K, Kartasurya MI, Widajanti L. Response of Blood Sugar Levels to the Consumption of Wet and Fried Lumpia in Semarang. *Journal of Public Health (JKM) (e-Journal) UNDIP.* 2014;2.
 9. Nani C. Indicators of Successful Management of Physical Activity in People with Diabetes Mellitus Type 2. Community Medicine Department, Sports Medicine Division, Faculty of Medicine, University of Indonesia. 2015; 3.
 10. Henry N. Ginsberg, MD and Paul R. MacCallum. The Obesity, Metabolic Syndrome, and Type 2 Diabetes Mellitus Pandemic: Part I. Increased Cardiovascular Disease Risk and the Importance of Atherogenic Dyslipidemia in Persons With the Metabolic Syndrome and Type 2 Diabetes Mellitus. *J Cardiometab Syndr.* 2009;4(2): 113–119. doi:10.1111/j.1559-4572.2008.00044.x
 11. Lars S, Anna-Karin L, Markku P, Jarl T, Claude B, Björn C, et al. Lifestyle, Diabetes, and Cardiovascular Risk Factors 10 Years after Bariatric Surgery. *The New England Journal of Medicine.* 2004; 351 (26): 2683-2693.
 12. Alison Gray RD. Nutritional Recommendations for Individuals with Diabetes. NCBI Bookshelf. A service of the National Library of Medicine, National Institutes of Health. 2015.
 13. Waqas S, Tahir A, Nadeem Shafique B, and Mohd Rashid AH. Effect of diet on type 2 diabetes mellitus: A review. *Int J Health Sci (Qassim).* 2017; 11(2): 65–71.
 14. Betteng R, Pangemanan D, Mayulu N. Risk Factor Analysis Causes of Type 2 Diabetes Mellitus in Productive Age Women at Wawonasa Primary Health Care. *E-Journal Biomedic (e-BM).* 2014; 2 (2).
 15. Wijaya IN, Faturrohman A, Yuda A, Mufarrihah, Soesanto TG, Kartika D, Agustin WW, Putri HPNS. Drug Use Profile in Diabetes Mellitus Patients in East Surabaya Primary Health Care. *Journal of Community Pharmacy.* 2015; 2 (1): 23-28.
 16. Abdulghani H. Al-Saeed, Maria I. Constantino, Lynda M, Mario D’S, Franziska LG, Connie L, et al. An Inverse Relationship Between Age of Type 2 Diabetes Onset and Complication Risk and Mortality: The Impact of Youth-Onset Type 2 Diabetes. *Diabetes Care.* 2016;39(5): 823-829. [https:// doi.org/10.2337/dc15-0991](https://doi.org/10.2337/dc15-0991)
 17. Awad, N., Langi, Y.A., Pandelaki, K. Risk Factors for Type 2 Diabetes Mellitus Patients at Endocrine Polyclinic, Medicine Faculty of Sam Ratulangi University Prof.Dr.R.D.Kandou Hospital.E-*Journal of Biomedic (e-BM).* 2013; 1(1): 45-49
 18. Fatmawati A. Risk Factors for Type 2 Diabetes Mellitus Outpatients (Case Study at Sunan Kalijaga General Hospital Demak). *Universitas Negeri Semarang (Unnes).* 2010.
 19. Sacerdote C, Ricceri F, Rolandsson O, Baldi I, Chirilaque MD, Feskens E, et al. Lower educational level is a predictor of incident type 2 diabetes in European countries: the EPIC-InterAct study. *Int J Epidemiol.* 2012; 41(4):1162-73. Epub 2012 Jun 25
 20. Luman A. Obstructive Sleep Apnea (OSA) pada DM Tipe 2. *Cermin Dunia Kedokteran.* 2016; 43(2).
 21. Abdullah SAG, Mohammed A AA and Muhammad ZK: Mechanism linking diabetes mellitus and obesity. *Diabetes Metab Syndr Obes.* 2014;7: 587–591. Published online 2014 Dec 4. doi: 10.2147 /DMSO.S67400
 22. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care.* 2012; 35 (suppl1) : 64-71
 23. American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus *Diabetes Care USA.* 2010;27 : 55
 24. Soegondo S. Principles and Strategies for Diabetes Education. Book section: Management of Integrated Diabetes Mellitus. 2007. Jakarta : Medicine Faculty, Indonesia University Press : 219
 25. Sudaryanto A, Setiyadi NA, Frankilawati, DA. The Relationship Between Diet, Genetics and Exercise Habits Against Type 2 Diabetes Mellitus

- in Nusukan Primary Health Care, Banjarsari. 2014. Proceeding : 5th National Seminar of Science and Technology. 2014. Engineering Faculty, University of Wahid Hasyim. Semarang
26. Sumangkut S, Supit W, Onibala F. The Relationship of Diet Patterns with Type 2 Diabetes Mellitus Incidence at Polyclinic Internal Prof. Dr. R.D. Kandou Hospital. E- Journal Nursing (e-Kp). 2013; 1(1).
27. Fatimah RN. Type 2 Diabetes Melitus. J Majority. 2015; 4 (5):93-101.
28. Simonson DC. Etiology and prevalence of hypertension in diabetic patients. Diabetes Care. 1988; **11**:821–827.
29. Wicaksono PR. Risk factors related to Type 2 Diabetes Mellitus (Case Study at Dr. Kariadi Hospital's Internal Disease Polyclinic). 2011. Universitas Diponegoro Semarang

Relationship between Cadres Counseling about Diarrhea to Handling Child Diarrhea

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ABSTRACT

Diarrhea is the second leading cause of death in children under five years, about 760,000 children die every year from diarrhea. Most people who die of diarrhea are actually due to severe dehydration and fluid loss. The handling of diarrheal diseases in the community both in the management of cases and for prevention is well controlled, but the problem of diarrheal disease is still a relatively big problem. The purpose to analyze relationship counseling cadres of health about diarrhea to handling child diarrhea. This research used descriptive quantitative method with cross sectional approach. The sample were cadres which follow health counseling to handling children diarrhea in Public Health Centre of South Purwokerto that is 48 people. Sampling technique used by simple random sampling. Data analysis using Spearman's Rank correlation. Media of counselling used audio visual and demonstration about diary management. Spearman's Rank correlation test results obtained p value = 0.001 ($\alpha = 0.05$) which means H_0 rejected and H_1 accepted, so that there is a relationship between health counseling cadres and handling of children diarrhea in Public Health Centre of South Purwokerto. Cadres who follow counseling well able to handle diarrhea children better by 67%. Handling of diarrhea in children is done in simple non-pharmacotherapy. The counseling cadres about diarrhea effectively to handling of children diarrhea in Public Health Centre of South Purwokerto. The importance for cadres health education program to the handling of diarrhea in children, so hopefully this program can be sustainable.

Keywords: Diarrhea, Handling, Health Counseling, Cadres

INTRODUCTION

Diarrheal diseases are still a global problem with high degrees of morbidity and mortality in many countries, especially in developing countries. Indonesia is one of the developing countries with high incidence of diarrheal diseases due to high morbidity and mortality¹. Endemic diarrheal disease also often appears as an outbreak (AOB) and followed by many victims. To overcome diarrhea diseases in the community both the management of the case and for the prevention is quite

controlled. However, the problem of diarrheal disease is still a relatively big problem².

Diarrheal disease is one of the causes of mortality and morbidity of children in the world. Diarrhea is the second leading cause of death in children under five years, about 760,000 children die every year from diarrhea. Most of them are caused by food and water sources contaminated with diarrhea. A total of 780 million people have no access to drinking water and 2.5 billion people have no sanitation. Infectious diarrhea is widespread throughout the developing world. Most people who die of diarrhea are actually due to severe dehydration and fluid loss³.

Based on data from Basic Health Research in 2013 there are 30775 cases of diarrhea. From these data indicate that diarrhea cases ranks seventh of the top 10 other diseases, while the incidence of diarrhea in Toddlers ranks second of 10 other diseases. Diarrhea was the number one cause of death in infants (31.4%)

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and toddlers (25.2%), whereas in all age groups it was the fourth cause of death (13.2%)⁴.

In 2015 there are 18 times the outbreak of diarrhea with the number of people with 1213 people and the death of 30 people (2.47%). The mortality rate when outbreak of diarrhea is expected to be <1%. Based on the recapitulation of outbreaks of diarrhea from 2008 to 2015, the 2008 mortality rate was still quite high (> 1%) of 2.94%, except in 2011 the mortality rate at AOB was 0.40%, while in 2015 the number death of diarrhea when the outbreak even increased to 2.47%. National morbidity results from the Diarrhea Morbidity Survey of 2012 which amounted to 214/ 1.000 population. So it is estimated that the number of diarrhea sufferers in health facilities as much as 5,097,247 people, while the number of diarrhea patients reported to be handled in health facilities as many as 4,017,861 people or 74.33%. The data is still below the national target of 5.405.235 or 100%⁵.

The proportion of cases of diarrhea in Central Java in 2015 amounted to 67.7 percent, decreased when compared to 2014 proportion of 79.8 percent. This suggests discovery and reporting still need to be improved. Cases found or treated in both government and private services have not been reported. For gender-based cases between men and women more women, this is due to the fact that women are more likely to be associated with diarrheal risk factors, which are transmitted through oral fecal, particularly related to clean water, food serving and clean and healthy live behaviour (CHLB). The highest number of cases of diarrhea was Kebumen by 202.5 percent, while the district with the lowest discovery rate was Brebes 11.9 percent. The number of cases of diarrhea in Banyumas Regency is in the order of 18, which is 67.8%^{6,24}.

Case of Diarrhea in Banyumas District from year to year is still high compared with other cases of illness. The number of diarrhea of Banyumas District in 2014 is 214/1000 population, while in 2013 it is 21.55/1000 population. Coverage The finding of Diarrhea case in 2014 is 100%. The number of diarrhea cases found in 2015 amounted to 35006 cases, while the number of diarrhea cases handled amounted to 23728 cases (67.8)²¹.

Based on research Suryati (2014), that there is a relationship between educations with the activeness of posyandu cadres in the prevention of childhood diarrhea⁸. In line with Agustina's (2012) research, it is conveyed that there is a relationship between health counseling about prevention of diarrhea in infants with mother attitude in prevention of diarrhea⁹.

Diarrhea case data at Puskesmas Purwokerto Selatan in 2015 amounted to 1174 cases. Based on preliminary study conducted on 07 November 2016 at Puskesmas Working Area of Purwokerto Selatan that case of diarrhea that happened to children under five from July 2016 until October 2016 counted 90 people under five. On average per month as many as 23 people under five suffering from diarrhea.

The purpose of this research is to know the relationship of health counseling about diarrhea to the handling of diarrhea in children in society.

METHOD

The type of research used in this research is quantitative with analytic design using cross sectional approach. Analyzed to find out the relationship of health counseling about diarrhea about the handling of diarrhea in children. The samples examined were some of the cadres who followed the counseling of diarrhea handling in the children at Puskesmas Purwokerto Selatan in November 2016. Number of respondents 48 cadres. The sampling technique used in this study is by Simple Random Sampling of the total population of 265 cadres.

RESULTS

1. Univarible Analitic

1.1 Characteristic of Respondents

Table 1: Characteristic of Respondents

Variable	Frequensi (n = 48)	Percentage (%)
Age (year)		
< 25	2	4,2
25–35	16	33,3
> 35	30	62,5
Education		
Low	21	43,8
Middle	24	50,0
High	3	6,3
Occupation		
Government	2	4,2
Housewife	45	93,8
Non government	1	2,1

Source: Primer data

Based on table-1 can be explained that most respondents aged over 35 years as many as 30 people (62.5%), high school education as many as 24 people (50%), and employment as housewife as many as 45 people (93.8%).

1.2. Health Counseling for Cadres and Handling Diarrhea

Table 2: Health Counseling for Cadres and Handling Diarrhea

Variable	Frequensi (n = 48)	Percentage (%)
Health counseling		
Less	6	12,5
Good	42	87,5
Handling diare		
Less	20	41,7
Good	28	58,3

Based on table-2 can be explained that most respondents assess health counseling cadres in good category as much as 42 people (87.5%). Most of the respondents in the handling of diarrhea in children in the good category as many as 28 people (58.3%).

2. Related Health Counseling Cadres with Handling Diarrhea for Children

Table 3: Related Health Counseling Cadres with Handling Diarrhea for Children

Counseling	Handling Diare				Total		p-value
	Less		Good		f	%	
	f	%	f	%			
Less	6	100,0	0	0,0	6	100,0	0,001
Good	14	33,3	28	66,7	42	100,0	

Source: Primer data

Based on table-3 it can be explained that all health counseling cadre in the category enough with the handling of diarrhea in the category enough as much as 6 people (100%), and there is no health education cadre in the category enough with diarrhea treatment in good category. Counseling of health cadre in good category with diarrhea treatment in category enough 14 people (33.3%), and health counseling of cadres in good category with diarrhea treatment in good category as

many as 28 people (66.7%). Spearman's rank correlation test results obtained p-value = 0.001 ($\alpha = 0.05$).

DISCUSS

1. Characteristic Respondents

1.1. Age: Age range of respondents in this study is a productive age in which work productivity can be done optimally. A person's age affects a person's capability and mindset on the information provided. Increasing age, the ability to catch and the mindset of a person growing^{10,27}.

Capture power is the ability of a person to receive information given to him. Capture power is related to the maturity of the body functions both the senses and the brain and the health of a person. Someone at the age of 30 years must have passed the growth stage of body functions. Age 30 is also a productive age in which work productivity can be performed optimally and health complaints are rarely disclosed. Maturity of body function, health and optimal productivity will influence the entry of better information, thereby increasing one's knowledge²².

The result of Agustina's research, about the relationship of health counseling about prevention of diarrhea in under fives with mother attitude in prevention of diarrhea in children under five years found that most of them are 31-40 years old as many as 18 respondents (44%)⁹. In line with Nugraha's, study on the relationship of mother's behavior in the prevention of diarrhea with the incidence of diarrhea in under-five children at Puskesmas Kalikajar I, Wonosobo District, it was found that the respondent's age was mostly 41-45 years old¹¹.

According Maulana, with increasing age also increased the experience that has been experienced by someone¹². Someone by the age of 30 must have gone through a short life journey, on the way to life experience and more communicating with others. The experience and information that is quite a lot at age increasingly shapes one's attitude towards a thing.

Adisasmito, states that maternal age is not a factor that affects the incidence of diarrhea in infants¹³. Young age and old age of a mother do

not affect the occurrence of diarrhea. Maternal age does not contribute to the occurrence of diarrhea, while those who contribute are knowledge, behavior and maternal hygiene.

1.2. Education: Most of the middle-level formal education is high school. In general, education is defined as any effort planned to influence other people, individuals, groups, or communities so that they, do what is expected by the educator¹⁰.

The higher the education of a person, the easier it is to receive information, the more the knowledge that the less educational will inhibit the development of one's attitude toward the newly introduced values¹⁴. That information obtained from both formal and non formal education can provide immediate impact to produce changes or increase knowledge¹⁵.

A person's level of education will have an effect on responding to something that comes from outside. An educated person will provide a rational response to the information coming and think about the extent to which they might gain the idea.

Suryati research, about factors related to the activeness of posyandu cadres in the prevention of diarrhea in infants found that most posyandu cadres have high school education and PT as much as 64.4%⁸. Education is anything consciously undertaken to nurture personality, developing a lifelong, physical and spiritual capability that lasts a lifetime within and out of school¹⁶.

The development of education can affect a person as well as the behavior of a person will the pattern of life, especially in motivating the attitude of participating in the development of health, generally the higher the education of a person will be more easily receive information so that more patterns owned¹⁷.

1.3. Occupation: The result showed that the respondent's job as big was housewife. Respondents work as housewives who daily take care of household affairs, so rarely have the availability of time to follow health counseling activities. Lack of health education, resulting in limited insight or knowledge, causing wrong perception so that mother to be negative to prevention of diarrhea in toddler.

The result of Agustina's research, about the relationship of health counseling about prevention of diarrhea in children under five with mother attitude in prevention of diarrhea in infants found that most work as housewife counted 26 respondents (64%)⁹.

2. Health Counseling Cadres: Respondents who evaluated cadre health counseling about handling simple diarrhea in good category were 87.5%. This shows that the willingness to learn great from the respondents. Information obtained from counseling, processed by a person to generate knowledge. The more often people are exposed to information, the more their knowledge.

In accordance with the opinion expressed by Maulana, that information is also a form of attitude. Information is accepted as an object of a pleasant attitude or not, if fun then it will be believed and eventually there will be a push to do it¹². Increasing the use of health cadres can be done through training, support, and supervision of health cadres.

The high number of drop outs of health cadres can be influenced by elements of leadership and management, such as funding sources and sustainability, community ownership, and selection mechanisms. The degree of effectiveness of healthcare kader programs varies, depending on the specific definition of the impact form and when. The health cadre program with considerable success is in the field of maternal and child health¹⁸.

3. Handling Diarrhea for Children: Respondents who can handle diarrhea in children with good category as much as 58.3%, other respondents less good. This indicates that most of the respondents have implemented the treatment of diarrhea in children well. This condition shows increasingly get health education about about diarrhea, hence the better also way of handling diarrhea in child.

Health counseling is an educational activity conducted by spreading the message, instilling confidence, so that people not only aware, know and understand, but also willing and able to do a suggestion that has to do with health. Health counseling can influence knowledge while knowledge can influence attitude and behavior according to K-A-P theory (knowledge-attitude-practice)⁹.

Where new behaviors can materialize following the stages of knowledge, attitude, and practice. In day-to-day practice may happen otherwise, a person behaves positively, although his knowledge and attitude are still negative^{10,28}.

The result of Agustina's research, about the relationship of health counseling about prevention of diarrhea in children under five with mother attitude in prevention of diarrhea in children under five stated that health counseling about diarrhea in under fives is the first step of increasing insight or knowledge of someone who can form attitude in handling diarrhea⁹. With frequent health counseling interesting and easy to understand can increase the knowledge of good mothers about handling prevention of diarrhea in infants will be responded positively by the mother at least from his attitude first before realized in the form of behavior (practice).

Rarely held health counseling, mother knowledge about handling of diarrhea in under five is also less than most also have negative attitude in handling diarrhea. Thus the more frequently held health counseling about prevention of diarrhea then have a role in determining better knowledge and in determining an increasingly positive attitude in the handling of prevention of diarrhea in infants.

- 4. Related Health Counseling Cadres with Handling Diarrhea for Children:** All cadres with poor health assessment of cadre counseling, can not handle diarrhea well. Health education cadre in good category with diarrhea handling in good category as much as 66.7%. Spearman's Rank correlation test results obtained p-value = 0.001 ($\alpha = 0.05$) which means H0 rejected and H1 accepted, so it can be stated that there is a relationship between health counseling cadres and handling of diarrhea in children in Puskesmas Area Working Purwokerto Selatan.

The existence of relationship between health education of cadre and handling of diarrhea in children according to the theory proposed by Notoatmodjo, that promotion or health education through counseling is essentially an activity or an effort to convey health message to society, group or individual¹⁰. In the hope that with the message, people, groups or individuals can gain knowledge about better health.

Health promotion is a comprehensive program of community behavior change, within the context of the community. Not only behavioral changes (within people), but also changes in the environment. Behavioral change without environmental change followed will not be effective, the behavior will not last long. Therefore, health promotion is not just change behavior but also seek to change environment, system, and so on¹⁰.

The result of Agustina's research, about health counseling relationship about prevention of diarrhea in under fives with mother attitude in prevention of diarrhea in under fives is found that there is health counseling about prevention of diarrhea in balita with mother attitude in prevention of diarrhea in underfive at health center of Kandangan in 2010 (p-value= 0.031). The more active or ever get health counseling the more positive attitude of the respondent, on the contrary more inactive or never get health education more negative attitude (r-count= + 0.322)⁹.

The role of health cadres can be increased so that it can be a source of messages that are believed and deemed capable of providing information. Efforts that can be done, among others, by training health cadres and routine coaching so that the cadres can become a reliable health instructor.

The cadres have a noble duty. Cader is expected to play a role as a provider of health information to the community, community mobilization to carry out health messages such as visiting posyandu and implementing clean and healthy life. Besides, the cadre can also act as the first to find out if there are health problems in the area and immediately report to local health personnel. Cader is a liaison between the community and health personnel because the cadres are always in the midst of society^{5,23}.

In line with Utami's, study on the effectiveness of individual verbal approaches by health cadres in improving early detection knowledge of diarrheal diseases in infants it is found that individual verbal approaches by health cadres are more effective in improving knowledge of early detection of diarrheal diseases in infants. This approach is chosen so that the delivery of materials and the implementation of the practice can work effectively¹⁹.

Based on the research of Solikhah, et al, obtained the need for implementation of cadre training on simple handling in cases of diarrhea, respiratory infections, and nutrient males²⁰. Health education is a learning process to develop the correct understanding and positive attitude of the individual or group on health so that the concerned can apply a healthy way of life as part of the way of life everyday. One of the extension methods that can be given is the lecture method in small groups. Lectures are a way of explaining and explaining an idea, understanding, or message orally to a target group so as to obtain information about health^{10, 26}.

CONCLUSIONS

Most of the respondents were over 35 years old, the majority of them were high school, and the majority did not work (housewife). Respondents most of the cadre health education assessment in the good category as much as 82%, as a form of high spirit. Respondents handled diarrhea in children in good category as much as 58.3%. There is a relationship of health counseling and cadre handling of diarrhea in children at Puskesmas Working Area of Purwokerto Selatan (p-value = 0,001). The results of this study can be useful as information and knowledge about the importance of health counseling to handle diarrhea that occurs in children. Community Health Center continue the diarrhea extension counseling program to all cadres, so it can be improved as early detection of case finding. The results of this study can be useful as a reference for researchers who want to conduct further research on diarrhea, especially in terms of health counseling conducted by health cadres.

ACKNOWLEDGMENT

The author sincerely thank for Head of Health Ministry Banyumas District and health worker from Health Community Center of Purwokerto Selatan.

Conflict of Interest: None declared.

Ethical Clearance: The study was approved by the institutional ethics committee of the medical and health research ethics committee, Faculty of Medicine Gadjah Mada University-Dr.Sardjito General Hospital, Ref: KE/FK/1124/EC/2016 on 30 September 2016.

REFERENCES

1. Magdarina, Agtini Destri. *Morbiditas dan Mortalitas Diare pada Balita di Indonesia, Tahun 2000-2007*. Jakarta: Kementrian Kesehatan RI. (2010)
2. Sudaryat, S. *Gastroenterologi Anak*. Jakarta: Sagung Seto. (2010)
3. WHO. *Diarrhoeal Disease*. Diakses dari <http://www.who.int/mediacentre/>. (2013)
4. Riskesdas. *Riset Kesehatan Dasar*. Diakses dari: <http://www.depkes.go.id/>. (2013)
5. Kemenkes RI. *Profil Kesehatan Indonesia*. Jakarta: Kemenkes RI. Diakses dari: <http://www.depkes.go.id/>. (2016)
6. Dinkes Jateng. *Profil Kesehatan Jawa Tengah*. Dinkes Jateng. Diakses dari: <http://www.dinkesjateng.go.id/>. (2015)
7. Dinkes Kab. Banyumas. *Profil Kesehatan Banyumas*. Dinas Kesehatan Kabupaten banyumas. (2015)
8. Suryati, B. *Faktor-faktor Yang Berhubungan Dengan Keaktifan Kader Posyandu Dalam Penanggulangan Diare Balita*. Jurnal Ilmiah: Keperawatan Poltekkes Jakarta. (2014)
9. Agustina, Emi. *Hubungan Penyuluhan Kesehatan Tentang Pencegahan Diare Pada Balita Dengan Sikap Ibu Dalam Pencegahan Diare Pada Balita*. Naskah Publikasi: Akademi Keperawatan Pamenang Pare Kediri. (2012)
10. Notoatmodjo, S. *Metodologi Penelitian Kesehatan*. Jakarta: Rineka Cipta. (2010)
11. Nugraha, Asfarian Andhita. *Hubungan Perilaku Ibu Dalam Pencegahan Diare Dengan Kejadian Diare Pada Balita Di Puskesmas Kalikajar I Kabupaten Wonosobo*. Naskah Publikasi: Prodi Ilmu Keperawatan STIKES Aisyiyah Yogyakarta. (2014)
12. Maulana, H.D.J. *Promosi Kesehatan*. Jakarta: EGC. (2009)
13. Adisasmito, W. *Sistem Kesehatan*. Jakarta: PT. Raja Grafindo Persada. (2007).
14. Mubarak, Wahit Iqbal. *Buku Ajar Keperawatan Komunitas 2*. Jakarta: CV Sagung Seto. (2006)

15. Riyanto, Agus dan Budiman. *Kapita Selekta Kuesioner Pengetahuan dan Sikap Dalam Penelitian Kesehatan*. Jakarta: Salemba Medika. (2013)
16. Rahman. *Konsep Dasar Pendidikan Anak Usia Dini*. Yogyakarta: PGTKI Press. (2008)
17. Wawan, A dan Dewi, M. (2010). *Teori dan Pengukuran Pengetahuan, Sikap dan Perilaku Manusia*. Yogyakarta: Nuha Medika
18. Lehmann U, Sanders D. *Community health workers*. Jakarta: Penerbit Buku. Kedokteran EGC. (2007)
19. Utami, Sri. *Efektivitas Pendekatan Verbal Secara Individual oleh Kader Kesehatan Terhadap Ibu Rumah Tangga Dalam Peningkatan Pengetahuan Deteksi Dini Penyakit Diare pada Balita dan Ketrampilan Penerapan Terapi Rehidrasi Oral di Desa RowoBungkul Kecamatan Ngawen Kabupaten Bora*. Skripsi tidak dipublikasikan. (2011).
20. Solikhah, U., Kusnanto, H., Haryanti, F., & Prabandari, Y.S. Imci Training Needs On Cadre For Improve Family And Community Capacity In Simple Handling Of Respiratory Infection, Diarrhea, And Less Nutrition In Children, *International Journal of Research in Medical Sciences*, 3 (1): 79-84. 2015
21. Maria et. al. *Child Health in the Peruvian Amazon: Prevalence and Factors Associated with Referred Morbidity and Health Care Access in the City of Iñapari*. Diakses dari <https://www.researchgate.net/publication/>. (2015)
22. Dharma, Kusuma Kelana. *Metodologi Penelitian Keperawatan: Panduan Melaksanakan dan Menerapkan Hasil Penelitian*. Jakarta: Trans InfoMedia. (2011)
23. Depkes RI. *Manajemen Terpadu Balita Sakit (MTBS)*. Jakarta: Depkes RI. (2008)
24. Depkes RI. *Buku Saku Petugas Kesehatan*. Jakarta: Depkes RI. (2011)
25. Dewi, Vivian N. L. *Asuhan Neonatus Bayi Dan Anak Balita*. Jakarta: Salemba Medika. (2011)
26. Dharma, Kusuma Kelana. *Metodologi Penelitian Keperawatan: Panduan Melaksanakan dan Menerapkan Hasil Penelitian*. Jakarta: Trans InfoMedia. (2011)
27. Hidayat. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: CV Alfabeta. (2011)
28. Maryunani, Anik. *Asuhan Kegawatdaruratan Maternal dan Neonatal*. Jakarta: Trans Info Media. (2013)

The Effect of Health Education about PJAS and PHBS on Students Grade V SDN 001 Sungai Kunjang, Samarinda

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ABSTRACT

The level food safety of school (PJAS) and the low level of clean and healthy life style (PHBS) implementation in schools is a serious problem that needs more attention. Elementary school students are the largest group at risk of exposure to food and water contamination diseases. This study aims to determine the effect of health education on PJAS and PHBS on the knowledge and attitude of students of grade V in SDN 001 Sungai Kunjang. The research method used Pre Experimental with the design of One Group Pre-Post Test and interventions are provided through health education. The population in the study were all students of grade V with a total sample of 121 people taken use the purposive sampling method, with kriterian inclusions are students who are will be to follow the researched and present the researched conducted. Technique of collecting data using interview method and using research instrument in the form of questionnaire and data taken within one day. The results showed that respondents who are knowledgeable before the health education 12% and after was 56%. Respondents who had good attitude before the health education 92% and after was 95%. The result of statistical analysis with wilcoxon signed rank test showed significant influence with p-value = 0,000. Provision of health education was proved to significantly influence the knowledge and attitude about PJAS and PHBS on students of grade V SDN 001 Sungai Kunjang, Samarinda.

Keywords: Health Education, PJAS, PHBS, Students

INTRODUCTION

School age children is an investment in the future of a nation, because they are the next generation of this nation-building. The nation's quality is determined by the quality of the kids at this point. Age group children in Indonesia are big enough that is 34% of the total population of Indonesia and consists of a group of elementary school age children by 5%.⁽¹⁾

Time primary school children 7-12 years of age is that is the golden age for instilling the values of clean living and healthy behaviors (PHBS) in order to support healthy behaviors through health degrees early on. However, children often become the high-risk groups against certain diseases. One of the reasons

that is administering the nutrition and food intake while growing hibiscus children not done perfectly. As the use of dangerous substances, the lack of hygiene in the process of management of individual foods, not paying attention to the environment and also do not reflect the efforts of clean living and healthy behavior. Phatogenic bacterial transmit disease in food by 80%.⁽²⁾

The outbreak of food poisoned according to BPOM RI indicated that 30% of food poisoned incidents occur in educational institutions and of those 89% events happening in the elementary school (SD/MI).⁽³⁾ The problem of the school cafeteria that has yet to apply the principles of Hygiene and behavior students who do not know about the behavior of living clean and healthy can also cause undesirable health effects. Based on data from the profile of East Kalimantan Health Office the year 2016, that diarrhea sufferers in Samarinda of 58%.⁽⁴⁾ This to be vigilance regarding early threat of infections and cases of poisoning are transmitted through food especially on traditional school children. The condition must be anticipated by increasing healthy life patterns via safe PJAS and PHBS.

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Lestari's et al. research (2015) in Madrasah Gonilan Surakarta showed there is the influence of education on healthy snacks to knowledge of students.⁽⁵⁾ Kurniatilah's research (2017) showed on SDN Taman kota Serang showed there is the influence of the CTPS to knowledge extension students.⁽⁶⁾ However, there are limitations of earlier studies is just researched about PJAS or PHBS, but in this study examines about PJAS and PHBS simultaneously. So that this research was conducted to find out the influence of health education on awarding of PJAS and PHBS to knowledge and attitude of students of class V SDN 001 Sungai Kunjang, Samarinda, East Kalimantan, Indonesia. This research in addition to researched also produced output. The output in this researched is the formation of Healthy Student Ambassadors SDN 001 Sungai Kunjang provided training.

METHOD

This type of research is Pre Experimental with the design of One Group Pre-Post Test and interventions are provided through health education. Measurement of early (pre-test) before treatment (experimental treatment) and after treatment carried out measurement again (post-test). This research was carried out on SDN 001 Sungai Kunjang, Samarinda on April 30, 2018.

The population in this study were all V graders as many as 137 students and the total of samples of 121 students. Method of sampling used a purposive sampling technique, with inclusions criteria are: students who are will be to follow the researched and present the researched conducted. As well as the criteria of exclusion is students who are not present in the activities of the school. This study aims to determine the effect of health education on PJAS and PHBS on the knowledge and attitude of students of grade V in SDN 001 Sungai Kunjang.

The material of questionnaires were include about food safety of school and clean and healthy life behavior. Data collection techniques method interviews used a researched instrument in the form of questionnaires using scale model guttman and data taken within one day. If the question is answered correctly then it will be assigned a value of 1, and if one is given the value 0. So the total score for knowledge was 16 and total score for attitude is 15. The primary data used for analysis in univariate and bivariate and using the wilcoxon signed rank test with a 95% significance level ($\alpha = 0.05$).

RESULTS AND DISCUSSION

Table 1: Distribution of Respondents Characteristics

No.	Characteristics	Frequency	%
1.	Sex		
	Male	67	55
	Female	54	45
2.	Age		
	10 years	31	25,6
	11 years	81	67
	12 years	8	6,6
	13 years	1	0,8
3.	Class		
	V B	29	24
	V C	29	24
	V D	30	25
	V E	33	27

Base on table 1 shows that the majority of respondents by male (55%), most 11 year old respondents (67%).

Table 2: Variable Distribution of Respondents

Variable	Category						Total	
	Good		Enough		Less		F	%
	F	%	F	%	F	%		
Knowledge								
Pre-test	14	12	97	80	10	8	121	100
Pos-test	68	56	53	43	1	1		
Attitude								
Pre-test	111	92	5	4	5	4	121	100
Pos-test	115	95	5	4	1	1		

On the basis of table 2 indicates that before given health education to students who had good knowledge of 14% and students who had less knowledge of 88%. After the given treatment to students who had good knowledge of 56% and students who had less knowledge of 1%.

Before treatment (given health education) to students who had good attitude of 92% and students who had attitude less by 4%. After treatment the students who had good attitude of 95% and the students who had attitude less of 1%.

Table 3: The Results Of Statistical Test

Variable	Mean	SD	Min-Max	P-value
Knowledge				
Pre-test	67,2	10,5	25,0-87,5	0,000
Post-test	78,4	10,2	4,7-100	
Attitude				
Pre-test	88,9	15,3	0-100	0,000
Post-test	92,9	11,7	0-100	

Based on table 3 average score of knowledge of respondents before the given health education is 67.2 with standard deviation 10.5. The highest score of respondents is 87.5 and the lowest score was 25.0. The average score of knowledge of respondents has given health education is 78.4 with standard deviation 10.2. The highest score of respondents is 100 and the lowest score was 4.7.

The average score of the attitude of the respondent before the given health education is 88.9 with standard deviation 15.3. The highest score of respondents is 100 and the lowest score was 0. The average score of the attitude of the respondent after the given health education was 92.9 with a standard deviation of 11.7. The highest score of respondents is 100 and the lowest score was 0.

The study has been finished to the respondent's knowledge there was significant differences before and after given health education. Before of health education majority of respondents knowledgeable enough and after given majority of good knowledgeable. It showed significant improvements before and after the given health education where respondents knowledgeable enough to become good knowledgeable.

This study is supported by Norimah & Rasidah's research (2017), the educational program had effect for increase significant for obese children's knowledge about healthy food.⁽⁷⁾ Base on study by Tafti's research et al. (2018), there was significant increased of knowledge after intervention of educational program in the experimental group.⁽⁸⁾

Eskandari's research et al. (2017), after intervention of an educational program for the experimental group there was significant increased of knowledge, it proved by the mean scores of knowledge before and after intervention.⁽⁹⁾ The study by Rosenkranz's et al. (2017) there were improved of knowledge after intervention nutrition education.⁽¹⁰⁾ This study was supported by

Jadhav's research et al. (2014), there was improvement of knowledge after intervention and there was effect of health education on students's knowledge.⁽¹¹⁾

This study was supported too by Ismail's research et al. (2018) there was a significant difference in knowledge of the respondent before and after the health education on the consumption of healthy snacks.⁽¹²⁾ Through health education by administering medical or health information messages in the form of outreach to provide or enhance the knowledge on health.⁽¹³⁾ A good level of knowledge can improve student behavior against the importance of the PJAS and PHBS so that in the future can support the PHBS behavior and good PJAS surroundings school.

Knowledge is the ability of a person to reveal what they knows through proof answer oral or writing that is stimulasi of the question. Knowledge is a component of common behaviors for adults. With the knowledge someone can consider to behave and act.⁽¹³⁾

Based on the results of the study showed the level of knowledge of respondents before and after health education with media power point average results obtained knowledge of the respondent increased after a given health education. Based on the results obtained there is increased knowledge of the respondent through the information provided in the form of health education through the medium of power point.

Power point is one medium that serves as a tool to present a material. Power point among other advantages: the material becomes more interesting because there's a game of colors, fonts and animation, the animated text or animated good pictures or photos. Message information visually easy to understand and more stimulating children to learn more information about the materials that are presented.⁽¹⁴⁾

Based on the results of the statistical tests are obtained that there is influence the given of health education to the level of respondents knowledge about the PJAS and PHBS. Given treatment of health education proved to be influential in improving the knowledge of the respondent this is evidenced through the score obtained by the respondent. After received health education, score of knowledge of respondents experienced an increase.

This research is supported by research conducted Korwa et al. (2018), that there is the influence of health education towards the level of knowledge about the

behavior of PHBS (healthy life) disposable hand wash SOAP before and after, in SD Negeri Tatelu Minahasa Regency North, evidenced with the change of knowledge before and after the given extension.⁽¹⁵⁾

The results of the research that has been conducted to the attitude of the respondent there was significant differences before and after health education the majority of respondents had good attitude, but an increase in the total of respondents who had good attitude. The existence of a given health education can change the attitude of the respondent, proved by the existence of difference in attitude for the better when getting health education about PJAS and PHBS.

Peyman's research et al. (2015), there was improvement student's attitude and knowledge after intervention and there was effect of health educational on attitude and knowledge students.⁽¹⁶⁾ This study was supported too by Bisallah's research et al. (2018), there was significant increased for the intervention group on their attitude and knowledge, there was effect of health education intervention program to improvement attitude an knowledge.⁽¹⁷⁾ Base on study by Yingklang et al, (2018), on the intervention group there was significant increased of attitude and knowledge and health education was effective to improvement students girl 's attitude and knowledge.⁽¹⁸⁾

This study was supported by Aini's research (2016) that the attitude of the respondent before the health education tend to be negative and, after treatment the attitude of students continues to rise and very respond good.⁽¹⁹⁾

Analestariastuti's reserach et al. (2014), showed the influence of health education on there students attitude, but there is no difference in the attitude of the students before and after the educational and health related diseases dengue fever. The research in contrast to the results of this study.⁽²⁰⁾

Based on the results of the statistical tests showed that there is influence of health education on responde'ts' attitude about the level food safety of school (PJAS) and clean and healthy life behavior (PHBS). Giving treatment of health education affecting the change in attitude of respondents for the better. This is because the respondents have a good knowledge will show a good attitude as well. A person's attitude can affect the knowledge there had. Someone who is likely to be positive knowledgeable good compared with that of being negative.⁽²¹⁾

This study is supported by Ramadhani's et al. research (2016), that were a significant difference in differences in attitude of students before and after education about a balanced nutritious food and safe.⁽²²⁾ Mulyawati's et al. research (2017), that there is the effect of health education on students attitudes toward traditional security.⁽²³⁾

CONCLUSION

There is a difference in the level of knowledge and attitude of students of grade V about the level food safety of school (PJAS) and clean and healthy life behavior (PHBS) before and after given health education. Increased knowledge and attitudes for the better after a given health education. It proves a significant influence about health education in the improvement of knowledge and attitude about PJAS and PHBS in students grade V SDN 001 Sugai Kunjang, Samarinda, East Kalimantan.

ACKNOWLEDGMENTS

This research was supported by the Directorate of Student Affairs, Directorate General of Learning and Student Affairs, Ministry of Research, Technology, and Higher Education in accordance with the contract of assignment of Student Creativity Program 5 areas year of funding 2018, Number: 149/SPK/KM/IV/2018.

Conflict of Interest: There is no conflict of interest.

Ethical Clearance: Ethical clearance was granted from Health Reserach Ethics Commission Faculty of Medical Mulawarman University, Samarinda, East Kalimantan, Indonesia with the number: No.76/KEP-FK/IX/2018 on 26 September 2018.

REFERENCES

1. Ministry of Health of the Republic of Indonesia. Indonesia Health Profile 2016 [Internet]. Jakarta: Kementerian Kesehatan RI; 2017. 1-220 p. Available from: www.depkes.go.id/.../profil-kesehatan-indonesia/Profil-Kesehatan-Indonesia-2016.pdf
2. Ningsih R. Hygiene Sanitation Counseling for Food and Beverages, as well as the Quality of Food Sold by Traders in the Samarinda City Elementary School. *J Public Health (Bangkok)*

- [Internet]. 2014;10(1):64–72. Available from: <http://journal.unnes.ac.id/nju/index.php/kemas/article/view/3071>
3. National Agency of Drug and Food Control. National Agency of Drug and Food Control Annual Report 2016. 2016;132–3. Available from: <http://www.pom.go.id/new/admin/dat/20171127/laptah2016.pdf>
 4. East Kalimantan Provincial Health Office. Health Profile 2016 [Internet]. 2017. Available from: [www.kesehatan.kaltimprov.go.id/downlot.php?file=Narasi Profil 2016.pdf](http://www.kesehatan.kaltimprov.go.id/downlot.php?file=Narasi%20Profil%202016.pdf)
 5. Lestari SAW, Dasuki MS, Candrasari A. Effect of Healthy Snacks Counseling on Students' Knowledge and Attitudes in Madrasah Ibtidaiyah Gonilan Kartasura. 2015; Available from: [http://eprints.ums.ac.id/39433/1/NASKAH PUBLIKASI.pdf](http://eprints.ums.ac.id/39433/1/NASKAH%20PUBLIKASI.pdf).
 6. Kurniatillah N. The Effect of PHBS Counseling on Hand Washing with Soap on the Knowledge, Attitudes and Practices of Class V Students of SDN Taman Kota Serang. *Faletehan Heal* [Internet]. 2017;4:153–7. Available from: lppm-stikes.faletehan.ac.id/ejurnal/index.php/fale/article/download/45/42
 7. Said N, Mohamed R. Impact of the Nutritional Educational Program to the Healthy Food Behaviour , Knowledge , Attitude and Environment for Obese Children. *Environ Proc J* [Internet]. 2017;2(February):25–7. Available from: <http://dx.doi.org/10.21834/e-bpj.v2i5.420>
 8. Tafti A, Rahaei Z, Shahi MA, Hakimi T. The Effect of Educational Program on the Prevention of Pediculosis in Primary School Fifth Grade Students : An application of the Health Belief Model. 2018;2(1):134–43. Available from: sbrh.ssu.ac.ir/article-1-57-en.pdf%0A
 9. Eskandari Z, Bashirian S, Barati M, Soltanian AR, Hazavehei SMM. The effect of an educational program based on health belief model on the empowerment of rural women in prevention of brucellosis. *Arak Med Univ ...* [Internet]. 2017;3(4):16–23. Available from: http://amuj.arakmu.ac.ir/browse.php?a_code=A-10-998-8&slc_lang=en&sid=1&sw=Educational+program
 10. Rosenkranz RR, Rodicheva N, Updike N, Rosenkranz SK, Dzewaltowski DA. Behaviorally oriented nutrition education at a Russian summer camp improves children's dietary choices: a quasi-experimental study. *Nutrire* [Internet]. 2017;42(1):18. Available from: <http://nutrirejournal.biomedcentral.com/articles/10.1186/s41110-017-0044-z>
 11. Jadhav S, Afroz S, Mumbre S. Effect of Health Education on Knowledge about Hiv/Aids of 1st Mbbs Students. *IOSR J Nurs Heal Sci* [Internet]. 2014;3(6):46–8. Available from: <http://www.iosrjournals.org/iosr-jnhs/papers/vol3-issue6/Version-2/K03624648.pdf>
 12. Ismail, Ansharullah, Rejeki S. Difference between Knowledge, Attitudes and Behavior of Children About Healthy Snack Consumption in SD Negeri 4 Poasia Kambu District Kendari City. *Food Sci Technol* [Internet]. 2018;3(1):1036–51. Available from: ojs.uho.ac.id/index.php/jstp/article/view/3976
 13. Nur'Azizaturrahmah. Knowledge Differences Between Before and After Health Counseling Interventions on Wood Furniture Finishing Workers [Internet]. Islam Negeri Syarif Hidayatullah Jakarta; 2013. Available from: [repository.uinjkt.ac.id/dspace/.../1/NUR %27AZIZATURRAHMAH-FKIK.pdf](http://repository.uinjkt.ac.id/dspace/.../1/NUR%27AZIZATURRAHMAH-FKIK.pdf)
 14. Prasetyo MS. Knowledge Differences Before and After Nutrition Counseling Using Power Point Media in Sd Negeri III Karangasem Surakarta [Internet]. Muhammadiyah Surakarta; 2013. Available from: <http://eprints.ums.ac.id/27250/>
 15. Korwa SP, Malonda NS, Engkeng S. Behavioral Differences Before and After Counseling about the Behavior of Handwashing with Soap at Tatelu Public Elementary School, North Minahasa Regency. 2018; Available from: <https://ejournalhealth.com/index.php/kesmas/article/view/743>
 16. Peyman N, Jangi M. The effect of educational intervention on knowledge, attitude and performance of high school girl students about AIDS. *Int J Pediatr* [Internet]. 2015;3(4):833–9. Available from: ijp.mums.ac.ir/article_4639.html

17. Bisallah CI, Rampal L, Lye M-S, Mohd Sidik S, Ibrahim N, Iliyasa Z, et al. Effectiveness of health education intervention in improving knowledge, attitude, and practices regarding Tuberculosis among HIV patients in General Hospital Minna, Nigeria – A randomized control trial. *PLoS One* [Internet]. 2018;13(2):e0192276. Available from: <http://dx.plos.org/10.1371/journal.pone.0192276>
18. Yingklang M, Sengthong C, Haonon O, Dangtakot R, Pinlaor P, Sota C, et al. Effect of a health education program on reduction of pediculosis in school girls at Amphoe Muang, Khon Kaen Province, Thailand. *PLoS One*. 2018;13(6):1–15.
19. Aini N. Changing the Snacking Behavior of Primary School Students through Health Education. *J Nurs Care Biomol* [Internet]. 2016;1:28–33. Available from: jnc.stikesmaharani.ac.id/index.php/JNC/article/download/7/61
20. Analestariastuti WO, Bahar H, Tina L. The Difference in the Effect of Health Counseling with the Method of Story and Lecture on the Knowledge, Attitudes and Actions of Elementary Students About DHF. *MKMI* [Internet]. 2014;8–15. Available from: journal.unhas.ac.id/index.php/mkmi/article/view/471%0A
21. Firiani NL, Andriyani S. The Relationship Between Knowledge With Attitudes Of End School Age Children (10-12 Years Old) About Snack Food At SD Negeri II Tagog Apu Padalarang Regency Of West Bandung 2015. 2015; Available from: ejournal.upi.edu/index.php/JPKI/article/view/1184
22. Ramadhani R, Siagian A, Lubis Z. The Influence of Nutrition Counseling on Balanced and Safe Nutritious Various Foods through Illustrated Story Book on Increasing Knowledge and Attitudes of Public Elementary School Students 060895 Medan. 2016;1–6. Available from: <http://repository.usu.ac.id/handle/123456789/54869>
23. Mulyawati I, Kuswardinah A, Yuniatuti A. Influence of Health Education on Children's Knowledge and Attitudes about the Safety of Snacks on Children's Knowledge and Attitudes. *Public Heal Perspect J* [Internet]. 2017;2(1):1–8. Available from: <https://journal.unnes.ac.id/nju/index.php/phpj/article/view/10992%0A>

Insights into Urban Informal Workers in Indonesia: Health Insurance Enrollment, Adverse Selection Issue and Access to Health Care

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ABSTRACT

Background: The present study identified health insurance market penetration among urban informal workers with its challenges and their health seeking behavior. This study had been carried out in the district of Banyumas, Central Java, Indonesia.

Method: A multi-methods design by mixing both qualitative and quantitative studies had been applied.

Results: The present study identified the enrollment of urban informal workers in health insurance program was less than 3%. Challenges in expanding health insurance enrollment among urban informal workers were related to adverse selection, the need for specific premium collection, irregularity of income, and higher rate of failure to pay premium. In fact, urban informal workers who had been enrolled in national health insurance program had benefited accessing health care services compared to those who live in rural areas. The logistic regression results proved that informal workers who live in urban areas were statistically significant in hospital admissions.

Conclusion: Policy makers and marketers of health insurance policies should recognize a specific approach and intervention for extending enrollment to urban informal workers. Empowerment of social capital and networks among urban informal workers could be modified to support the effort of universal health insurance enrollment and enhance access to quality health services of such workers.

Keywords: *Informal workers, urban area, health insurance, adverse selection, access to health*

INTRODUCTION

Informal workers account for the larger number of workers in urban areas in developing countries^{1,2}. These workers often bear substantial risks and vulnerabilities as an effect of their activity and occupation settings³. In Indonesia, as the effort to achieve universal health coverage through the implementation of national health insurance, extending enrollment among such workers remains challenging to date^{4,5}. This “missing middle” population in health insurance market needs a specific

concern with considering each group of informal worker’s characteristics^{4,6}.

The challenges of expanding health insurance enrollment to informal workers in urban area is how to identify their unique preferences and behaviors⁶. The urban informal workers have better access to health care facilities compare to the rural population, however their specific characteristic may causing a slow increase in enrollment⁷. Moreover, substantial adverse selection problem of the informal workers membership in health insurance scheme also need to be encountered⁵.

The present study aimed to identify health insurance market penetration among urban informal workers with its challenges and their health seeking behavior. In doing so, we filled an important gap in knowledge as prior literature has not yet explored the situation of health insurance enrollment among informal workers in urban settings.

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METHOD

This study had been carried out in the district of Banyumas, Central Java, Indonesia. A multi-methods study design by mixing both quantitative and qualitative approaches had been applied. For the quantitative study, we selected 197 respondents from non-salary worker's members of *BPJS Kesehatan* database who had arrears in premium payment. The independent variables consisted of information on sociodemographic factors (sex, household's size, age, level of education, occupation), household economic and health status, while the dependent variable was inpatient utilization. The quantitative study focused on measuring the determinants of inpatient utilization among informal workers. All analyses were performed with SPSS statistical software.

For the qualitative study, we selected 8 informants from urban informal workers. By using phenomenology study design, this approach focused on exploring the experience of urban informal workers on having insurance, and the effort to prevent failure to pay for premium. For data analysis, we adopted thematic framework approach. To facilitate qualitative data, we performed with MAXQDA 11 qualitative software. The software assisted the researcher in conducting data sorting and coding to construct conceptual and thematic categories. Ethical approval was obtained prior to commencement of study and declared by the research ethics committee of the Faculty of Medicine, Jenderal Soedirman University, Indonesia.

RESULTS AND DISCUSSIONS

The results indicate that informal workers who were living in urban area increased the use of inpatient care in hospital (Table 1). Informal workers in urban area were less likely to have geographical barrier to access hospital service compare to those who lived in rural area. Urban informal workers could spend less transportation cost as well as accommodation costs for their carers. In developing country like Indonesia, geographic barrier may prevent people from accessing health services due to a higher marginal cost such as costs for transportation and accommodation^{8,9}.

Table 1: The determinants of inpatient utilization among informal workers

No.	Variables	β^a	(se) ^a
1.	Female	1.367	0.394
2.	Household member > 4 persons	0.703	0.362

Conted...

3.	Age composition (years):		
	17–25	3.692*	0.727
	26–35	0.551	0.394
	36–45	1.150	0.522
	46–55	1.360	0.481
	55–65	1.232	0.883
	65 and above		
4.	Urban	1.961*	0.352
5.	Occupational status:		
	Farmer	0.000	1.140E4
	Trader	0.000	1.140E4
	Fisheries	0.506	4.180E4
	Entrepreneur	0.000	1.140E4
	Odd jobs	1.337	2.529E4
	Etc.	0.000	1.140E4
6.	Chronical illnesses	4.671***	0.337
7.	Household income:		
	Lowest 20%	0.804	0.517
	Lower 20%	1.751	0.426
	Middle 20%	1.746	0.428
	Higher 20%	0.941	0.528
8.	Education:		
	Lower level	1.452	0.719
	Middle level	1.514	0.367
	Constant	6.098E8	1.140E4

^aThe estimated parameters (β s) and asterisks indicate statistical significance at the 1% (***) , 5% (**) and 10% (*) level; ^bRobust standard errors in parentheses.

The study results also show an interesting phenomenon that informal worker who joining the insurance scheme was encouraged by their health status (Table 1). An adverse selection phenomenon was occurred in health insurance scheme in Indonesia. Although the membership of *BPJS Kesehatan* is mandatory, however in the initial stage of its implementation, the coercive characteristics of this scheme was less effective. This finding is in line with the previous published work in China that adverse selection became a problem for basic health insurance scheme in Wuhan when being extended to informal workers¹⁰.

The qualitative findings provide additional information regarding urban informal workers phenomenon on an increasing number of beneficiaries had arrears in health insurance premium payments, potentially encouraging to enrollment suspension. Irregularity of income and lower ability to health insurance premium might cause failure to pay for urban informal workers to sustain their payments. Moreover, government has implemented a regulation to

prevent the rears in premium payments. However, it needs an extensive campaign in order to educate the informal workers by considering their income characteristics. The introduction of the community partnership model by developing public-private mixed approach like Indian Rashtriya Swasthya Bima Yojana, RSBY, as healthcare financing mechanism for household workers in informal sector where government plays a role as a guarantor and supports premium subsidy may reinforce the sustainability of such workers to pay health insurance premium ¹¹.

The effort to extend health insurance enrollment among urban informal workers needs a specific concern and government policy to maintain the sustainability of the premium payments among the insured. The barriers of the extending health insurance among informal workers have been well documented ^{4, 6, 10}. Most of them have several problems related to the revenue of the premium, low awareness of health insurance mechanism and adverse selection. In urban settings, informal workers have better access to health facilities and social capital/networks that could support the effort to extend the enrollment to such workers as well as to assure the sustainability of the membership ⁵. Therefore, government should recognize this opportunity through developing innovative marketing and tailored approaches as well as community empowerment as the effort to achieve universal coverage to such workers.

CONCLUSIONS

Policy makers and marketers of health insurance policies should recognize a specific approach and intervention for extending enrollment to urban informal workers. Empowerment of social capital and networks among urban informal workers could be modified to support the effort of universal health insurance coverage and increase accessibility to quality health services of such workers. Future research needs to elaborate on innovative models that may be more effective at addressing the challenges in the efforts to extend the enrollment among informal workers particularly in urban areas.

ACKNOWLEDGMENTS

We are grateful to the Indonesian Ministry of Research, Technology and Higher Education for supporting a research grant. We also thank to the BPJS kesehatan branch office of Purwokerto, Central Java, Indonesia for their cooperation in providing database for respondent selection process for this study. Most of all, we appreciate the participants of the study.

Conflict of interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this manuscript.

Ethical Clearance: Ethical approval was received from the ethical committee of the Faculty of Medicine, Jenderal Soedirman University, Purwokerto, Indonesia.

REFERENCES

1. Chattopadhyay O. Safety and health of urban informal sector workers. *Indian Journal of Community Medicine*. 2005 April-June;30(2).
2. Handayani SW. Social protection for informal workers in Asia. Mandaluyong City, Philippines: Asian Development Bank 2016.
3. Lund F, Nicholson J. Tools for advocacy: social protection for informal workers. Bangkok: WIEGO and Homenet Thailand; 2006.
4. Aji B, Masfiah S, Harwanti S, Ulfah N, Minh HV. Social capital, health Insurance, and community action: toward universal health coverage for informal workers. *Advanced Science Letters*. 2017;23(4):3586-9.
5. Bitran R. Universal health coverage and the challenge of informal employment: lessons from developing countries. Washington, DC: World Bank 2014 Contract No.: 87077.
6. Peterson L, Comfort A, Omasanjuwa E, Ambrose K, Hatt L. Extending Health Insurance Coverage to Urban Informal Sector Workers in Lagos, Nigeria. Bethesda, MD: Health Finance & Governance Project, Abt Associates Inc. 2015.
7. Camara BO, Louisa ZY. Extending Healthcare to the Informal Sector in Laos. Singapore Lee Kuan Yew School of Public Policy, National University of Singapore 2013.
8. Aji B, Yamamoto SS, Sauerborn R. The economic impact of the insured patients with severe chronic and acute illnesses: a qualitative approach. *Glob Health Action*. 2014;7:22526.
9. Aji B, Mohammed S, Haque MA, Allegri M. The Dynamics of Catastrophic and Impoverishing Health Spending in Indonesia: How Well Does the Indonesian Health Care Financing System Perform? *Asia Pac J Public Health*. 2017 Sep;29(6):506-15.
10. Barnighausen T, Liu Y, Zhang X, Sauerborn R. Willingness to pay for social health insurance among informal sector workers in Wuhan, China: a contingent valuation study. *BMC Health Serv Res*. 2007 Jul 20;7:114.
11. Ahmed S, Hoque ME, Sarker AR, Sultana M, Islam Z, Gazi R, et al. Willingness-to-Pay for Community-Based Health Insurance among Informal Workers in Urban Bangladesh. *PLoS One*. 2016;11(2):e0148211.

Hospital with No-Class Wards Policy: An Effort to Create the Right to Access to Quality Health Care for the Poor

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ABSTRACT

Background: No-class wards policy has been implemented in some local public hospitals in Indonesia. The purpose of the present study was to explore the experience of the poor and non-poor patients after the implementation of no-class wards policy, hospital behaviour towards the treatment patients under no-class wards policy, and the possible impact of no-ward class policy on the poor and non-poor patients with respect to the government and hospital commitments to enhance non-discrimination in provision and quality of care.

Method: This case study was conducted at Wates Hospital in the district of Kulon Progo, Yogyakarta, Indonesia. The purposeful sampling was used to yield participants. This study employed in-depth interviews with healthcare users, district health care stakeholders such as hospital managers, district health officer, and local authority, and focus group discussion with hospital healthcare professionals.

Results: No-class ward policy at Wates Hospital had clearly demonstrated on improving the right to access quality health care for the poor. The policy had effectively reducing the experiences of patients on discriminatory treatment and improving quality of services. The policy also had an impact on increasing hospital utilization significantly among public insurance beneficiaries for both the poor and non-poor patients that support the success of the implementation of the universal health coverage. Moreover, the policy had improved the assurance of quality of services.

Conclusion: Future research needs to expand on our work to compare the implementation of no-class wards policy in other hospitals in different regions in Indonesia considering different local context such as local political issues, public expectations and other technical issues.

Keywords: *Right to access health care, discrimination, no-class wards hospital policy, underserved populations, Indonesia*

INTRODUCTION

Access to quality health services based on people needs, not ability to pay, regardless of where they live in the country becomes a foundation for developing the equity of access in healthcare system. Government commitment to strengthen the provision and finance of

healthcare will facilitate the effectiveness in improving well-being of people, particularly those who are marginalized. This reflects to the normative content of the right to health that encompasses both freedoms and entitlement. The freedom reflects the right of people to make decisions about their health and to be free from interference, while entitlement reflects the ability of healthcare system to assure all people to enjoy the highest attainable standard of health^{1,2}.

In developing countries, the issue of equal access to quality of health care is persistent and widespread, for example limited accessibility by the poor to hospital care^{3,4}. A lack of access due to limited number of health care personnel and facilities provided by public sector created two-tier health care system. Sophisticated and expensive

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hospitals with better services are predominantly provided by private entities or public owners with profit oriented, and modest hospital facilities are provided by government provisions with not for profit oriented⁵. This situation will have a negative effect on the vulnerable and marginalized groups of population to achieve full access to their right to health and raise the issue of discrimination on accessing quality health care⁶.

Two-tier hospital system is now also widely regarded as problematic in healthcare system in Indonesia. There is serious inequity issue arising from the different service structure embedded in this particular close intertwining of public and private. For example, public hospitals in Indonesia also offer private wards or 'pay-beds' (e.g. VIP and VVIP class wards) for 'cost recovery' and revenue generating although they still have obligation to provide basic services (e.g. third class ward) for the poor. The effect of this two-tier fee structures on quality of care is pervasive, especially after the implementation of health insurance for the poor in early 2005 where the poor becomes 'non-paying patients' in the 3rd class ward of public hospital. The different fee structure in public hospital wards raise a critic concerning that the system create an incentive to increase waiting time, amenities gap and less satisfaction services for the poor patients⁷. Moreover, the perception of low quality hospital services by the poor continues⁸.

No-class wards policy for public hospital has been implemented in some local public hospitals in Indonesia. To date, there are 44 hospitals that have been restructured to adapt no-class wards policy in response to the equity issues affecting access to quality health care in Indonesia. An interesting policy innovation to create hospital without class ward is implemented at Wates Hospital in the District of Kulonprogo-Yogyakarta. In 2012, Kulonprogo District Governor launched a universal coverage district healthcare system and restructured the local public hospital 'Wates Hospital' become hospital without different class wards for the poor⁹. This innovative policy guides hospital to accept the entire poor patients although the third class wards have been fully occupied. The poor could be upgraded to the higher class wards such as the first and second class wards without any additional charges if there are no beds available at the lower class to which they are entitled⁹.

During the implementation of the policy, the ward class system still exists. It is related to the public hospital

autonomy to generate revenue from user fees especially from patients who could pay for 'hotel' benefit¹⁰, as consequence of the government policy to generate non-tax revenues from public healthcare facilities. The policy does not change the existing 'cost recovery' beds, but it has converted all hospital beds into 'non-pay-beds' exclusively only for the poor to enhance the availability of hospital bed for them. The policy has influenced the poor patients' admission substantially. As a result, admission rate among the poor increased from 39.60% in 2011 to 43.42% in 2012 and 56.35% in 2013⁹.

This innovative policy has a potential to create the right to access to quality health care for the poor in Indonesia. However, there is a dearth of research about poor patients' right to access to quality care in hospital settings especially in Indonesia. The purpose of the present study was to explore the experience of the poor and non-poor patients after the implementation of no-class wards policy, hospital behaviour towards the treatment patients under no-class wards policy, and the possible impact of no-ward class policy on the poor and non-poor patients with respect to the government and hospital commitments to enhance non-discrimination in provision and quality of care.

METHOD

This case study was conducted in the district of Kulonprogo, Yogyakarta, Indonesia, especially at Wates Hospital. The area of this district is 586.27 km with the population was 388,755 in 2010¹¹. Purposeful sampling was used to yield participants who could provide valuable insight into the right to access to quality health care and differed on a wide range of characteristics. Hospital administrators were asked to refer patients who had been admitted or hospitalized, and varied on wide range of attributes, including sex, insurance holder, socioeconomic status, and health treatment. This study also employed in-depth interviews with district health care stakeholders such as hospital managers, district health officer, and local authority. From the final research project sample of participants, we extracted the interviews to analyse their narratives.

The data collection was consisted of conducting thirty to sixty-minute individual, face-to-face interviews with each participant. A semi-structured approach was employed throughout the interview process to allow the emergence of unexpected themes. Some questions were

asked during the interview process, and the researcher probed for in-depth elaboration on the answers provided and emerging themes that the participants identified. Focus group discussion (FGD) with hospital healthcare professionals was conducted to explore how the policy affected the quality of care based on their views.

The purpose of the qualitative data analysis was to identify and characterize as fully as possible concepts and themes emerging from the interviews and FGD that assisted in the interpretation of the qualitative findings. This consisted of a sequence of interrelated steps that was, reading, coding, displaying, reducing, and interpreting. Preliminary analysis included multiple readings of all interviews/FGD and field notes. This procedure helped researchers evaluate the existing data and generated new strategy for collecting better data¹². In this step, a contact summary sheet was designed to summarize time-limited data for each interview/FGD, which served as an initial step to identify concepts, themes, and issues that emerged from the interview/FGD. A thematic network analysis was adopted in which concepts and themes were formulated from the text and data¹³. The qualitative data analysis software package MAXQDA 11 was used to code the qualitative data into conceptual and thematic categories.

RESULTS AND DISCUSSIONS

The data collections were conducted in three different phases. The first phase was in-depth interviews with 19 patients or their family members/carers. The second phase was in-depth interviews with 9 stakeholders: local government officer, district health officer, and chief executive officer of Wates Hospital. The third phase was FGD with 8 hospital professionals such as hospital managers, senior doctor (neurologist), senior nurses, midwives, and administrative staffs.

The six main themes that emerged from in-depth interviews and focus group discussion i.e.: (a) experiences and practices of healthcare users of no-discrimination, (b) strategies for ensuring quality of services, (c) creating positive branding of hospital to be pro-poor, (d) fostering a positive working environment and a service culture, (e) supporting the success of the universal health coverage insurance program, and (f) challenges and opportunities around implementing inclusive policy with a pro-poor focus.

This qualitative study clearly demonstrated the impact of inclusive policy at Wates Hospital by restructuring its facilities to accommodate pro-poor focus of the local government policy. This study highlighted interesting phenomena regarding the right to access quality healthcare especially for the poor. First, the experience of the poor and non-poor patients after the implementation of no-class wards policy and hospital behaviour towards the treatment patients under the policy. Healthcare users, for both insured and uninsured, experienced friendly and dignified treatments, non-discrimination medical treatment, hospital provided information in an accessible way, and equitable access to healthcare after the implementation of the policy.

Second, the impact of no-ward class policy on the poor and non-poor patients with respect to the government and hospital commitments to enhance non-discrimination in provision and quality of care. The policy had an impact on increasing hospital utilization significantly among public insurance beneficiaries for both the poor and non-poor patients. It means that the hospital policy had also supported the success of the universal health coverage insurance program in the local context. Moreover, in relation to service quality assurance for all patients regardless their socioeconomic status, hospital conducted several efforts through building a trustful relationship between healthcare professionals and users, improving hospital quality through patient empowerment and right, and developing clinical pathways for assuring quality of services. These efforts had created a positive branding of hospital to be more pro-poor. This qualitative study also highlighted the impact of no-class wards policy on fostering a positive work environment and a service culture among healthcare professional at Wates Hospital. And, third, this study provided relevant evidence for policy related several challenges and opportunities for the improvement of the implementation of this inclusive policy with a pro-poor focus.

The discriminatory practice in healthcare can take many forms, including those associated with insufficient communication between healthcare users and providers, undignified treatments, unequal right to access health services, and providers' stereotyping of patients¹⁴. The results showed that the no-class wards policy at Wates Hospital could reduce discriminatory practice in healthcare. Healthcare users had positive experiences of

treatments that may affect their future healthcare use and have important consequence on continuing to alleviate socioeconomic health disparities.

The inclusive hospital policy was a complement of the success of the universal health coverage program in the district of Kulonprogo. No-class wards policy supported local governor political interest in creating equal access to health care services for all people in the district. Limited accessibility particularly for the poor to hospital care in developing countries is not inevitable. Limited number and two-tier system of hospitals in developing countries have worsened disparity in access between the poor and the wealthy⁵. No-class ward policy could tackle this problem through increasing capacity of hospital ward to achieve the poor patient not only limited to the lower class of ward but also the higher class without any additional expenditure. The increasing number of healthcare utilization was the main objective of this policy that indirectly influenced the success of the implementation of universal health coverage program⁹.

The demand for better quality of services was the prominent factor that motivated hospital professionals to improve the strategy for ensuring quality of services. Building a trustful relationship between healthcare professionals and users was a first strategy to improve the quality of service that had been implemented by Wates Hospital. Through restructuring hospital policy to accommodate public expectation, Wates Hospital had been able to develop a positive impression of healthcare users to the hospital performance. Moreover, to build a trustful relationship between provider and users, Wates Hospital also focused on improving effective communication with healthcare users, for example, by providing adequate medical information to the patients. Effective communication will facilitate the realization of an individual's enjoyment of human rights, especially the right to seek, obtain and deliver information. Effective communication with the patients will also be viewed by individuals as delivering high quality care because of provider's sufficiency of interpersonal skills¹⁵.

Another indicator for assuring quality of services that had been used by Wates Hospital was ensuring minimum standard of services to protect healthcare users from poor and unsafe care. Guideline and standard for clinical care are requirement for the implementation of quality improvement strategy¹⁶. The development of case manager was also part of quality assurance that had

been implemented at Wates Hospital. These activities had supported a positive impression of the public to hospital performance and as fulfilled public expectations of high standard of care¹⁷.

This study highlighted positive branding of hospital to be pro-poor due to the implementation of no-class wards policy. The policy had filled the gap of disparity in the use of hospital services. Healthcare utilization among the poor increased significantly after the implementation of the policy⁹. The hospital policy enhanced capacity of hospital wards to accept the poor patients although the third class had been fully occupied. Upgrading to a higher class wards such as the first and second class wards without any additional charges led to the hospital to avoid refusal of treatment to the patients with marginalized background. This was also part of reducing discrimination of treatment on the basis of socioeconomic status^{1, 18}. Other public hospitals in Indonesia have different policy for upgrading class wards. The consequence of the upgrading leads to a higher out-of-pocket expenditures and becomes a barrier, particularly the poor, in accessing health services^{7, 19}. The no-class wards policy at Wates Hospital might be able to be a relevant intervention to tackle this issue.

This study was able to capture some perceptions related to hospital branding based on patient satisfaction expression. In general, healthcare users felt satisfied to the hospital performance, particularly among poor patients. The poor patients perceived that hospital policy had improved their accessibility to the hospital wards. Setting up facilities and services around the poor need had fulfilled public expectation to the hospital performance. This finding is in line with previous published study by Sreenivas and Babu²⁰ that patient satisfaction was influenced by fulfilling patient expectation toward health professional's services, facilities and availability of hospital logistic.

In the context of working environment and organization, the implementation of no-class wards policy had shaped health professionals behaviour pattern. Fostering a positive working environment and service culture had been identified in this study. Adequate support from financial aspect had created a better working performance among healthcare professionals. Moreover, hospital policy also influenced values, beliefs and norms within hospital organization, which in turn help shape the way in which hospital professionals

interact and engage with patients. Service culture became embedded into hospital professional values and influenced the way of delivery of health services. Improving hospital performance was the main advantage from positive working environment and service culture. This finding is in line with previously published studies that organizational culture had a substantial influence to the organizational performance^{21,22}.

This study provides relevant evidence for policy, regarding several challenges and opportunities for the improvement of the implementation of no-class wards policy. The effect of no-class ward policy on increasing hospital bed occupancy was inevitable. As the consequence, longer waiting time occurred that led to potential anxiety and inconvenience caused by any delays in receiving care. This situation could affect patient satisfaction as well as influenced the quality of services of hospital²³. Improving infrastructure of hospital to provide adequate quantity of hospital wards becomes a take home message in direct response of the phenomena for the hospital managers and local policy maker in the district of Kulonprogo.

Better access to healthcare provider influences the workload of healthcare professionals due to limited number of personnel. Recruiting healthcare professionals to fulfil the ratios of health workers to population should be immediately implemented. Indonesia's health workforce is small compare to countries that have similar income level. Indonesia has considerably lower health worker to population ratios²⁴. It is a challenge for policy maker how to improve availability of health workers to enhance accessibility for all people to health services.

Policy replication was an important issue to scale up the policy to other hospitals. No-class ward policy had clearly demonstrated on creating the right to access quality health care, particularly for the poor. Policy adoption to other hospital in different districts and provinces will provide an opportunity to tackle disparity in access to hospital in Indonesia. However, it needs an adjustment with political context in each regions, healthcare user expectations, and technical issue in each local hospital. Moreover, sustainability of the policy should be maintained to ensure the perpetuity of the program.

An important limitation of this study is that it was conducted only in a hospital in a district. Actually there are about 44 hospitals that have been restructured to

adapt no-class wards policy in different regions in Indonesia. Given that this study had not conducted a comparative study among different regions, the data lacked information on policy context, public expectations, and technical issue in hospital in different regions. The implementation of decentralization policy has created huge differences in managing public sector among regions in Indonesia²⁵. Consequently, different local context was not possible to be identified.

CONCLUSION

No-class ward policy at Wates Hospital had clearly demonstrated on improving the right to access quality health care, particularly for the poor. The policy had effectively reducing the experiences of patients on discriminatory treatment as well as improving quality of services. The policy also had an impact on increasing hospital utilization significantly among public insurance beneficiaries for both the poor and non-poor patients that support the success of the implementation of the universal health coverage in local context. Moreover, the policy had improved the assurance of quality of services through building a trustful relationship between healthcare professionals and users; patient empowerment and right; and developing clinical pathways for assuring quality of services. Policy replication becomes an important issue to scale up the policy to other hospitals in the different regions in Indonesia by considering local political context and various infrastructures. Future research needs to expand on our work to compare the implementation of no-class wards policy in other hospitals in different regions in Indonesia considering different local context such as local political issues, public expectations and other technical issues.

ACKNOWLEDGMENT

We are grateful to the World Health Organization (WHO) Gender, Equity and Human Rights for supporting a research grant. We also thank to Wates Hospital, Kulonprogo, Yogyakarta for approving data collection. We appreciate to all study participants.

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this manuscript.

Ethical Clearance: Ethical approval was issued by the ethical committee of the Faculty of Medicine, Jenderal

Soedirman University, Purwokerto, Indonesia. Permission to conduct the study was obtained from the local government of the districts of Kulonprogo, Yogyakarta. All participants were recruited voluntarily and provided both verbal and written consent. Anonymity and confidentiality were maintained throughout the process.

REFERENCES

- Hunt P, MacNaughton G. Impact Assessments, Poverty and Human Rights: A Case Study Using The Right to the Highest Attainable Standard of Health: World Health Organization 2006.
- Scott-Samuel A, O'Keefe E. Health impact assessment, human rights and global public policy: a critical appraisal. *Bull World Health Organ.* 2007 Mar;85(3):212-7.
- Meessen B, Chheng K, Decoster K, Heng TL, Chap SC. Can public hospitals be pro-poor? The health equity fund experience in Cambodia 2008.
- Aji B, Mohammed S, Haque MA, Allegri M. The Dynamics of Catastrophic and Impoverishing Health Spending in Indonesia: How Well Does the Indonesian Health Care Financing System Perform? *Asia Pac J Public Health.* 2017 Sep;29(6):506-15.
- Lewis M, Eskeland G, Traa-Valerezo X. Primary health care in practice: is it effective? *Health Policy.* 2004 Dec;70(3):303-25.
- UNHCR. The Right to Health. Geneva: United Nations High Commissioner for Human Rights; 2008.
- Aji B, Yamamoto SS, Sauerborn R. The economic impact of the insured patients with severe chronic and acute illnesses: a qualitative approach. *Glob Health Action.* 2014;7:22526.
- Utomo B, Sucahya PK, Utami FR. Priorities and realities: addressing the rich-poor gaps in health status and service access in Indonesia. *Int J Equity Health.* 2011;10:47.
- Sakir, Atmojo ME, Handoyo A. An evaluation of classless health services for poor families (Gakin) in Wates, Kulon Progo Regency. *Journal of Governance and Public Policy.* 2018;5(2):239-58.
- Suwandono A, Gani A, Purwani S, Blas E, Brugha R. Cost recovery beds in public hospitals in Indonesia. *Health Policy Plan.* 2001 Dec;16 Suppl 2:10-8.
- BPS. Kulon Progo Regency in Figures 2012. Kulon Progo: BPS- Statistics of Kulon Progo Regency; 2012.
- Miles MB, Huberman AM. Qualitative data analysis. California: SAGE Publications; 1994.
- Attride-Stirling J. Thematic networks: an analytic tool for qualitative research 2001; I.
- FRA. Inequalities and multiple discrimination in access to and quality of healthcare. Vienna: European Union Agency for Fundamental Rights; 2013.
- Gostin L, Hodge JG, Valentine N, Nygren-Krug H. The Domains of Health Responsiveness – A Human Rights Analysis. Health and Human Rights Working Paper Series No 2 [serial on the Internet]. 2003.
- WHO. What are the best strategies for ensuring quality in hospitals 2003.
- Silow-Carroll S, Alteras T, Meyer JA. Hospital quality improvement: Strategies and lessons from US hospitals 2007.
- Nygren-Krug H. 25 Questions and Answers on Health and Human Rights: World Health Organization 2002.
- Aji B, De Allegri M, Souares A, Sauerborn R. The impact of health insurance programs on out-of-pocket expenditures in Indonesia: an increase or a decrease? *Int J Environ Res Public Health.* 2013 Jul;10(7):2995-3013.
- Sreenivas T, Babu NS. A study on patient satisfaction in hospitals: A study on three urban hospitals in Guntur District, Andhra Pradesh. *International journal of management research and business strategy.* 2012;1(1).
- Jacobs R, Mannion R, Davies HT, Harrison S, Konteh F, Walshe K. The relationship between organizational culture and performance in acute hospitals. *Soc Sci Med.* 2013 Jan;76(1):115-25.

22. Sørensen JB. The Strength of Corporate Culture and the Reliability of Firm Performance. *Administrative Science Quarterly*. 2002;47(1):70-91.
23. Ofili AN, Ofovwé CE. Patients' assesment of efficiency of services at a teaching hospital in a developing country. *Annals of African Medicine*. 2005;4(4):150-3.
24. Rokx C, Schieber G, Harimurti P, Tandon A, Somanathan A. *Health Financing in Indonesia: A reform roadmap*. Washington DC: World Bank; 2009.
25. Kurniadi BD. *Health Decentralization in Indonesia: Some Obstacles*2009.

Improvement of Water Quality after Implementation of Water Safety Plans (WSPs) in Semarang City, Indonesia

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ABSTRACT

We implemented Water Safety Plans (WSPs) program at previous work due to poor of water quality in the coastal area of Semarang, Indonesia. The aimed of the research was to evaluate water quality before and after implementation of WSPs program in Bandarharjo village, Semarang city. This was an experimental design with steps for implementations of WSPs program adopted the guidelines and tools of the World Health Organization. Numbered 80 samples before and after implementation of WSPs and fulfilled by purposive sampling technique. The main parameters of drinking water were total coliform with MPN method, turbidity with turbidity meter, salinity and pH with potentiometer instrument. Data were analyzed using Wilcoxon match-paired signed-rank test at $\alpha = 5\%$. Bacteriological quality of drinking water in Bandarharjo village has increased 17.5% after implementation of WSPs program. There were significant difference between total coliform ($p = 0.016$), salinity ($p = 0.028$), and turbidity ($p < 0.001$) before and after implementation of WSPs. Implementation of WSPs program has improved water quality, however regularly monitoring of the water supply system and bacteriological treatment are needed.

Keywords: *implementation of WSPs program, water supply system, drinking water, coastal area, water quality improvement.*

INTRODUCTION

People in coastal area of Semarang, Indonesia used the deep ground water or artesian wells for daily needs (i.e., drinking, cooking, and washing). The number of deep ground water were not met the requirement in terms of bacteriological quality was 9 out of 20 water samples. Microbial contamination of major urban drinking water has the potential to cause outbreaks of waterborne disease.¹

Our field risk assessment of water supply system in previous study in the coastal area revealed a very high degree of risk at source system, at a reservoir, at processing system, and at costumer or household system. We obtained a high degree of risk at distribution system.²

The water safety plans (WSPs) program implemented³ in the coastal area of Semarang in accordance with the WHO guidelines.⁴ The steps of WSPs program consist of introducing WSPs program, team building, training the team, examination of water safety before risk assessment, risk assessment, minor repair I, examination of water safety risk, minor repair II after monitoring.⁵

Introducing of WSPs program to the community conducted by presented the results of research related to water quality in the region to the representative community. The value of drinking water (i.e., reduce future water borne disease) also was informed. The team of WSPs was built and legalized by decree of village office. The WSPs

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team was well-trained using the materials adapted from the WHO training module.⁴ Methods of training included presentation and discussion, simulation, field visit, and working group. Risk assessment and minor repairs were implemented in source system, distribution system, and household system.³

However, implementation of WSPs program has not been evaluated. Evaluation of the implementation of WSPs program could be evaluated due to the parameters of quality of the drinking water. The aim of the research is to evaluate the water quality before and after the implementation of Water Safety Plans (WSPs) program in the coastal area of Semarang.

METHOD

Study Design: The location was in the Bandarharjo village, Semarang is chosen based on bacteriological water quality in the supply system. The samples numbered 40 out of 73 customers withdrawn by a purposive sampling technique. The parameters of drinking water are total coliform⁶⁻⁸ with MPN method⁹, turbidity with turbidity meter, salinity, and pH with potentiometer.^{1,7,10,11} The examination of drinking water quality was performed in the Local Health Laboratory of Central Java Province. Research activities used the framework of WSPs guidelines⁵, steps included: Introducing of WSPs to community by presentation and discussion method; WSPs team building and training by class, exercise and field visit method; examination of water safety before risk assessment by laboratory examination; risk assessment of water safety by WSPs team using tools of WHO; minor repair I: after risk assessment; examination of water safety risk after minor repair; monitoring of water safety risk; minor repair II: after monitoring of WSPs field trial in rob area.⁷ This work used experimental with pretest and posttest design.¹²⁻¹⁴

In accordance with sample representativeness, it was being taken from locations that are representative of the points of use⁶. The time between sampling and analysis were kept to a minimum and it was storage in clean a glass or polyethylene bottles at a low temperature (4°C) in the dark sampler. Acidify (pH) and turbidity of water was tested immediately after sampling to prevent change during storage and transport⁶.

STATISTICAL ANALYSIS

Description of data conducted by compared water quality before and after of the WSPs implementation.

Kolmogorov-Smirnov was performed to analyze normality of data (MPN coliform, turbidity, pH, and salinity). Wilcoxon match-paired test was performed to analyze the quality of drinking water before and after implementation of WSPs program at $\alpha = 0.05$ ¹⁵. All statistical analyses were performed using SPSS statistical software version 20.0 (IBM™ Corp.).

RESULTS AND DISCUSSIONS

Table 1, in term of pH and salinity, all water sample qualify the standard, yet two of 40 samples exceed turbidity standard (> 25 mg/l). Eighty percent of water sample at customer level did not meet specified standard according to Decree of Ministry Health of Republic of Indonesia number 416/1990, which is maximum 10/100 ml water sample. Water quality does not require BOD parameter. The BOD examination was performed to estimate a possibility of piping leakage, loose connections, or water contamination by sewer or tidal inundation, also possibility sedimentation in inner pipe. In addition, from the results of our spot check by cutting distribution pipeline, we found in the inner wall of the pipe has a lot of stick impurity deposition.

On physical examination at household level of deep ground water, the turbidity levels before the repair were found in two samples of 40 samples tested, that did not qualify at more than 25 mg/liter. However, the physical examination of the water quality parameters of turbidity after the improvement of drinking water supply system, it is no longer found turbidity levels that exceed the requirements of Ministry of Health regulation number 416/1990.

Bacteriological quality of the water in the deep ground well at customers level is qualified according to Ministry of Health regulation number 416/1990 as much as 13 (32.5%) of the 40 samples tested (same sample before risk assessment). While the quality of deep ground well on customers who do not qualify the requirements as much as 27 (67.5%) of the 40 samples tested. Bacteriological quality of water that met the requirements have increased 17.5%, from 6 (15%) to 13 (32.5%). The most bacteriological quality of the water samples examined (67.5%) remained not met its specified requirements.

As a conclusion, test results of water quality parameters of physics, chemistry, and biology at the consumer level after the improvement of drinking

water supply as follow (Table 1): (a) Physical quality parameters of turbidity of water with as many as 40 samples (100%) were eligible; (b) Bacteriological quality (total coliform) from deep ground well water to customers who still have not qualified as much as 27 (67.5%) of the 40 samples examined; (c) Parameters pH and salinity and BOD all (100%) were eligible.

Table 1: The category of standard of water quality before and after minor repairs of implementation of the WSPs program

Water parameters	Before (n = 40)	After (n = 40)
MPN coliform		
Met standard	17.5	32.5
Not met standard	82.5	67.5
Turbidity (NTU)		
Met standard	95	100
Not met standard	5	0

Table 2: The water quality before and after minor repairs of implementation of WSPs program

Water parameters	Before (n=40)			After (n=40)			p-value	Remark*
	Mean ± SD	Min.	Max.	Mean ± SD	Min.	Max.		
MPN coliform	740.2 ± 1012	3	2400	273.93 ± 641.3	3	2400	0.016	Not met standard
Turbidity (NTU)	4.28 ± 11.5	0.18	65.9	0.26 ± 0.23	0.02	1.34	<0.001	Met standard
Salinity (mg/L)	0.12 ± 0.09	0.018	0.66	0.24 ± 0.15	0.04	0.4	0.028	
pH	7.0 ± 0	7.0	7.0	7.0 ± 0	7.0	7.0	-	Met standard
BOD (mg/L)	0.45 ± 0.5	0.1	2.91	0.42 ± 0.22	0.1	0.94	0.697	-

*According Ministry of Health of Republic of Indonesia 416/1990

The local government drinking water supply system consists of intake of raw water, physical and chemical treatment, distribution and household connection. Complete water treatment included screening, coagulation, sedimentation, filtration, disinfection, and distribution.¹⁶ However, the minimum requirement for ground water is disinfection. One way to disinfect water is using chlorine. An effective disinfection using chlorine kills bacteria, viruses, and protozoa such as Giardia and Cryptosporidium.¹

Coliform bacteria is an intestinal bacteria leaves in human digestion tract, has a pathogenic capacity which used to be an indicator of sanitation. The most widely used in drinking water indicators are coliforms

Conted...

Salinity (mg/L)		
Met standard	100	100
No met standard	0	0
pH		
Met standard	100	100
Not met standard	0	0
BOD (mg/L)		
Met standard	100	100
Not met standard		

*According Ministry of Health of Republic of Indonesia 416/1990

Table 2 showed the statistical analysis of parameters of the water quality before and after minor repairs of implementation of the WSPs program in Bandarharjo village. The average level of the MPN coliform, turbidity, and salinity were significant difference before and after implementation of WSPs program (p=0.016, p<0.001, and p=0.0028). There were no difference between pH and BOD before and after implementation of WSPs program (p=-, p=0.697).

(total coliforms), fecal or thermo tolerant coliforms, Escherichia coli, enterococci (fecal streptococci or intestinal enterococci) and bacteriophages.¹⁷The presence of fecal coliform, which counted by a number of colonies, is positively correlated with the presence of pathogenic bacteria. In addition, the detection of the coliform is cheaper, faster, and simpler than detection of other pathogenic bacteria method. Therefore, a coliform determination could be used as an indicator of water quality. Although E. coli is a part of the normal microbial digestive tract, the presence of certain strains could cause moderate to severe gastroenteritis level in humans and animals. Feces can be a source of pathogenic bacteria, viruses, protozoa, and helminth.⁷ The presence of coliforms in the distribution system,

while possibly due to inadequate treatment, could also be due to cross-connections or failure to maintain an adequate disinfectant residual.¹⁸

Water supply system in Bandarharjo village mostly relies on deep ground wells. The water has undertaken neither physical nor chemical treatment processing to secure water quality and safety. Disinfection is an effective barrier to many pathogens (especially bacteria) during drinking-water treatment and should be used for surface waters and for groundwater subject to fecal contamination.⁷

The average number of MPN coliform before and after implementation of WSPs program remain not met the standard in accordance with Ministry of Health of Indonesia number 406/1990 (Table 2). Although the average number of MPN coliform significantly decreased before and after implementation of WSPs program ($p = 0.016$). This probably because the minor repair of the water system that only focused on the improvement of physical infrastructure to prevent contamination, rather than chemical aspects. Chemical treatment such as water disinfection had not been done due to community rejection. Thus the bacteria remain contaminated water from the source and distributed to costumers. Although at water source the bacteriological quality actually improved, the improvement was not significant in accordance with a standard. A recent study revealed groundwater to be vulnerable to contamination both in the vulnerable and critical zones in the north and the east of Semarang. This groundwater was unsuitable for drinking water due to seawater intrusion in the damage area.¹⁹

The presence of microbial may also influence by organic materials²⁰ deposition in the inner of type pipe²¹ in distribution and the process included three stages.²² It was indicated the presence of BOD, although in a small amount. The BOD level was lower after WSPs program implemented even it was not statistically significant. The pipe deposition may cause of microbial growth.²³ Several studies have demonstrated presence of coliforms in drinking water distribution systems associated with biofilm growth problems.^{24,25}

The salinity of drinking water was very low, despite the increase in salinity after minor repair of the water supply system. The water salinity level met the requirement in accordance with the quality of drinking water. Biofilm growth is influenced by a number of

physical, chemical, and biological processes. The level of acidifying (pH) of water was 7 (in neutral pH) and its good chemical condition for growing microbial in the water.²² There was no significant difference (constant) of pH before and after implementation of WSPs program. There was no treatment process in the water supply system, a primarily addition of the chemical agent. So the pH remained constant in average.²⁶ The pH is an important operational water quality parameter, for effective disinfection with chlorine, the pH should preferably be 6-8, because chlorination may be ineffective above pH 9.⁷

Turbidity was met a standard and significantly reduced in average (difference) before and after implementation of WSPs program ($p < 0.001$). Water supply system: at the source (i.e., cisterns, pipe, and cisterns cover), at distribution pipe (i.e., leakage pipe, lost connection, flushing), and at customer connection (i.e., water meter, connection pipe) were improved. Turbidity correlates with changes of suspended bacterial concentration²¹ and adversely affects the efficiency of disinfection.⁷ As the turbidity decreased, the number of MPN also showed a significant decrease.

CONCLUSIONS

The bacteriological quality of water supply system in Bandarharjo village increased 17.5% after implementation of WSPs program. The implementation of WSPs program is able to improve the quality of drinking water and can be replicated. However need continuous assistance and improvement particularly to maintain the team, disinfection process using acceptable method, periodically flushing, and monitoring drinking water supply system.

ACKNOWLEDGEMENTS

We want to express our gratitude to the WSPs team, village officer of Bandarharjo Primary Health Care of Bandarharjo, WHO representatives of Indonesia, local health volunteer, artesian well owners, Institute for Research and Community Service of Diponegoro University.

Conflict of Interest: The authors declare that they have no conflicts of interest.

Source of Funding: This work was sponsored by World Health Organization (grant number: SE INO1206445).

REFERENCES

- World Health Organization. Guidelines for drinking-water quality First Addendum to Third Edition Volume 1 Recommendations. http://www.who.int/water_sanitation_health/publications/gdwq3rev/en/. Geneva, Switzerland: WHO Press; 2006:23 May 2017.35. Available from: apps.who.int/iris/bitstream/handle/10665/204411/9789241547611_eng.pdf;jsessionid=DF6A89EB4257BE40FA581322A3C65149?sequence=1.
- Budiyono, Ginandjar P, Saraswati LD, Pangestuti DR, Jati SP, Rahfiludin Z. Risk assessment of drinking water supply system in the tidal inundation area of Semarang - Indonesia. *Procedia Environ. Sci.* 2015 Jan; 23(2015):93–8. Available from: <http://creativecommons.org/licenses/by-nc-nd/4.0/>. doi: 10.1016/j.proenv.2015.01.014.
- Budiyono, Ginandjar P, Saraswati LD, Pangestuti DR, Martini, Jati SP. Implementation of Water Safety Plans (WSPs): A Case Study in the Coastal Area in Semarang City, Indonesia. *IOP Conf. Series: Earth and Environmental Science* 116 (2018):012-029. Available from: <http://iopscience.iop.org/article/10.1088/1755-1315/116/1/012029/pdf>. doi :10.1088/1755-1315/116/1/012029.
- World Health Organization. Water Safety Planning for Small Community Water Supplies Step-by-step risk management guidance for drinking-water supplies in small communities. http://www.who.int/water_sanitation_health/publications/small-comm-water_supplies/en/. Geneva, Switzerland: WHO Press;2012:31July2017.8–37. Available from: http://apps.who.int/iris/bitstream/handle/10665/75145/9789241548427_eng.pdf?sequence=1
- World Health Organization. Water safety plans manual: Step by step risk management for drinking water suppliers. <http://apps.who.int/iris/handle/10665/75141>. Geneva, Switzerland: WHO Press and IWA;2009:15August2017.8–65. Available from: http://apps.who.int/iris/bitstream/handle/10665/75141/9789241562638_eng.pdf?sequence=1&isAllowed=y.
- World Health Organization. Guidelines for drinking-water quality.—2nd ed. Volume 3 Surveillance and control of community supplies. http://www.who.int/water_sanitation_health/publications/small-water-supplies-guidelines/en/. Geneva : WHO Press;1997:23May2017.52–59. Available from: <http://apps.who.int/iris/bitstream/handle/10665/42002/9241545038.pdf?sequence=1&isAllowed=y>.
- World Health Organization. Guidelines for drinking-water quality: incorporating 1st and 2nd addenda, Vol.1, Recommendations.— 3rd ed. Geneva : WHO Press;2008:18April2015.5,282. Available from: http://www.who.int/water_sanitation_health/dwq/fulltext.pdf
- Antony RM, Renuga FB. Microbiological analysis of drinking water quality of Ananthanar channel of Kanyakumari district, Tamil Nadu, India. <http://www.ambi-agua.net/seer/index.php/ambi-agua/article/view/881>. *An Interdisciplinary Journal of Applied Science.* 2012 (23May2017). 7(2):42–48 <https://doi.org/10.4136/ambi-agua.881>
- Ashbolt NJ, Grabow WOK, Snozzi M. Indicators of microbial water quality. *Water Quality: Guidelines, Standards and Health.* Fewtrell L and Bartram J. http://www.who.int/water_sanitation_health/publications/whoiwa/en/. (London: IWA Publishing;2001:11May2015.289–316. Available from: http://www.who.int/water_sanitation_health/dwq/iwachap13.pdf?ua=1
- Allen MJ, Brecher RW, Copes R, Hrudehy SE, Payment P. Turbidity and Microbial Risk in Drinking Water. https://www.researchgate.net/publication/228605563_Turbidity_and_microbial_risk_in_drinking_water. B.C. Minister of Health:British Columbia;2008:2017May23:11–22. Available from: https://www.researchgate.net/profile/Ray_Copes/publication/228605563_Turbidity_and_microbial_risk_in_drinking_water/links/00b7d526af648dcc2d000000/Turbidity-and-microbial-risk-in-drinking-water.pdf
- ElEmamiAA, ElHossadiAA, ElSlamA, AzzouzH, Fouad SM. An assessment of the quality of drinking water in Benghazi City, Libya (Determination of physical parameters) *Der Chemica Sinica.* 2012 (23June2017); 3 (4):1014–19. Available from: <http://www.imedpub.com/abstract/an-assessment-of-the-quality-of-drinking-water-in-benghazi-cityrnllyadetermination-of-physical-parameters-12165.html>

12. Chivite-Matthews N, Thornton P. Guidance on evaluating the impact of interventions on business. <https://www.gov.uk/government/publications/impact-evaluation-guidance-for-business>. London: Business Innovation&Skills (BIS);2011: 18April2015:26-37. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/212318/11-1085-guidance-evaluating-interventions-on-business.pdf
13. Dimitrov DM, Rumrill Jr PD. Pretest-posttest designs and measurement of change. *Work*. 2003 (23May2017). 20:159–165. Available from: <https://content.iospress.com/articles/work/wor00285>
14. Marsden E, Torgerson CJ. Single group, pre- and post-test research designs: Some methodological concerns. *Oxford Review of Education*. 2012 (23May2017). 38 (5):583–616. Available from: https://www.researchgate.net/publication/258227131_Single_group_pre-post_test_research_designs_Some_methodological_concerns/download. <http://dx.doi.org/10.1080/03054985.2012.731208>
15. Rosner B, Glynn RJ, Lee MLT. The Wilcoxon Signed Rank Test for Paired Comparisons of Clustered Data. *Biometrics*. 2005 (23May2017). 62:185–192. Available from: http://people.musc.edu/~bandyopd/bmtry704.09/Rosner_clustered_signedrank.pdf. DOI: 10.1111/j.1541-0420.2005.00389.x
16. Department of Chemical Engineering University of Pretoria. Handbook for the operation of water treatment works. Schutte F (ed). Republic of South Africa; 2007 (23May2017):70-117. Available from: https://www.sswm.info/sites/default/files/reference_attachments/SCHUTTE%202007%20Handbook%20for%20the%20Operation%20of%20Water%20Treatment%20Works.pdf
17. Figueras MJ, Borrego JJ. New Perspectives in Monitoring Drinking Water Microbial Quality. *Review Int. J. Environ. Res. Public Health*;2010 (8May2015).7: 4179–202. Available from: www.mdpi.com/journal/ijerph. doi:10.3390/ijerph7124179
18. LeChevallier MW. The ease for maintaining a disinfectant residual. *J Am. Water Work Assoc.* 1999 (6May2015);91(1):86-94. Available from: https://www.researchgate.net/publication/239778071_The_case_for_maintaining_a_disinfectant_residual. DOI: 10.1002/j.1551-8833.1999.tb08573.x
19. Putranto TT, Widiarso DA, Susanto N. Assessment of Groundwater Quality to Achieve Sustainable Development in Semarang Coastal Areas. *IOP Conf. Series: Earth and Environmental Science*. 2017. 79 (2017):1-9. Available from: https://www.researchgate.net/profile/Thomas_Putranto/publication/319167440_Assessment_of_Groundwater_Quality_to_Achieve_Sustainable_Development_in_Semarang_Coastal_Areas/links/59a73c544585156873cfd12b/Assessment-of-Groundwater-Quality-to-Achieve-Sustainable-Development-in-Semarang-Coastal-Areas.pdf?origin=publication_detail. doi:10.1088/1755-1315/79/1/012001
20. Horemans B, Breugelmans P, Hofkens J, Smolders E, Springael D. Environmental Dissolved Organic Matter Governs Biofilm Formation and Subsequent Linuron Degradation Activity of a Linuron-Degrading Bacterial Consortium. *Applied and Environmental Microbiology*. 2013 (2August2017);79 (15):4534–42. Available from: <http://dx.doi.org/10.1128/AEM.03730-12>. doi:10.1128/AEM.03730-12
21. Hyun-Jung J, Choi YJ, Ka JO. Effects of Diverse Water Pipe Materials on Bacterial Communities and Water Quality in the Annular Reactor. *J. Microbiol. Biotechnol.* 2011 (2August2017);21(2):115–123. Available from: <http://www.jmb.or.kr/journal/viewJournal.html?year=2011&vol=21&num=2&page=115>. doi: 10.4014/jmb.1010.10012
22. Garrett TR, Bhakoo M, Zhang Z. Bacterial adhesion and biofilms on surfaces. *Progress in Natural Science*. 2008 (2August2017);1:1049–56. Available from: <https://www.sciencedirect.com/science/article/pii/S1002007108002049>. doi:10.1016/j.pnsc.2008.04.001
23. United State Environmental Protection Agency Health Risks from Microbial Growth and Biofilms in Drinking Water Distribution Systems. Washington DC: EPA;2002

- (2August2017):22–23. Available from: https://www.epa.gov/sites/production/files/2015-09/documents/2007_05_18_disinfection_tcr_whitepaper_tcr_biofilms.pdf
24. Vitange D, Pamminer F, Ourtsanis T. Maintenance and survey of distribution systems. In: Safe piped water: Management Microbial Water Quality in Piped Distribution System. Ainsworth R (ed). London: WHO and IWA Publishing;2004(23May2017):69–86. Available from: <https://www.researchgate.net/publication/252865754/download>
25. Pachepsky Y, Morrow J, Guber A, Shelton D, Rowland R, Davies G. Effect of biofilm in irrigation pipes on microbial quality of irrigation water. *Lett Appl Microbiol.* 2012 (2August2017).54(3):217-24. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/2215042>. doi: 10.1111/j.1472-765X.2011.03192.x.
26. Abdullahi ME, Folorunsho AD, Agaie BG, Jibril M. Predictive Model for Lime Dosage in Water Treatment Plant. *International Journal of Scientific and Research Publications.* 2012 (2August2017).2(12): 1–5. Available from: <http://www.ijsrp.org/research-paper-1212/ijsrp-p1241.pdf>:

Social-Ecological Risk Determinant and Prediction For Dengue Transmission

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ABSTRACT

Background: Dengue hemorrhagic fever is a serious health problem in Medan, with high incidence annually. Social and ecological factors are play role on dengue transmission.

Purpose: The aims of study to determine the impact of social and ecological factors on dengue transmission and made a prediction model for dengue transmission.

Method: This study was a cross sectional study with 100 households both in high and low subdistricts dengue incidence that were selected using systematic random sampling. Of the 100 households, larvae examination was performed. Data analysis was performed using simple and multiple logistic regressions.

Results: The results revealed that houses without window screen, frequency of cleaning of garbage dump more than 7 days and presence of larvae positive container had roles on dengue transmission in Medan with the equation of prediction model for dengue transmission = $2.343 + (-2.025 \times \text{houses without window screen}) + (1.876 \times \text{frequence of cleaning garbage dump more than 7 days}) + (1.549 \times \text{presence of larvae positive container})$.

Conclusions: social and ecological factors are related to dengue transmission in Medan. Health promotion about dengue prevention is essential and should be intensified to improve dengue preventive measures.

Keywords: social-ecological, risk, prediction, dengue transmission.

INTRODUCTION

Dengue hemorrhagic fever (DHF) is health problem in many tropical and subtropical countries worldwide. Presently, more than 100 countries are endemic for dengue virus infection with 390 million dengue infection occur annually¹. It was estimated that about 3.9 billion people live in 128 countries high-risk areas for dengue infection². World Health Organization (WHO) noted Indonesia as the country with the highest dengue cases in Southeast Asia. Among 34 provinces, North Sumatera Province is endemic area for DHF cases di Indonesia

with Medan is the highest for DHF cases in North Sumatera Province³.

The factors responsible for DHF incidence are complex. Social factors as well as ecological factors play role on dengue transmission. Social factors such as poverty, illiteracy, household density, and cultural practices affect the abundance of *Aedes aegypti* mosquitoes. In addition, environmental factors such as environmental and housing conditions with poor hygiene conditions can create potential breeding sites. Moreover prolonged storage of water for domestic could also create breeding place for *Aedes aegypti*, thereby increasing dengue transmission^{4,5}. A study in Southern Brazil by Thammapalo *et al.* (2008) found brick houses and houses with poor garbage disposal are at higher risk for contracting DHF⁶. Another study by Spiegel *et al.* (2007) found that social and environmental factors are associated with the presence of *Aedes aegypti* and thereby have a higher risk for DHF⁷.

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Public awareness about dengue and prevention measures are essential in dengue prevention and control. Many studies investigate the knowledge, attitudes and practices concerning dengue in communities. A study by Shuaib *et al.* (2010) concluded that appropriate knowledge does not always lead to effective practices⁸. Contrary with Al-Dubai study *et al.* (2013) found that knowledge regarding dengue is associated with effective practices for dengue prevention⁹.

DHF is a health problem in Medan. Many prevention efforts have been conducted, however the incidence of DHF remains high. For effective control measures, efforts should be focused on the disease risk factors, particularly social and ecological factors. Therefore, this study was designed to identify the social and ecological risk determinants of dengue transmission.

METHOD

This study was conducted in Medan, a district with high DHF incidence in North Sumatera from 20th August, 2016 to 28th September, 2016. In this study, the larval survey was done based on WHO procedure by inspection of containers both indoor and outdoor in selected houses to examine *Aedes larvae* as shown in Figure 1 and then house index (HI) was calculated.



Fig. 1: Activity in larva survey

Sample: In this study, two subdistricts with high DHF incidence (Selayang, Tuntungan) and two subdistricts with low DHF incidence (Denai, Medan area) were purposively selected based on the incidence of DHF. From the high subdistrict, households were systematically selected among the households with reported cases from the health office registry, whereas in the low subdistrict, households were systematically selected based on the registry of the household from the sub-district administrative office.

Sample size: Sample size was calculated using the two-proportion formula¹⁰, with an average Odds Ratio (OR) of 3.45. Proportion of low education in cases group (P1) of 0.49 and proportion of low education in control group (P0) of 0.22¹¹. An allowable error of 5% and a power of study of 80%. The sample size was 48. Therefore, 100 households for subdistrict with both high and low DHF cases were included in this study.

Study instrument: The sociocultural data, knowledge as well as environmental condition were collected by interview and check list and then recorded using questionnaires that were developed based on questionnaires published research^{12,13}. The socio-cultural factors included education level, knowledge, hanging clothes, frequency cleaning of water container and frequency cleaning of garbage dump. Environmental factors included house construction, window screen and house with positive container. Knowledge was assessed via eighteen questions regarding cause, symptoms, mode of transmission, breeding place and prevention. These questions could be answered with yes (scoring 1 point) and no or do not know (scoring 0 points). Knowledge was classified as good when 75% or more of the answers were correct and low when less than 75% of the answers were correct.

STUDY ANALYSIS

The Statistical Package for Social Science (SPSS) program Release 22.0 was used for data analysis. House indices were calculated and tabulated for descriptive statistics. Simple and multiple logistic regressions were used to analyze the association between social and ecological factors with dengue transmission

RESULTS AND DISCUSSION

A total of 100 samples were included in this study consisted of 100 households both in high and low subdistricts dengue cases. The majority of respondent in high subdistrict have low educational level (48.0%) and poor knowledge (60.0%). Habits that promote *Aedes aegypti* breeding, such as hang-drying clothes, cleaning water container more than 7 days, garbage disposal more than 7 days were found to be 88.0, 34.0, 48.0%, respectively (Table 1).

Table 1: Socio-cultural profile of respondents (n = 100)

Socio-cultural factor	High subdistrict n (%)	Low subdistrict n (%)
Education level		
High	26 (52.0)	36(72.0)
Low	24 (48.0)	14 (28.0)
Knowledge		
Good	20 (40.0)	31 (62.0)
Poor	30 (60.0)	19 (38.0)
Hanging clothes		
No	6 (12.0)	9 (18.0)
Yes	44 (88.0)	41 (82.0)
Frequency cleaning of water container		
≤ 7 days	33 (66.0)	39 (78.0)
> 7 days	17 (34.0)	11 (22.0)
Frequency cleaning of garbage dump		
≤ 7 days	26 (52.0)	38 (76.0)
> 7 days	24 (48.0)	12 (24.0)

Concrete houses were the most common house (50.0%) in high subdistrict. Of the 50 houses, 44% houses without window screen. Moreover, houses with positive container in high subdistrict are more found than low subdistrict with houses indices 22.0% versus 6.0% (Table 2). Of the type positive container both high and low subdistrict, there were eight type of positive container in high subdistrict, while only one type in low subdistrict as presented in Figure 2. While for houses with positive container in high subdistrict is more than low subdistrict, thereby house indices for *Aedes* in high subdistrict compared to low subdistrict are 22 % versus 6 % as presented in Figure 3.

Of the simple logistic regression showed that education level, knowledge, frequency cleaning of water container, frequency cleaning of garbage dump, houses without window screen and presence of positive container were significant variables that indicated with *p value* less than 0.25 (Table 3). Then these variables were included in the multiple logistic regression and with the enter method, three significant variables contribute to dengue transmission such as houses without window screen, frequency

Table 2: Environmental characteristic of respondents (n = 100)

Environmental variable	High subdistrict n(%)	Low subdistrict n(%)
Houses construction		
Wood	5 (10.0)	2 (4.0)
Brick	18 (36.0)	31 (62.0)
Concrete	15 (50.0)	14 (28.0)
Mixed	2 (4.0)	3 (6.0)
Window screen		
Yes	28 (56.0)	13 (26.0)
No	22 (44.0)	37 (74.0)
Positive container		
Yes	11 (22.0)	3 (6.0)
No	39 (78.0)	47 (94.0)

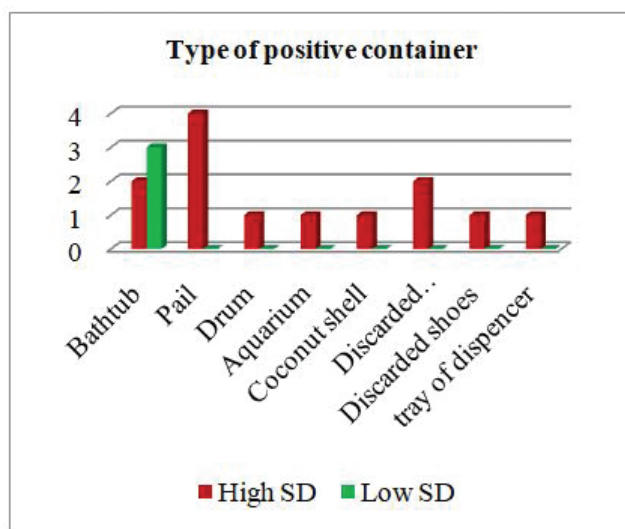


Fig. 2: Type of positive container

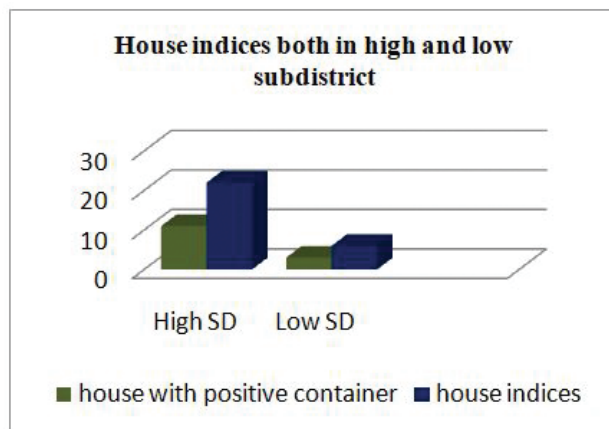


Fig. 3: House indices in high and low subdistrict

cleaning of garbage dump more than 7 days and presence of positive container. Then three significant variables put into fix model to produce equation for prediction model for dengue transmission is $2.343 + (-2.025 \times \text{houses without window screen}) + (1.876 \times \text{frequency cleaning of garbage dump more than 7 days}) + (1.549 \times \text{presence of water container})$ as shown in Table 4.

Table 3: Factors associated with dengue transmission using Simple Logistic Regression

Variabel	Crude OR 95 % CI	p value
Education level		
High	2.37	0.031
Low	(1.04; 5.44)	
Knowledge		
Good	2.45	0.029
Poor	(1.09; 5.49)	
Hanging clothes		
No	1.61	0.401
Yes	(0.53;4.92)	
Frequency cleaning of water container		
≤ 7 days	1.83	0.181
> 7 days	(0.75; 4.44)	
Frequency cleaning of garbage dump		
≤ 7 days	2.93	0.014
> 7 days	(1.25; 6.87)	
House construction		
Wood		0.390
Brick		
Concrete	1.28	
Mixed	(0.73 ; 2.27)	
Window screen		
Yes	3.62	0.003
No	(1.36; 8.40)	
Positive container		
Yes	4.33	0.033
No	(1.13; 16.62)	

Waste management was associated with dengue transmission. As known that the solid waste of plastic bottles, disposed of carelessly can be a breeding place for the vector of dengue fever and thereby could increase the incidence of dengue hemorrhagic fever. In this study the frequency of garbage dump was associated with dengue transmission. This finding is consistent with Thammapalo study *et al.* (2008) the cities of Songkhla and Suwannapong

et al. (2014) in Thailand. They found that poor garbage disposal contributed to dengue transmission^{6,14}. Likewise, Cordeiro *et al.* (2011) study in South East Brazil found that low frequency of garbage collection was associated with an increase in the incidence of DHF¹⁵.

Window screen have been promoted for use to prevent mosquitoes entering the house therefore, preventing contact with *Aedes* mosquitoes. In this study, houses without window screen was associated with dengue transmission. This findings was supported by Norli & Azmi (2008) study in Johor Bahru and Koyadun study *et al.* (2012) in Thailand found that houses without window screen contributed to DHF incidence^{16,17}.

Table 4: Factors associated with dengue transmission using Multiple Logistic Regression

Variabel	β	Crude OR 95 % CI	p value
Frequency cleaning of garbage dump			
≤ 7 days		6.53	0.001
> 7 days	1.87	(2.12; 20.06)	
Window screen			
Yes		7.57	0.000
No	-2.025	(2.53 ; 21.72)	
Positive container			
Yes		4.71	0.027
No	1.549	(1.19 ; 18.62)	
Constant	2.343		

The presence of container positive for larvae would allow mosquito to breed and increase the mosquito population and risk for dengue transmission. In the current study, number of containers positive for *Aedes* larvae were more in the high subdistrict compared to low subdistrict. This related to high incidence in the subdistrict. This findings was consistent to Phuong *et al.* (2008) in a study in Binh Thuan Province, found that positive water container for *Aedes* larvae was associated with high incidence of dengue fever in Binh Thuan Province¹⁸.

Bathtub was one of the important breeding places for *Aedes* mosquitoes. Bathtub made of cement and brick was preferred by *Aedes* for eggs attachment. Most people keep water in the bathtub to take a bath and cleaned up more than two weeks or even once a month. This could be a potential breeding place for *Aedes* and high risk for dengue transmission. In this study, bathtub was the commonest container positive for *Aedes* larvae

both in high and low subdistrict. This finding was consistent to the findings by Yotopranoto *et al.* (2010) in Nginden district and found that traditionally bathtub was the potential container for Aedes larvae inside the house¹⁹.

Vector density as well as breeding places are the important for effective vector control. larval indices was significantly associated with DHF transmission. Health Ministry of Indonesia and The Pan American Health Organization used HI as an indicator for dengue transmission. In this study, house indices (HI) in high subdistrict was more than low subdistrict (22% versus 6%). Therefore, HI in the high subdistrict was more than 10. It indicates that this subdistrict has a high risk of DHF transmission²⁰.

In this study we found that prediction model for dengue transmission is $2.343 + (-2.025 \times \text{houses without window screen}) + (1.876 \times \text{frequency cleaning of garbage dump}) + (1.549 \times \text{presence of water container})$. From this equation can interpreted that one point added in house without window screen will increase risk of dengue transmission is 7.57 times compared to houses with window screen. The increased of one point in frequency cleaning of garbage dump more than 7 days will increase 6.53 times risk of dengue transmission compared to frequency cleaning of garbage dump less than or 7 days. Likewise, for positive water container one point added in presence of water container probably increase 4.71 risk of dengue transmission compared to absence of water container. Thus, houses without window screen, frequency cleaning of garbage dump more than 7 days and presence of water container are predictor dengue transmission

CONCLUSION

Our study revealed that social and ecological factors are associated with dengue transmission. House without window screen, frequency cleaning of garbage dump more than 7 days and presence of larvae positive container are predictor for dengue transmission.

For effective control measures, effort was focused on the risk factors, specifically on social and ecological factors. Therefore, health promotion about dengue prevention is essential to improve dengue preventive measures.

ACKNOWLEDGEMENTS

We are thankful to Rector University of Sumatera Utara provide financial support for this research. Thanks also for head of district health office and head of health facility for their assistance and for all people who were involved in this study

Conflict of Interest: No conflict interest involved in this study.

Ethical Clearance: Before the study was conducted, human subject approval was obtained from The University of North Sumatera on 19 August 19, 2016. The study was approved by the Research and Ethics Committee, School of Nursing, University of North Sumatera (Reference code number 1207/VIII/SP/2016).

REFERENCES

1. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, Drake JM, Brownstein JS, Hoen AG & Sankoh O. The global distribution and burden of dengue. *Nature*. 2013;**496** : 504-507.
2. Brady OJ, Gething PW, Bhatt S, Messina JP, Brownstein JS, Hoen AG & Hay SI. Refining the global spatial limits of dengue virus transmission by evidence-based consensus. *PLoS neglected tropical disease*. 2012 ; **6**(8) : e1760.
3. MHI. Report of dengue hemorrhagic cases in North Sumatera Province. Ministry of Health of Indonesia (MHI), Jakarta, Indonesia. 2015.
4. Torres JR & Castro J. The health and economic impact of dengue in Latin America. *Cad Saude Publica*. 2007; **23 Suppl 1**: S23-31.
5. Mondini A & Chiaravalloti Neto F. Socioeconomic variables and dengue transmission. *Revista de Saude Pública*. 2007; **41**(6) : 923-930.
6. Thammapalo S, Chongsuvivatwong V, Geater A & Dueravee M. Environmental factors and incidence of dengue fever and dengue hemorrhagic fever in an urban area, Southern Thailand. *Epidemiology Infect* ; **136**(1): 135-143.
7. Spiegel J, Bonet M, Maria Ibarra A, Pagliccia N, Ouellette V & Yassi A. Social and environmental determinants of Aedes aegypti infestation in Central Havana: results of a case-control study

- nested in an integrated dengue surveillance programme in Cuba. *Tropical Medicine and International Health*. 2007; **12 (4)**: 503-510.
8. Shuaib F, Todd D, Campbell-Stennett D, Ehiri J & Jolly PE. Knowledge, attitudes and practices regarding dengue infection in Westmoreland, Jamaica. *The West Indian Medical Journal* . 2010; **59(2)** : 139-146.
 9. Al-Dubai S, Ganasegeran K, Mohanad Rahman A, Alshagga MA & Saif-Ali R. Factors affecting dengue fever knowledge, attitudes and practices among selected urban, semi-urban and rural communities in Malaysia. *Southeast Asian Journal Tropical Medicine Public Health*. 2013; **44(1)**: 37-49.
 10. Naing NN. A practical guide on determination on sample size in health science research. Malaysia: Pustaka Aman Press. 2010 : p 36-57.
 11. Siqueira JB, Martelli CM, Maciel IJ, Oliveira R M, Ribeiro MG, Amorim FP, Moreira BC, Cardoso DD, Souza WV & Andrade ALS. Household survey of dengue infection in central Brazil: spatial point pattern analysis and risk factors assessment. *The American Journal of Tropical Medicine and Hygiene*. 2004; **71(5)**: 646-651.
 12. Matta S, Bhalla S, Singh D, Rasania S & Singh S. Knowledge, attitude and practice (KAP) on dengue fever: a hospital based study. *Indian Journal of Community Medicine*. 2006; **31(3)**: 185-186.
 13. Van Benthem B, Khantikul N, Panart K, Kessels P, Somboon P & Oskam L. Knowledge and use of prevention measures related to dengue in northern Thailand. *Tropical Medicine & International Health*. 2002; **7(11)**: 993-1000.
 14. Suwannapong N, Tipayamongkhogul M, Bhumiratana A, Boonshuyar C, Howteerakul N & Poolthin S. Effect of community participation on household environment to mitigate dengue transmission in Thailand. *Tropical Biomedicine*. 2014; **31(1)**:149-158.
 15. Cordeiro R, Donalisio MR, Andrade VR, Mafra AC, Nucci LB, Brown JC & Stephan C. Spatial distribution of the risk of dengue fever in Southeast Brazil, 2006-2007. *BioMed Central Public Health*. 2011; 11(1): 355.
 16. Norli R & Azmi M. A case-control study on factors affecting the incidence of dengue fever in Johor Bahru. *Journal of Community Health*, . 2008; **14(2)** : 56-67.
 17. Koyadun S, Butraporn P& Kittayapong P. Ecologic and sociodemographic risk determinants for dengue transmission in urban areas in Thailand. *Interdisciplinary Perspectives on Infectious Disease.*, **2012**.
 18. Phuong HL, De Vries P, Boonshuyar C, Binh T, Nam NV & Kager PA. Dengue Risk Factors and Community Participation in In Binh Thuan Province, Vietnam, a Household Survey. *Southeast Asian Journal Tropical Medicine Public Health*. 2008; **39 (1)**: 79-89.
 19. Yotopranoto S, Kusmartisnawati K, Mulyanto KC. & Arwati H. The Fluctuation of Aedes Aegypti in Endemic Area of Dengue Hemorrhagic Fever in Surabaya City, Indonesia. *Indonesian Journal of Tropical and Infectious Disease*, 2010; **1(2)**: 60-64.
 20. Pham HV, Doan HT, Phan TT & Minh NNT. Ecological factors associated with dengue fever in a central highlands Province, Vietnam. *BioMed Central Infectious Disease*. 2011; **11(1)**,172.

Determinants of Plumbun Level in Blood among Elementary School Students in Cinangka, Bogor

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ABSTRACT

Plumbun is one of toxic heavy metal that can decrease hemoglobin and IQ, affect the digestive, cardiovascular and reproduction system. In Cinangka Village (Bogor), plumbun pollution on the ground reached 270,000 ppm (WHO threshold = 400 ppm). The purpose of this study was to analyze the determinant factors of plumbun level in blood among elementary school students in Cinangka. This research was an analytic survey with cross sectional design. To measure plumbun, blood samples were taken from 103 students in Cinangka (2014). Independent variables consist of location of residence, parent's education, nutrient intake were known by using questionnaire. The measurement of nutritional status was known by calculating Body Mass Index. Statistical analysis with Mann-whitney test showed there was mean difference in plumbun level between students who living in Cinangka villages and outside Cinangka Village ($p=0.004$). For mother's education, there was mean difference in plumbun level between students who had mother with low education and high education ($p=0.032$). There was not mean difference in plumbun level for father's education ($p=0.250$) and nutritional status variable ($p=0.145$). Rank spearmen correlation test showed there was correlation between intake of potassium ($p=0.05$; correlation coefficient=-0.191), calcium ($p=0.05$; correlation coefficient=-0.192) and zinc ($p=0.05$; correlation coefficient=-0.194). There was not correlation between intake of iron ($p=0,107$) and protein ($p=0.080$) with plumbun. Determinant factors of plumbun level in this study were location of residence, mother's education, intake of potassium, calcium and zinc. Variable of father's education, nutritional status, iron and protein intake were not determinant factors of plumbun level.

Keywords: *Determinant factors, blood lead levels, students*

INTRODUCTION

Heavy metal pollution is becoming a serious issue in developing countries^[1]. Plumbun is one of heavy metal that can pollute the air. The first effect on chronic plumbun poisoning before it reaches the target organ is the presence of disturbances in the biosynthesis of the hem, and if the disorder is not resolved soon it can lead to disruption to various organ systems such as the

nervous system (IQ level), kidneys, reproductive system, gastrointestinal tract and anemia^[2].

Although today some countries have made policies to remove plumbun from gasoline, but plumbun exposure at the population level in some areas, especially in developing countries remains high. Mean of plumbun level in China were reported 13 $\mu\text{g}/\text{dl}$ ^[3], 15 $\mu\text{g}/\text{dl}$ in the urban populations in Bangladesh^[4], and 11 $\mu\text{g}/\text{dl}$ in urban children in India^[5]. Plumbun level in 50 children aged 3 months to 19 years involved in the WHO investigation ranged from 39.8-613.9 $\mu\text{g}/\text{dl}$, with an average of 129.5 $\mu\text{g}/\text{dl}$ (SDs of 92.4 $\mu\text{g}/\text{dl}$)^[6]. In contrast, in developed countries, such as the United States, reported that the mean of plumbun level in children's blood 1.9 $\mu\text{g}/\text{dl}$ ^[7].

Since March-April 2010 there has been an outbreak of plumbun poisoning in the Zamfara region of Nigeria.

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Investigations involving WHO confirmed that severe plumbun poisoning occurred in more than 100 children in Dareta and Yargalma Villages, with a mean of plumbun level in the blood's children of 119 µg/dl [8].

The research was done by Cao (2014) in China showed the arithmetic mean, geometric mean and median of plumbun levels of 0- to 6-year-old children from Shanghai were 22.49 mg/L, 19.65 mg/L and 19.5 mg/L, including 0.26% (6/2291) with concentrations >100 mg/L and 2.7% (61/2291) with concentrations >50 mg/L. Boys' levels (23.57 mg/L) were greater than those of girls (21.2 mg/L). The plumbun levels increased with age. Risk factors for lead contamination included housing environment, parents' education levels, social status, hobbies, and children's nutritional status[9].

Today the battery recycling industry is an important source of plumbun pollutants today. Plumbun is used in industries derived from mined ore (primary) or from battery recycling (secondary)[10].

The Ministry of Environment, Indomesia informed that plumbun pollution is still a problem in Jakarta, Bogor, Depok and Tangerang (Jabodetabek). This indicates that air pollution by plumbun comes from other sources rather than gasoline. began conducting an environmental investigation in 2001 and then resulted in findings in 2005. Early indications indicate that the source of high air pollution by plumbun in Jabodetabek area is due to the battery smelting industries in the various regions. Furthermore, the findings indicate that Tangerang City, Tangerang Regency and Bogor Regency have higher number of battery smelting industries.

Based on the report of The Leaded Gasoline Elimination Committee in 2011, plumbun level in children's blood in the battery smelting area in Tangerang and Bogor quite disturbing. Cinangka is one of the areas in Bogor District that has battery smelting industry and became a polluted place by plumbun since the 1980s. In Cinangka Village, plumbun pollution on the ground reached 270,000 ppm, whereas the WHO threshold is 400 ppm. It can be seen that plumbun pollution based on these results indicates that the quality of the environment is bad enough and contains great harm to human health and other life. The purpose of this study was to analyze the determinant factors of plumbun level in blood among elementary school students in Cinangka.

METHOD

A cross sectional study was conducted during May-June 2014. This study used questionnaire to collect data on the variables of location of residence and parent's education level by doing interview. Variable of nutrient intake was known by using food recall 2x24 hour form/questionnaire. Each participants asked to fill food recall 2x24 hour form. Variable of nutrient intake consist of intake of iron, protein, zinc, calcium and potassium. The measurement of nutritional status was known by calculating Body Mass Index and converted into Z-score value. The Body Mass Index (BMI) was calculated as weight in kilograms divided by height in square meters (kg/m²). Data on plumbun level as dependent variable, was collected by measuring 3 ml venous blood from the arm of participants. Blood specimens were taken by 3 medical personnel from Puskesmas Cilandak, South Jakarta and Jati Rahayu Hospital. The measurement of plumbun level conducted in the Hiperkes laboratory Jakarta, using AAS (atomic absorption spectrophotometer).

Population was the elementary school student in Cinangka Village (Bogor District) grade 4, 5, and 6 with total population 535 students. Simple random sampling method was used to recruit elementary school students in Cinangka. Initially 103 students who met the study's inclusion criteria and approved informed consent, invited to participate in this study.

Variable of location of residence, parent's education level and nutritional status, divided into 2 categories or groups. The Mann-Whitney test was statistical analysis test to analyze whether there was a difference of plumbun level in the 2 categories of each variable. Data analysis using rank spearman correlation test was done to know the correlation of nutrient intake variable (iron, protein, zinc, calcium, potassium) with plumbun level.

RESULTS AND DISCUSSIONS

The description of plumbun level in blood as the dependent variable in this study was shown by tables 1 and 2.

Table 1: Description of Plumbun Level in Students

Variable	Mean	Median	SD	Min	Max
Plumbun level	14.70	14.01	11.95	0.05	52.11

Table 2: Distribution of Plumbun Level Category Based on CDC Treshold

Variable	F	%
Plumbun level		
≥ 5 µg/dl	79	76.7
< 5 µg/dl	26	23.3

WHO has determined that the threshold value for plumbun level in blood was 10 µg/dl, whereas the CDC has set a threshold level of plumbun level of 5 µg/dl^[11]. Based on the results of the analysis, of 103 respondents found that the mean of plumbun level in their blood was 14,70 µg/dl, so that greater than WHO and CDC threshold values. The highest plumbun level of 52.11 µg/dl were found in a boy aged 12.17 years in grade 6 SD. Plumbun levels are grouped into 2 categories based on CDC cut off point of 5 µg/dl. As many as 76.7% of respondents were known to had plumbun levels in blood ≥ 5 µg/dl.

Dhimal (2017) from Nepal reported that, found 64.4% of the children in his research had plumbun level in blood exceeding the CDC cut-off point of 5 µg/dl indicating a serious public health importance. Although no child had a plumbun level >45 µg/dl, which would have required chelation therapy as per CDC guideline^[12].

The results of this study indicate that children living in Cinangka Village and children living outside Cinangka Village had different mean of plumbun levels. It was known that Cinangka is one of the areas in Bogor District which has battery smelting industries and become a place polluted by lead. In the 1980s, Cinangka Village became the center for battery smelting industries. In fact, the battery melting into a home-based industry. In the middle of the settlement, residents burned tin without chimneys and filters of emissions to cause polluted air and the sky covered with black fog. In Cinangka Village, lead pollution on the ground reaches thousands or even hundreds of thousands of ppm, whereas WHO threshold is 400 ppm.

Researchers believe that such conditions lead to environmental contamination in Cinangka Village due to plumbun exposure derived from the battery recycling (recycling) industry that has been ongoing since the 1980s. The presence of lead contamination in the environment caused children living in Cinangka Village had mean of plumbun level, higher than children living outside Cinangka Village.

This study had a similar result with a study by Clune et al (2011). Clune tried to create a global map of plumbun level in blood in children, by reviewing 120 scientific publication data representing a total of 62,275 children, of which the sample came from 242 different populations. Of the 242 populations, as many as 57 populations (24%) can be formed a hotspot or points of the area contained plumbun pollution. 57 hotspots representing 8,345 children. It was known that 9 hotspots had mean of plumbun level in blood ≥ 20 µg / dl, and the most commonly presumed major source of hotspots were melting and casting, recycled batteries and pottery-glazed pottery. 3 hotspots had mean of plumbun level in blood ≥ 40 µg/dl, and this is related to the production of lead-glazed pottery in La Victoria, Ecuador (mean=40 µg/dl), 15 batteries recycling in Manila, Philippines (mean=49.9 µg/dl), 16 hotspots of metal disassembly in Mumbai, India (geometric mean 69.2 µg/dl)^[13].

Table 3: Description of Nutrient Intake in Student

Variable	Mean	Min	Max	P value	r
Iron intake	4.82	0.4	21,5	0.107	-0.160
Protein intake	30.71	4.2	76.8	0.08	-0.174
Zinc intake	3.43	0.50	10.30	0.05	-0.194
Calcium intake	280.97	11.0	1638,6	0.05	-0.192
Potassium intake	659.23	47.5	2450.6	0.05	-0.191

The result of univariate analysis showed that from 103 respondents it was known that the mean of iron intake in students was 30.708 g, zinc intake 3.2 mg, calcium intake 280.968 mg and potassium intake 659.233 mg. Bivariate analysis using Rank Spearman correlation test showed from 5 variable of nutrient intake, there were 3 variables that had correlation with plumbun level. The three variables were zinc intake, calcium intake and potassium intake, where all variables had p value of 0.05. Rank Spearman coefficient value of -0.194 for zinc intake, -0.192 for calcium intake and -0.191 for potassium intake. The coefficient was negative, it means that zinc, calcium and potassium had negative relationship with plumbun level. The interpretation was, the higher the zinc, calcium and potassium intake, the lower the plumbun level in blood.

Results showed there was no correlation between iron intake and plumbun level. This was probably

because there were other factors that are more influential for plumbun level, such as the other nutritional intake. This study was not in line with research conducted by Bagepally (2016) in India. The results showed the workers with plumbun level > 30 µg/dl (Fe 1745 ± 723 µg/l) had significantly (p<0.05) lower serum Fe ratio as compared to workers with plumbun level ≤ 30 µg/dL (Fe 2063 ± 784 µg/l). The serum Fe showed significant negative correlation with plumbun level^[14].

This study found a correlation between zinc intake and plumbun level in the blood. This was supported by previous research conducted by Chao (2014) in China. He reported that zinc supplementation proved to be a protective factor of high plumbun level in blood (p = 0.039). Iron, zinc, calcium and plumbun are all divalent metal ions, and are absorbed from the gastrointestinal tract and metabolized through common pathways. Dietary deficiencies of the trace iron, zinc, and calcium elements lead to increased plumbun absorption. A diet full of dairy products can act to diminish the absorption of plumbun^[9].

The result of study was conducted by Pramono, et al (2017) showed all school children in their study (100%) had plumbun level in blood ≥ 10 µg/dl and zinc serum levels < 65 µg/dl. Recently, even though plumbun level in blood less than 10 µg/dl is considered safe, a study confirmed that plumbun level in blood < 10 µg/dl has associated with cognitive deficits. Thus our data showed all children had low zinc serum levels (< 65 µg/dl). The Joint WHO/UNICEF/IAEA/IZiNCG asserted zinc serum levels < 65 µg/dl has been recognized as serious public health problems^[15].

Data indicated there was a correlation between calcium intake with plumbun level. A research conducted by Lacasana in Mexico city showed the average of blood lead level in 200 children under five years was 9.93 w g dl⁻¹ (range 1-31 w g dl⁻¹). An inverse relationship was observed between plumbun levels in blood and daily calcium intake. This relationship was statistically significant among children aged 13 months - 5 years^[16].

In theory, under low-calcium dietary conditions may increase plumbun absorption^[11]. Calcium is absorbed via passive transport through epithelial cell tight junctions, and via active, vitamin D-regulated, transport, which predominates, especially when intake levels are low to moderate. Plumbun uses both these mechanisms to cross intestinal cells, and the luminal calcium transport protein 1 (CaT1) exhibits high affinity for both calcium

and lead.³⁹ Therefore, competition between plumbun and calcium exists at the active transporter, and it makes sense that low calcium intake would be related to greater plumbun absorption. Because the expression of CaT1 is dependent on vitamin D, however, the status of this vitamin would play an important role in plumbun absorption^[17]. Among postpartum women in Mexico City, lower levels of bone plumbun were associated with higher intakes of calcium, vitamin D, phosphorus, magnesium iron, zinc, and vitamin C, though these relationships showed inconsistent trends^[18].

The results showed a correlation between potassium intake and plumbun level in blood. In theory, a low intake of potassium will result in an increase in blood pressure. Potassium and plumbun have indirect correlation. This is because plumbun can have an impact on human health, such as hypertension, while low potassium intake can also affect the occurrence of hypertension. The results of Han's (2018) study in China showed plumbun level in blood was positively associated with systolic blood pressure (SBP) and diastolic blood pressure (DBP) and with the morbidity of hypertension in occupational populations with a high concentration of lead exposure^[19].

Table 4: Distribution of Location of Residence, Nutritional Status and Parent's Education Level

Variable	Frequency	Mean	p value
Location of residence:			
Living in Cinangka Village	94	54.62	0.004
Living outside Cinangka Village	9	24.61	
Nutritional status:			
Malnutrition	33	45.79	0.145
Normal	70	54.93	
Mother's education:			
Low education	81	55.27	0.032
High education	22	39.95	
Father's education:			
Low education	71	54.26	0.250
High education	32	46.98	

Table 4 shows that the mean of plumbun level in children who living in Cinangka Village (54.62 g/dl), were higher than plumbun level in children living outside Cinangka Village (24.61 g/dl). The result of Mhan-Whitney test showed that there was a difference mean of plumbun level in children living in Cinangka

Village and outside Cinangka Village, with p value of 0.004. For nutritional status variables, bivariate analysis showed that the mean of plumbun level in children with malnutrition condition and children with normal nutritional status were no different (p value of 0.145).

Meanwhile, children who had mothers with low education had mean of plumbun levels higher (55.27 g/dl) than children who had mother with high education level (39.95 g/dl). The result of bivariate analysis using Mhan-Whitney test showed that there was a mean difference of plumbun level in children who had mother with high and low education (p value = 0.032). Similar results were shown by Chao's research in China (2014). Based on bivariate analysis, p value of 0.000 with OR of 1.25 and CI = 1.14-1.37. Parents' level of education can indirectly affect children's plumbun level in blood. Parents' learning and understanding of plumbun poisoning is related to their level of education^[9]. Mothers have an important role to regulate eating patterns in the family. Thus, theoretically the higher of mother's education level, the higher the level of knowledge she has. For the variable of father's education level, the result of bivariate analysis did not show any difference in the mean of plumbun level between children with high and low education father.

CONCLUSIONS

Determinant factors of plumbun level in this study were location of residence, mother's education, intake of potassium, calcium and zinc. Variable of father's education, nutritional status, iron and protein intake were not determinant factors of plumbun level.

ACKNOWLEDGEMENTS

We are grateful to all of the respondents in this research, Ministry of Education, University of Indonesia and also Kuningan Health Science Institute. This research was funded by the Ministry of Education Indonesia.

Conflict of Interest: There was no conflict of interest in this study.

Ethical Clearance: This study has been approved by the Ethics Committee from Kuningan Health Science Institute.

REFERENCES

1. C. Sheng Qu, Z. Wei Ma, J. Yang, Y. Liu, J. Bi, L. Huang. Human Exposure Pathways of Heavy Metals in a Lead-Zinc Mining Area, Jiangsu Province, China. *Plos one journal*. 2012 ; 7 [11]
2. R.A. Goyer, Toxic Effects of Metals. In Casarett and Doull's Toxicology. The Basic Science of Poisons 3rd Edition. New York, Macmillan Publishing Co. 1993
3. X.Ye, H. Fu, T. Guidotti. Environmental Exposure and Children's Health in China. *Arch Environ Occup Health Journal*. 2007 ; 62 [2] : 61-73
4. R. Kaiser , A. K. Henderson, W. R. Daley, M. Naughton, M. H. Khan, M. Rahman , et al., Blood Lead Levels of Primary School Children in Dhaka, Bangladesh. *Environmental Health Perspective Journal*. 2001; 109 : 563 – 5665. X.Ye, H. Fu, T. Guidotti. Environmental Exposure and Children's Health in China. *Arch Environ Occup Health Journal*. 2007 ; 62 [2] : 61-73
5. A. Roy, D. Bellinger, H. Hu, J. Schwartz, A. S. Ettinger, R. O. Wright, et al., Hemoglobin, Lead Exposure, and Intelligence Quotient: Effect Modification by the DRD2 Taq IA Polymorphism. *Environmental Health Perspective Journal*. 2009 ; 117:1607 – 1611
6. P.Haefliger, M. M. Nolf, S. Locicero, C. Ndiaye, M. Coly, A. Diouf, A. L. Faye, A. Sow, J. Tempowski, J. Pronczuk, A. P. F. Junior, R. Bertollini, R. and M. Neira. Mass lead intoxication from informal used lead-acid battery recycling in Dakar, Senegal. *Environmental Health Perspective Journal*. 2009; 117 [10]
7. R. L. Jones, D. M. Homa, P. A. Meyer, D. J. Brody, K. L. Caldwell, J. L. Pirkle, et al., Trends in Blood Lead Levels and Blood Lead Testing among US Children Aged 1 to 5 Years, 1988 – 2004. *Pediatrics Journal*. 2009 ; 123[3] : 376 - 385
8. 10. World Health Organization (WHO), Nigeria: Mass Lead Poisoning from Mining Activities, Zamfara State. http://www.who.int/csr/don/2010_07_07/en/index.html (2010)
9. J. Cao, M. Li, Y. Wang, G. Yu, C. Yan. Environmental Lead Exposure among Preschool Children in Shanghai, China: Blood Lead Levels

- and Risk Factors. PLOS ONE Journal 2014 ; 1. Available from : <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0113297>
10. World Health Organization (WHO), Childhood Lead Poisoning, The WHO Document Production Services, Geneva, Switzerland. 2010
 11. Pediatric Environmental Health Specialty Unit (PEHSU), Recommendations on Medical Management of Childhood Lead Exposure and Poisoning, PEHSU Publications. 2013
 12. M. Dhimal, K. M., Karki, K. K. Aryal, B. Dhimal, H. D. Joshi, S. Puri, A. R. Pandey, P. Dhakal, A. K. Sharma, G. B. Raya, I. Ansari, D. A. Groneberg, R. M. Iler, and U. Kuch. Correction: High blood levels of lead in children aged 6-36 months in Kathmandu Valley, Nepal: A cross-sectional study of associated factors. PLOS ONE Journal. 2017; Available from : <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185773>.
 13. A. L. Clune, H. Falk, A. M. Mapping Global Environmental Lead Poisoning in Children. Journal of Health and Pollution. 2011 ; 1 [2]
 14. B. S. Bagepally, R. Kalahasthi, and T. Barman, T. Serum Iron, Zinc and its relationship with Blood lead levels among lead exposed worker from lead battery plant. Journal of Molecular Pathophysiology. 2016 ; 5, 1-7
 15. A. Pramono, B. Panunggal, M. Z. Rahfiludin and F. Swastawati, . 2017. Low zinc serum levels and high blood lead levels among school-age children in coastal area. 2nd International Conference on Tropical and Coastal Region Eco Development 2016 IOP Publishing. IOP Conf. Series: Earth and Environmental Science 55 (2017)
 16. M. Lacasana, I. Romieu, L. H. Sanin, E. Palazuelos, M. Hernandez-Avila. 2010. Blood lead levels and calcium intake in Mexico City children under five years of age. International Journal of Environmental Health Research. Published online: 21 Jul 2010 ; Available from : <https://doi.org/10.1080/0960312002001537>
 17. K. Kordas The “Lead Diet”: Can Dietary Approaches Prevent or Treat Lead Exposure?. The Journal Of Pediatrics. 2017 ; 185
 18. A. S. Ettinger, H. Hu, and M. H. Avila. Dietary Calcium Supplementation to Lower Blood Lead Levels in Pregnancy and Lactation. Journal Nutr Biochem. 2007 ; 18(3): 172–178. Available from : doi:10.1016/j.jnutbio.2006.12.007.
 19. L. Han, X. Wan, R. Han, M. Xu, Y. Zhao, Q. Gao, H. Shen, H. Zhang. Association between blood lead level and blood pressure: An occupational populationbased study in Jiangsu province, China PLOS ONE Journal ; 2018. Available from : <https://doi.org/10.1371/journal.pone.0200289>

Immunization Coverage on Infant in High-Risk Area in Semarang City Indonesia

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ABSTRACT

In 2013, the national target of UCI was 86%, and 20% villages in Indonesia have not yet reached the national standard coverage. High risk Areas were very risky to have lower coverage. The aim this research was to identify the coverage of immunization (UCI) in Semarang City. The research is an observational descriptive with quantitative and qualitative approach. The high-risk areas in this study were Bandarharjo, Dadapsari, Kuningan, Pedurungan Lor, and Tanjungmas villages. The sample was 64 infants from all villages and the respondent were the infant's parent. UCI was measured using Rapid Card Check (RCC) form recommended by UNICEF. The results of the study indicated that several infants were still unimmunized. High-risk areas meant that the areas status was economically poor, crowded, and bad sanitation. Under-five mothers refused to immunize their babies for any reasons, such as because of religion, preoccupation, and sickness. Immunization was infant's right. Immunization was very important to maintain the infant's health from the disease in case of outbreak. Understanding of the infant's mother was necessary to raise the coverage of immunization in Semarang City.

Keywords: *Immunization coverage, UCI, RCC, High risk*

INTRODUCTION

To eradicate infectious diseases is very difficult because their spread might go anywhere even across administrative boundaries. To prevent the spread of the disease to other areas, immunization is one of the measures although it is very cost effective. Immunization is of primary prevention efforts.⁽¹⁾

According to Law Number 36, 2009 on Health, immunization is one of priority activities of the Ministry of Health. The main objective of the immunization program is to reduce morbidity and mortality caused by

preventable diseases by immunization (PDI). PDI is a contagious disease that potentially leads to outbreaks and death especially in Toddlers.⁽²⁾

Routine Data of Directorate General of P2P of 2015 showed that the coverage of complete basic immunization from 2013-2015 decreased from 89.9%, 86.9%, to 86.5% nationally.⁽³⁾ According to routine data of 2013, the complete basic immunization coverage reached its target as stated in Strategic Plan (Renstra) of the Ministry of Health.⁽⁴⁾ However, in 2014 and 2015, the immunization coverage did not reach its target of the strategic plan.⁽⁵⁾

In 2013-2015, the coverage of complete basic immunization in Central Java was 100.7%, 93.4%, and 97.2%. In the case of PDI, measles was considered extraordinary events (KLB), as there were 32 cases in 2013, 308 cases in 2014, and 576 cases in 2015.⁽⁶⁾

In Semarang City during 2013-2015, the basic immunization coverage decreased. The coverage of HB0

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immunization in 2013-2015 was 113%, 88%, and 94%; of BCG immunization was 118%; 102%; and 100%. Meanwhile, the immunization of Penta 3 was 121%; 100%, and 101%; of Polio 4 immunization was 120%, 100%, and 102%; and of Measles immunization was 122%, 101%, and 104%.⁽⁷⁾

In 2013, approximately 20% of villages in Indonesia did not meet the national UCI target of 86%. In Central Java during 2013-2015, the achievement of UCI was 99.14%, 99.7%, and 99.95%.⁽⁶⁾ Meanwhile, in Semarang City in 2015, the number of villages that meet UCI was > 80%, as many as 177 villages (100%) from 177 villages. This number is still the same until today since 2013.⁽⁷⁾

The Government at district/municipal and provincial level undertaken by community health center shall carry out national planning for the implementation of immunization. The immunization planning includes identifying the location, logistical needs, and funding. In the era of decentralization, the success of the immunization program is largely determined by strong commitment, operational cost support, and other resources provided by local governments.

The condition of health of infants and toddlers in Semarang City is still high at the level of community health center. Based on the problems, the coverage of immunization in high risk areas in Semarang City was being the focus of the investigation

METHOD

The research design used in this research was descriptive observational with quantitative and qualitative approach that describes immunization coverage in Semarang City. The population was all parents who have babies of < 2 years old living in high-risk areas in Semarang City i.e. Bandarharjo, Dadapsari, Kuningan, Pedurungan Lor, and Tanjungmas. The sample was parents who have babies of < 2 years old in Semarang City with a total sample of 64 respondents. The technique in sampling in this research was random sampling. This research was conducted in 1 month from February-March 2017.

The research instrument used was Rapid Card Check (RCC) form recommended by UNICEF. The research variables include immunization coverage and accuracy of immunization.

RESULT AND DISCUSSION

Table 1: Criteria of High Risk Community and Sources of Immunization Information

Variables	Yes		No	
	f	%	f	%
HRC Criteria				
Slum	18	28.1	46	71.9
Poor	16	25.0	48	75.0
Boro	1	1.6	63	98.4
Minority	15	23.4	49	76.6
River banks	0	0	64	100
Railway Sides	0	0	64	100
Certain religion	0	0	64	100
Certain ethnicity	0	0	64	100
Others	0	0	64	100
Source of information				
Health worker	41	64.1	23	35.9
Kader	25	39.1	39	60.9
School	0	0	64	100
Religion Leaders	4	6.3	60	93.8
Friend/Neighbor	9	14.1	55	85.9
TV	11	17.2	53	82.8
Radio	0	0.0	64	100
Newspaper	1	1.6	63	98.4
Leaflet	0	0	64	100
Banner	0	0	64	100
Poster	2	3.1	62	96.9
Others	4	6.3	60	93.8

Table 1 shows that 18 out of 64 respondents chose slums as the greatest criteria in high-risk groups; while, riverbank, rail sides, religion, and ethnic were not categorizing as high-risk groups criteria.

Furthermore, 64.1% of respondents received immunization information from health workers; while, information from schools, radio, leaflets, and banners were not the sources for respondents.

Table 2: Coverage and Accuracy of Immunization

Variables	Yes		No	
	f	%	f	%
Coverage of Immunization				
HB0	47	73.4	17	26.6
BCG	49	76.6	15	23.4
Penta 3	31	48.4	33	51.6

Conted...

Polio 4	33	51.6	31	48.4
Measles	27	42.2	37	57.8
Accuracy of Immunization				
HB0	43	67.2	21	32.8
BCG	42	65.6	22	34.4
Penta 3	22	34.4	42	65.6
Polio 4	21	32.8	43	67.2
Measles	18	28.1	46	71.9

According to data research of basic immunization coverage in Semarang City, many parents did not immunize their children in that region. The most immunization not given was penta 3 immunization as many as 51.6% and measles as many as 57.8%.

The result showed that many mothers did not properly provide immunization to their baby. For HB0 immunization, 67.2% had immunized their baby at the age of 0-7 days; while, 32.8% of infants were immunized improperly time.

For BCG, 65.6% infants had received BCG immunization before their infants were 1 month old; while, 34.4% of infants were immunized improperly time.

For Penta 3, 34.4% of infants had been immunized Penta 3 before the baby was 4 months old; while, 65.6% of infants were immunized not at proper time.

For Polio 4, 32.8% of infants had received Polio 4 immunization before the baby was 4 months old; while, 67.2% of infants were immunized not at proper time.

For measles, 28.1% of infants had been immunized against Measles before the baby was 9 months old; while, 71.9% of infants were immunized not at proper time.

The result showed that immunization coverage in high-risk area in Semarang city was low because there were still infants who have not been immunized. Data from interviews showed that mothers did not immunize their children for several reasons such as sick children, parents were busy working, lack of knowledge, and religious factors believed that the vaccine used was forbidden (haram).

The research conducted Arumsari (2015) concluded that the reason most often raised by mothers who do not immunize their baby is due to busy mom working and inappropriate schedule of immunization.⁽⁸⁾ Meanwhile,

Maryani and Sulastri (2009) stated that there are values and beliefs influence mother not to immunize their infant taken place in Blumbang Village Tawangmangu Subdistrict, Karanganyar Regency.⁽⁹⁾

Parents also stated that health officer's factors also affected the implementation of immunization by mothers. This finding was in accordance with the research conducted Adriani (2015) who stated that health officers who have poor performance affect the coverage of immunization.⁽¹⁰⁾ This was also in line with the research of Kontesa & Mistuti (2013) in working area of community health center of Air Dingin, Kecamatan Koto Tengah, Kota Padang that more than half (57.6%) of respondents stated that a health officer in the working area of community health center Air Dingin, KotoTengah Subdistrict perform poorly.⁽¹¹⁾

The absence of counseling from cadres caused little information of immunization mothers obtained and the mother feared about the emergence of ill effects after immunization. The lack of cadres in maximum reaching the mother was caused by several factors such as limited facilities and infrastructure in making home visits, lack of knowledge about immunization, and the number of reports that cadres must do.

This finding was consistent with L. Green's theory of enabling factors that include the availability of infrastructure, health care facilities, and individual health care needs.⁽¹²⁾ In a study conducted by Adriani (2015), there was an association between education, training, and knowledge, posyandu facilities and infrastructure, motivation, wage salary, tenure, and cadre attitude with the performance of posyandu cadres on the performance of posyandu cadres.⁽¹⁰⁾

The impact was that mothers did not immunize nor delayed in giving immunization to their children. In addition, the cadres expressed the need for cooperation with religious leaders/community leaders in supporting immunization activities to encourage and convince community that immunization is religiously accepted (halal).

CONCLUSION

The conclusion of this research is that there are still babies who still do not completely immunized on time in Semarang City. Immunization is the right of the baby.

Immunization is very important to keep baby's health from disease in case of outbreak. Maternal understanding needs to be developed to increase immunization coverage in Semarang City. Support of religious leaders/ community leaders can be the one of the efforts in encouraging people to immunize their children.

ACKNOWLEDGMENT

We would like to extend our gratitude to the Unicef for the facilitation of funds, and Health Officer of Semarang City permits in carrying out research, as well as research respondents.

Conflict of Interest: None

Ethical Clearance: The study was approved by the Ethics Committee on Public Health Faculty, Diponegoro University on April, 25th, 2018, Number 040/EC/FKM/2018

REFERENCES

1. Ranuh IG, Suyitno H, Hadinegoro SRS, Kartasasmita CB, Ismoedijanto, Soedjatmiko. Pedoman imunisasi di Indonesia. Ketiga. Jakarta: Satgas Imunisasi-IDAI; 2008. 2-9 p.
2. Undang-Undang Republik Indonesia Nomor 36 tahun 2009 Tentang Kesehatan.
3. Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia. 2017. Data dan Informasi Profil Kesehatan Indonesia 2016
4. Balitbang Kementerian Kesehatan Republik Indonesia. 2014. Riset Kesehatan Dasar 2013. Jakarta: Balitbang Kementerian Kesehatan RI
5. Pusat Data dan Informasi Kementerian Kesehatan Republik Indonesia. 2016. Situasi Imunisasi di Indonesia
6. Dinas Kesehatan Jawa Tengah. 2016. Profil Kesehatan Provinsi Jawa Tengah Tahun 2015. Semarang: Dinas Kesehatan Provinsi Jawa Tengah
7. Dinas Kesehatan Kota Semarang. 2016. Profil Kesehatan Kota Semarang Tahun 2015. Semarang: Dinas Kesehatan Provinsi Kota Semarang
8. Arumsari, Rahmaika D. Faktor- faktor yang Berhubungan dengan Status Imunisasi Dasar pada Bayi. *J Pendidik Kesehat.* 2015; 4(1): 9–15.
9. Maryani I, Sulastri. Faktor-faktor yang Mempengaruhi Ketidapatuhan Ibu terhadap Pelaksanaan Imunisasi pada Balita di Desa Blumbang Kecamatan Tawangmangu Kabupaten Karanganyar. 2009; 182–90.
10. Adriani M, Puadi. Faktor-faktor yang Mempengaruhi Kinerja Kader Posyandu dalam Kegiatan Imunisasi Dasar Lengkap di Wilayah Kerja Puskesmas Perkotaan Rasimah Ahmad Tahun 2015. *J Berk Epidemiol.* 2015; 2(2): 83–92.
11. Kontesa M, Mistuti. 2013. Faktor Yang Berhubungan Dengan Kinerja Kader Posyandu Di Wilayah Kerja Puskesmas Air Dingin Kecamatan Koto Tangah Kota Padang. Padang: *Jurnal STIKes MERCUBAKTIJAYA* Padang.
12. Green L. 1991. *Health Promotion Planning An Educational and Environmental Approach*, 2nd edition. London: Mayfield Publishing Company

Qualitative Study: Patients Perception of PITC in Semarang's Hospitals

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ABSTRACT

HIV test is the only way to know a person's HIV status. The number of patients who were initiated to do HIV test was very low, compared to the number of patients showing AIDS clinical symptoms and the number of babies born from HIV-positive-mother. Moreover, there was a great rejection from patients to do HIV test. The objective of this research was to describe hospital patients' perception of the implementation of PITC by health care workers. This was a qualitative research using case study design. Nine informants were in-depth interviewed from two hospitals in Semarang City which implement PITC. The result showed that patients were assuming that the initiation of HIV test by health care workers was important because they were hoping to know their sickness, so they could get the proper treatment as soon as possible. Information about HIV test was given incompletely, because PITC was practiced in short time and in a lack-of-privacy room. It is suggested to PITC implementers that the initiation of HIV test should be carried out by focusing more on patients understanding about why they were initiated to do HIV test and focusing more on the 3 C, especially the confidentiality as mentioned in PITC Guideline by Ministry of Health of Indonesia.

Keywords: PITC, HIV Test, Hospital, Patients

INTRODUCTION

AIDS (Acquired Immune Deficiency Syndrome) appeared as an epidemic disease in several countries since years ago caused by HIV (Human Immunodeficiency Virus). This virus weakened human immune system. A person who infected by HIV could easily be infected by other germs, bacteria and viruses. The condition will then be called AIDS when the person has some opportunistic infections.^{1,2,3}

HIV&AIDS cases is similar to the ice berg phenomenon. There are big numbers of unknown cases than the known cases. The only way to find the unknown cases is to implement HIV test to more people. HIV Test is encouraged among key populations.^{1,4,5}

There are two types of HIV test based on the initiation, they are Client Initiated-Testing and Counseling (CITC) and Provider Initiated-Testing and Counseling (PITC). Client Initiated-Testing and Counseling (CITC) mostly known as Voluntary Counseling and Testing (VCT) in some countries. In VCT, patients come to the health facilities to do HIV test of their own willingness. The main reason they decided to do VCT is due to the feeling of vulnerability or at risk. However, not everyone willing to do HIV test, even those who are at high risk.^{6,7}

Provider Initiated Testing and Counseling (PITC) is an HIV test that initiated by health care workers and offered to all patients. The implementation of PITC to all patients is expected to increase patients' access to do HIV test, society acceptance to HIV test, and HIV detection rate.⁷ PITC should be offered to all patients who show clinical symptoms indicating HIV infections, without considering the epidemic level.^{8,9}

The implementation of PITC in hospital is considered important to find new cases of AIDS. Health care workers need to initiate more suspected patients to do HIV test.

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Hospitals generally have facilities for Mother and Child Health, Tuberculosis, Sexual Transmitted Infections, and facilities for people at high risks.^{9,10}

Semarang is at concentrated epidemics level of HIV, which means PITC must be implemented to all patients showing clinical symptoms of HIV and to all babies born from mother living with HIV. Based on annual report of PITC, from three hospitals in Semarang City, there were 341 patients who were pre tested in PITC in 2012.¹¹ The number of patients initiated to do HIV test was very low compare to the number of patients who have clinical symptoms indicating AIDS and the number of babies who were born from mother living with HIV.¹²

The big gap between the patients initiated to do HIV test with the patients who should have been initiated to do HIV test is a fundamental problem in PITC implementation in Semarang City. Based on the previous research conducted to PITC implementers in Semarang City, it was found that there was a great rejection from patients to do HIV test although the implementers were all trained well.¹³

Therefore, the objective of this research is to describe the patients' perception of PITC implementation in hospital setting.

METHOD

This research was conducted by using qualitative method and case study approach to describe patients' perception of PITC implementation in hospital setting. This research was implemented in Semarang City, Central Java Province, Indonesia. The research site was chosen based on the existence of PITC program and regular report of PITC implementation to Semarang Health Office.

From 28 hospitals in Semarang City, there were only 3 hospitals who met the criteria. Those hospitals have different characteristics. Such as the patient's residences, the origin of referral, PITC implementer sector, and PITC implementers. However, this research was implemented in two hospitals due to permission issues.

The sampling was done by purposive sampling method because the informants in this research are patients who have been initiated to do HIV test by health care workers. There were 9 informants who were in-depth interviewed.

Data was content analyzed and used triangulation for the validation method. The triangulation was done by in-depth interviewing the PTC implementers, Head Unit of HIV or VCT, and to the Person in Charge (PIC) of HIV program or VCT program at the related hospital.

RESULTS AND DISCUSSIONS

Characteristics: There were 9 informants who participate in this research. Informants were in productive age. The youngest informant was 22 years old. The oldest informant was 38 years old. Five informants were female and four informants were male.

All of the informants had finished 9-years compulsory education. Two informants were graduated from Junior High School. Seven informants were graduated from Senior High School.

Six of the informants were married. One of the married informants admitted that the partner had opportunistic infections of AIDS. And the partner was once initiated to do HIV test by health care workers.

Four of the informants admitted that they did unsafe sex with many sexual partners. Which means, they never used condoms everytime they are having sex.

Three of the informants did HIV test before being initiated in current hospitals. One of them was initiated by midwife in public health center. The other was forced by the prison guard. And the other one was doing it by his own willingness. While the six others never had HIV test before and never being initiated to do HIV test.

Result showed that 2 informants were mother who gave birth and 7 informants were patients with severe infections. Most of the informants had opportunistic infections.

The Delivery of Health Care Workers: Result showed that almost all of the informants thought that the health care workers were nice, care, patient and communicative when initiating HIV test. The health care workers also giving the chances for patients to ask anything that patients need to know. Eventhough some informants did not asked anything because they did not know what to ask.

The attitude of health care workers made patients felt comfortable when they are implementing PITC, from the beginning of giving the information about HIV test until the PITC process is finished. Therefore, it made the patients felt satisfied.

However, one of the informants thought that the attitude of health care workers was not communicative and not friendly. Informant stated that the health care workers were unfriendly, grumpy and curt, including the health care worker who implement PITC. This condition is uncomfortable for informant. The feeling of uncomfortable could affect informants' reception to HIV test, hence informants would feel unsatisfied with the service from health care workers.

In a service, there are some external factors that influence consumer's perception. A study completed by Gulliver about health services showed that the characteristics of health care workers could influence patient's perception to given services. The characteristics are race, health care worker's ability in doing certain services, and health care workers credibility.¹⁴

Most of the informants thought that there were only a little information that were given in PITC. Most of health care workers only asked informants' risky behavior history. They did not explain anything about HIV&AIDS or anything related to HIV test to informants. However, all of the informants said that PITC implementers explained the reason for initiating HIV test to them. They also explained that HIV test and the result of HIV test is confidential. The PITC implementers also explained that patients have the right not to tell anyone about the HIV test result, but PITC implementers suggest them to tell their spouses as a precautions and to initiate HIV test to their spouses.

The explanation from informants proved that the information that was given in PITC implementation was not consistent to the Guidance of PITC implementation by Health Ministry of Republic Indonesia. The pre test information should be focusing on three components : give important information about HIV&AIDS, explain the procedure to guarantee confidentiality, and make sure the patient is willing to do the test and ask their consent.^{8,10}

Those three components were not delivered by all of the PITC implementers. According to some informants, the PITC implementers did not delivered important information about HIV&AIDS and the procedure to guarantee patients' confidentiality. They only asked for patients' consent to do HIV test. However, based on the triangulation result with PITC implementers and the Head of VCT Unit, they stated that the patients might

not understand entirely about the information that was given by PITC implementers when they were initiated to do HIV test. Patients tend to agree to anything that was offered by health care workers, including PITC implementers, because patients had high hope to recover.

All of the informants thought the communication method which was used by health care workers when implementing PITC was good enough. Informants felt comfortable because PITC implementers were using interpersonal communication method and it made them feel more private. Almost all of the informants did not need any media in receiveing any information related to HIV test and HIV&AIDS. However, the PITC implementers in one hospital stated that he needed to bring paper or flip notes (writing media) when implementing PITC to a patient who stayed in a ward full with other patients (and patients companion), and it was not possible to move patients to another empty room. The paper or flip notes will be used to write sensitive words such as HIV, HIV Test, and other sensitive words. The PITC implementers will write those words on the writing media and tried to avoid saying those words. Hence, when the PITC implementers had to say it, he will only need to point at the paper or flip notes.

That method was done in order to keep the confidentiality, so patients will be spared from stigma and discrimination that might happen in the future. Also in order to prevent other patients or other people in the ward knew what PITC implementers doing to the patients.

Based on the Guidance of PITC implementation by Ministry of Health, the delivery of pre test information could be given individually, pair or groups, according to the condition. However, the consent have to be given individually, private, witnessed by health care workers.^{8,10}

The Place and Time: The PITC implementers initiate HIV test in varied places. PITC implemented depends on patients' condition. The result of this research showed that most of the informants were initiated to do HIV test in the inpatient room. One of them stayed in a one-bed-inpatient room, so the PITC implementation was done in the room without worrying that their conversation could be heard by other people. Other informants were staying in a two-beds-inpatient room, four-beds-inpatient room, and six-beds-ward. Three informants stated that the HIV test initiation was implemented in a 6-beds-ward

with full of people. Ideally, PITC implementer should move the patients to other room with more privacy so the initiation process could be done by prioritizing the confidentiality. According the triangulation result to the PITC implementers and Head of VCT Unit, such condition happened due to patients' condition (having severe disease or not able to move out of the bed), they could not be moved to another room, even sometimes there was no empty room that could be used by PITC implementers. Therefore, the PITC will be done in the inpatient room whether there were a lot of people or not. However, the PITC will be done very carefully by closing the separator curtain and talking with very low volume as long as the patient could hear. Informants stated that they did not mind to do PITC in their inpatient room or wards, because they wanted to be recovered as soon as possible, so whatever they need to do, they will do it.

Four of the informants stated that the HIV test initiation was conducted in 5 minutes. While three informants stated that the HIV test initiation was conducted in 30 minutes. However, there were two informants who stated that the initiation was done in a very short time. Informants explained that the PITC implementers were in a rush and only explained that their blood will be tested and informants were asked to sign the informed consent, without any explanation about HIV&AIDS and HIV test. Even PITC implementers did not explain about the reason of taking the blood sample. All of the informants thought that the HIV test initiation should be carried out for about 10 to 30 minutes, so informants could get enough information about the reason they were initiated, about HIV&AIDS and about HIV test. However, almost all of the informants perceived that the place and time in PITC implementation is satisfying enough. It is corresponding with the study from Anjaryani in 2009, which stated that attitude, behavior, speech, friendliness and easy access to information and communication ranked the highest in patient's perception of satisfaction. Eventhough patients felt the outcome was not suitable to their expectation, but they still feel satisfied enough if they were served with the attitude that respect their feelings and dignity.¹⁵

According to the triangulation result, the PITC implementers from both hospital stated that they tried their best to implement PITC. However, in the implementation of any programs, there will be some obstacles, as well as in the implementation of PITC. The

condition of patients that were impossible to be moved to a more private room made the PITC implementer forced to "cheat" such situation. However, the "cheating" act was considered as a solution to PITC implementers so PITC could still be implemented without decreasing the focus of the implementation and uphold the 3 C principle (Consent, Counselling, Confidentiality).

CONCLUSIONS

Informants perceived that PITC is important for them, therefore they agree to do HIV test. However, they need a longer pre HIV test, because they need more information about the reason they were initiated, about HIV&AIDS, and about HIV test when PITC was implemented to them. It is suggested that PITC could be implemented by focusing more on patients understanding about why they were initiated to do HIV test and focusing more on the 3 C, especially the Confidentiality.

ACKNOWLEDGMENTS

Special thanks to two Hospitals as research site, health care workers especially PITC implementers and Head of VCT Unit or Head of HIV Unit, and to all patients as the informants who were willing to participate in this research. This research was independently funded.

Conflict of Interest: This research has no conflict of interest.

Ethical Clearance: This research has been approved by the Ethical Committee of Medical Faculty of Diponegoro University-RSUP dr. Kariadi Semarang No. 555/EC/FK-RSDK/2014 in October 3rd 2014.

REFERENCES

1. Sax, PE, Cohen, CJ, Kuritzkes, DR. HIV essentials. Bangkok: iGroup Press; 2007.
2. UNAIDS, WHO. HIV/AIDS Programme: guidance on Provider-Initiated Testing and Counseling in health facilities. World Health Organization; 2007.
3. World Health Organization. Interim WHO clinical stages of HIV/AIDS and HIV/AIDS Case Definitions for Surveillance. Nairobi: WHO; 2005.

4. Ministry of Health of Indonesia. integrated biological and behavioral survey. Jakarta: Ministry of Health of Indonesia; 2011.
5. Wu, Z, Sun, X, Sullivan, SG., Detels, R. HIV testing in China. *Science*. 2006;312:1475-76.
6. Bock, NN, Nadol, P, Rogers, M, Fenley, MA, Moore, J, Miller, B. Provider-Initiated HIV Testing and Counseling in TB clinical settings: tools for program implementation. *TB-HIV Supplement*. 2008;12:569-72.
7. Ministry of Public Health of Thailand. The potential of Provider-Initiated Voluntary HIV Counseling And Testing at health care settings in Thailand. Nonthaburi: Ministry of Public Health; 2009.
8. Ministry of Health of Indonesia. Integrated HIV Test and Counseling in Health Care/PITC: Training for Health Provider. Jakarta: Ministry of Health of Indonesia; 2010a.
9. World Health Organization. Guidance on provider-initiated HIV testing and counselling in health facilities. Geneva: WHO and UNAIDS; 2007.
10. Ministry of Health of Indonesia. Integrated HIV Test and Counseling in Health Care/PITC: Guideline. Jakarta: Ministry of Health of Indonesia; 2010b.
11. Semarang City Health Office. Monthly Report Provider Initiated Testing and Counseling (PITC) Semarang City, Central Java Province. Semarang: Semarang City Health Office; 2012.
12. Semarang City Health Office. The health profile of Semarang City. Semarang: Semarang City Health Office; 2011.
13. Handayani, N. 2013. The Implementation of Provider-Initiated Testing and Counselling (PITC) in Semarang City Indonesia [Thesis]. Salaya: Institute of Population and Social Research Mahidol University; 2013.
14. Gulliver, A, Griffiths, KM, Christensen, H. Perceived barriers and facilitators to mental health help-seeking in young people: a systematic review. *BMC Psychiatry*. 2010;10,1-9.
15. Anjaryani, WD. The satisfactory of inpatient toward nurse service in Tugurejo Hospital Semarang City [Thesis]. Semarang: Master of Health Promotion Diponegoro University; 2009.

System Dynamic Model of Leptospirosis Control in Demak, Indonesia, 2014

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ABSTRACT

Cases of leptospirosis persist in Demak District of Indonesia every year. It's needed a mix method (epidemiology, ecology, and system thinking approach) to analyze and to choose the best intervention based on time series data. The study located in Demak, Jawa Tengah on May to November, 2014. Based on an existing model that formulated by time series data for six years (2007 – 2013), leptospirosis control was simulated using a system dynamics method. The simulation was based on seven pre-defined scenarios. The software used to assist the completion of the dynamic model was Powersim version 2.5 for Windows. Predictions extended over 5 years. The model predicted that, if the intervention was biological control and included rodent control, the leptospirosis cases could be prevented up to 20.7%. Wound care could prevent up to 1.6% of the disease. Efforts to prevent direct contact between healthy humans and urine of infected rodents had the strongest impact on reducing leptospirosis in this model, as this could decrease cases by up to 98.14%. Domestic waste management as a source of rodent food in households reduced the predicted number of leptospirosis cases by 1.8%. A combination of the prevention of contact between healthy humans with contaminated water, wound care, biological and mechanical rodent control, and domestic waste management together resulted in a predicted incidence of 0.45% leptospirosis cases per year. The model was a useful tool to predict the efficiency of leptospirosis control under various intervention scenarios.

Keywords: leptospirosis, system dynamic model, control, interventions, scenarios

INTRODUCTION

Leptospirosis is a zoonosis which can be transmitted by domestic animals (dogs, cats, pigs, cattle) and rodents, especially rats. The International Leptospirosis Society (ILS) has mentioned that mortality on Indonesia's incidence rate of leptospirosis was declared as third in the world ¹. Based on data of Central Java Provincial Health Office in 2010, several areas with leptospirosis were Semarang, Demak, Klaten, Pati and Purworejo. ²

Cases of leptospirosis persist in Demak District of Indonesia every year. Leptospirosis in Demak had been known since 2003. Until 2013 there were still cases of

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leptospirosis. In 2011 there were 20 cases of leptospirosis with 1 death. In 2012 there were 13 cases with 2 deaths and in 2013 until July were 13 cases with 2 deaths.³

Leptospirosis is a disease based on dynamic environment. It has several epidemiology's settings too. Epidemiology of leptospirosis specific localized in several areas with different environmental conditions. But, efforts to control leptospirosis has not been a comprehensive and integrated into a single entity based on risk factors that interact each other.

To understand the dynamics of transmission of leptospirosis, some authors propose different mathematical models. Previous study on leptospirosis' risk factors as a basis for control recommendations made by statistical methods. Leptospirosis risk factor study had been conducted by Priyanto, 2007, Cahyati, 2008, Ikawati, 2009, Ningsih, 2009, Lestari, 2009, and Putri, 2009.⁴⁻⁹ In statistical methods, the relationship between variables is one-way. Meanwhile, the characteristics of the system dynamics method, the variables that exist in the system changes with the change of time (dynamic), accounted the nonlinearities, and related reciprocally.¹⁰

The model is a form that is made to simulate a symptom, structures, systems, picture (abstraction) of a system, which is used to solve the problem. The capacity of the human mind for formulating and solving complex problems is very small when compared to the scope of the problem itself, because the solution should be in accordance with the real behavior of the rational.¹¹

Leptospirosis control efforts adapted to the case data and existing risk factors. Various efforts to control leptospirosis as a form of control model that has been done by District Health Office in Demak were screening, socialization to the village level, technical facilitation to the prevention and eradication of diseases officer. Another leptospirosis prevention undertaken in Demak were disinfection and increased knowledge and practice of the wounds in the skin detection and also treatment that carried out in small groups. All efforts need community's supports for improving hygienic behavior and healthy environment.¹² Efforts to control leptospirosis has not been a comprehensive and integrated into a single entity based on risk factors that interact each other. It's needed a mix method (epidemiology, ecology, and system thinking approach) to analyze and to choose the best intervention based on time series data. Based on the

existing model, its developed a model of leptospirosis control by system dynamics method. From the existing leptospirosis problems in Demak District, it can be formulated the purpose of study was to develop a model of leptospirosis control, precisely in Demak District, with system dynamics method. Control models need to be developed in leptospirosis endemic areas with respect to appropriate environmental risk factors and factors that interact with each other to form a complex mutual relationship (causal loop). The purpose of study was to develop a model of leptospirosis control, precisely in Demak District, with system dynamics method.

Although this study has been going on for a while, but the results of this study will be expected to be useful as a reference for further research in the field of leptospirosis in Indonesia. As far as researcher know this study is rarely is done, because it is particularly about leptospirosis, one of neglected disease, in Indonesia, moreover using system approach specially modeling with system dynamic.

METHOD

The study located in Demak, Jawa Tengah on May to November, 2014. Based on an existing model that formulated by time series data for six years (2007 – 2013), leptospirosis control was simulated using a system dynamics method. The simulation was based on seven pre-defined scenarios. The software used to assist the completion of the dynamic model was Powersim version 2.5 for Windows. Predictions extended over 5 years.

The application had permission from the Regional Investment Board of Central Java Province and the Board of Kesbangpolinmas (National Unity, Politics and Community Protection Agency) of Demak Regency. Before the research, there was socialization of the research.

The modeling flow began with the formulation of Causal Loop Diagram (CLD) and Stock Flow Diagram (SFD) incidence of leptospirosis. Causal loop diagram (CLD) is a diagram that describes the causal relationships of the components that build the system. Formulation was done by brain storming method by inviting experts and researchers leptospirosis, and expert of system dynamics modelling. The participants of CLD formulation were the research team of Banjarnegara Research and Development of Zoonosis Control Unit, the holder of leptospirosis program of Demak District

Health Office and the livestock farming officer. After compiled CLD concepts followed by the preparation of Stock Flow Diagram (SFD). Stock Flow Diagram (SFD) is a computer diagram that describes CLD using Powersim software. The data of the SFD constituent variables in the system dynamics model of leptospirosis occurrence which be collected in this study were secondary data from epidemiological investigations of health workers in Demak and from previous related studies, supplemented with primary data collected.

Causal loop diagrams (CLDs) that have been created along with SFD were tested in advance of the validity of the model using visual validation and statistical validation.¹³ The model is valid if it is scientifically proven capable of simulating actual system performance. Visually, the model is called valid if the behavior (form graph) model simulation results to Stock variables approach or resemble graphic form of real simulation results based on reference data in time series. The method used to determine the validity of statistical model in this research is Absolute Mean Error (AME) method. Absolute Mean Error (AME) method calculated by calculating the difference in the value of the simulation results variable and the variable value based on real data divided by real values. If the calculation results of $AME \leq 0.10$ for a controlled Stock variable, then the model is said to be valid. For uncontrolled Stock variables it is declared valid if $AME \leq 0.30$.¹³

In this study, the data included in the modeling was secondary data from 2007 to 2013, or at least three years from 2011 to 2013, supported by data of 2014. Data had not obtained by numbers, determined by interpolation or extrapolation methods. Controlled stock variables used in this study were “healthy man”, “human leptospirosis”, and “human healed”. While the uncontrolled Stock variable was “rat population” and “infected rat”.

The next step is to test the consistency of model dimension to know the consistency of unit of measure or unit of each variable and relationship between variables. If the model turns out to be invalid or inconsistent, then identify the source of the error and the corrective actions stated in the table. The model was improved and tested for validity and consistency. The validation test used visual test by compare the graph of accumulation cases' trend and the graph of simulation.

After the model was valid and consistent, a model simulation was used to predict the performance of the

system in a business-as-usual condition, followed by a sensitivity test that aims to explain the sensitivity of parameters, variables, and relationships among variables in the model. Furthermore, it was possible to determine possible intervention scenarios. The final step was optimization of the model that was to achieve optimal conditions by choosing the best scenario that can reduce the incidence of leptospirosis in 5 years to come (2019). Variable or combination of variables after the intervention simulation test showed the highest decrease in leptospirosis occurrence, defined as the variable having the highest leverage in decreasing the incidence of leptospirosis (leverage variables).

Data modeling processed and analyzed by system dynamics approach using software Powersim Constructor Version 2.5d.

RESULTS AND DISCUSSIONS

In accordance with the modeling flow and test the validity of the model, the CLD and SFD models in this study experienced several changes and corrections. The story was prepared in accordance with the existing problems in Demak District as follows.

People with leptospirosis were still present in Demak District. The number was likely increased since 2011. In 2011 the number of people or healthy people but at risk of contracting leptospirosis in Demak were 1,122,905 people. In 2012 it dropped to 1,092,622 people. In 2013 it was 1,162,967 people. Human leptospirosis patients treated quickly and appropriately can be cured. The greater the rate of treatment, the number of people who recover was increasing. In contrast, patients with untreated leptospirosis were more numerous then the rate of death increases, so in the end the number of leptospirosis patients who died was also increasing. The rate of treatment of leptospirosis patients in Demak District from 2007 to 2013 was 100%. This shows that all reported patients received treatment. But not all patients who had been treated had healing. The average recovery rate reached 79.3%. This calculation was seen from the number of patients atreated and not died. (Number of treated patients minus the number of people who died).

Leptospirosis is transmitted primarily through contact with contaminated urine of rat infected with *Leptospira* bacteria, or other reservoir animals infected with the bacteria. The rate of transmission will increase

if the contact is supported by the existence of injuries in a healthy human body. *Leptospira* bacteria can more easily enter into the healthy human body especially through the wound. The more the number of urine rat and other infected reservoir animals that pollute the water source in the environment, then the amount of water contaminated *leptospira* bacteria will be more and more, so the number of contacts with water the more contaminated. Direct contact with the urine of infected rat or the urine of other infected reservoir animals may also increase the rate of leptospirosis transmission in man. Rats are the main reservoir of leptospirosis. The more rat populations the more the number of infected rats will increase the amount of urine rat that can contaminate the water in the environment. The rate of infection in rat populations is affected by the number of rat population and infection rate. From the results of laboratory tests in primary data collection in this study showed the results that 8.5% of rats were captured positive leptospirosis. Increased rat population was influenced by the increasing rate of birth of rats. The rate of birth of rats increases when the population of female rats and their fertility increases as well. The number of rats that died after being infected with leptospires bacteria more and more when the rate

of death is greater. And the rate of death was affected by the constant death of rat. Assumed rat's mortality due to leptospirosis infected reached 1%.

It is assumed that the amount of water source in Demak is the source of water used by every person every year that was 10 liters (Demak Regency statistical data) plus an average of 21 liters of rainfall per year. The amount of contaminated water was assumed to be the sum of number water, urine rat infected with the urine of other infected reservoir animals. Other infected animal reservoir urine was assumed to be 5 liters per year (regardless of animal species, due to very limited data), urine rat per head per year averaging of 0.96 liters (rough estimation from Suratman, 2003)¹⁴ and the number of rat populations of 1.650.000 rats determined based on the number of rats caught during the rat survey in a village in Demak, which is considered 7% of the total number of rats (population of rats in Demak), multiplied by the number of villages in Demak multiplied by 10, and the amount was assumed to be almost stable every year.

After experiencing several changes of cycles , the final CLD was obtained as shown in Figure 1.

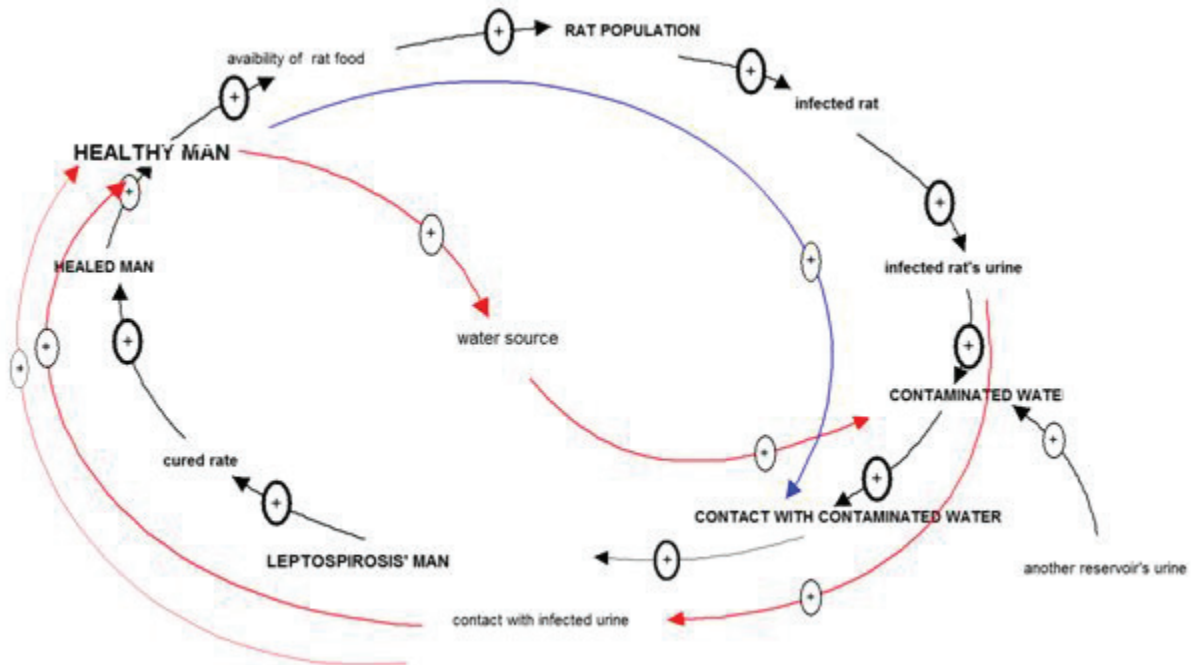


Fig. 1. Causal loop diagram

The sequence of leptospirosis events in the real world begins in healthy humans. The more healthy the number of people, the amount of food for rat will increase. The number of food for rats is increasing, the

rat population is also increasing. If the rat population increases then the number of rat infected with leptospirosis will also increase. The number of infected rat increased will increase the amount of urine rat

contaminated with leptospira bacteria. The number of urine of infected rat increases, it will further increase the amount of water in the environment contaminated leptospira bacteria. The amount of contaminated water increased also due to the additional amount of urine of other reservoir animals infected by leptospira bacteria which also increased. If the amount of contaminated water increases in the environment around humans, then the number of contacts between humans and water contaminated with leptospira bacteria will increase as well. The number of contacts between humans and contaminated water, which includes the type of indirect contact in leptospirosis transmission, if increasing, the number of leptospirosis patients will also increase. The number of people with leptospirosis is increasing, the rate of treatment is increasing so that the number of people who recover from leptospirosis disease will also increase. Thus will again increase the number of healthy humans. This circuit is a large loop called Reinforcing or is positive loop.

The small loop in the CLD begins with an increasing number of healthy people that will increase the amount of water sources used. The increased number of water sources will increase the amount of water contaminated. The amount of contaminated water increases will

increase the number of contacts between humans with contaminated water, and so on to increase the number of human leptospirosis patients. This series is positive.

The next small loops indicate a direct contact with leptospirosis. The first loop is the one that connects the infected rat urine variables, the contact with the urine of the infected rat, and the leptospirosis' man. The second loop is the linking of the urine variables of other infected reservoir animals, contact with the animal urine of the other infected reservoir and the number of leptospirosis' man. Both small loops are positive.

Based on the CLD was made SFD. In the SFD there was the addition of several variables for more logical relationship between the variables in the CLD. Added variables were the rate of transmission, the rate of recovery, the presence of injury, the use of water per person, the rate of domestic waste per person, the fertility of rats, the birth rate, the rate of infection (transmission of leptospirosis in rats), infection rate, urine volume per rat, and rat death rates.

Results of real data simulation on the leptospirosis control model during 2007 - 2014 are presented in Fig 2. Figure 2 also showed comparison of the real data's graph and the simulation's graph.

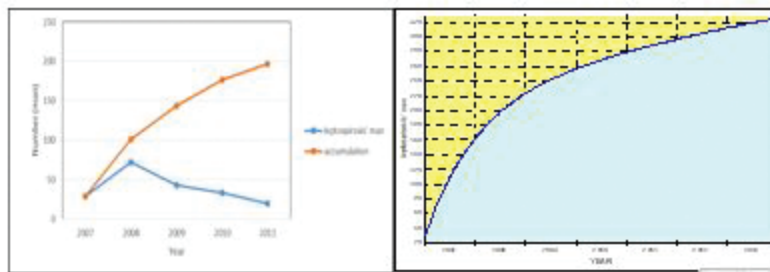


Fig. 2: Comparison of real data graph (left) with model simulation graph (right)

Figure 2 showed that the model was valid based on validation test visually. The behavior pattern of the occurrence of leptospirosis (accumulation) based on existing data from 2007 - 2013 in Demak Regency shows a pattern of behavior similar to the pattern of behavior of graphs of the model simulation results. Validation results by means of statistics based on the results of the calculation of AME of 0.3 which means that it meets the validity requirements of ≤ 0.3 indicates that the model is valid.

Parameters in the simulation model of leptospirosis control are the number of people with leptospirosis. Although the pattern of behavior of the number

of leptospirosis sufferers tends to increase, but the controlling limit is in the rat population and the rate of treatment. In certain numbers and circumstances, the number of rat populations will be controlled by itself. For example the availability of food for rats. The increasing number of rat populations, the available land as a food source for rats will decrease. At certain times, the ability of rat fertility will also decrease, so the number of rat births will decrease or be most unstable.

Graphs of real data simulation results on leptospirosis control models during 2007 - 2014 are presented in Figure 3.

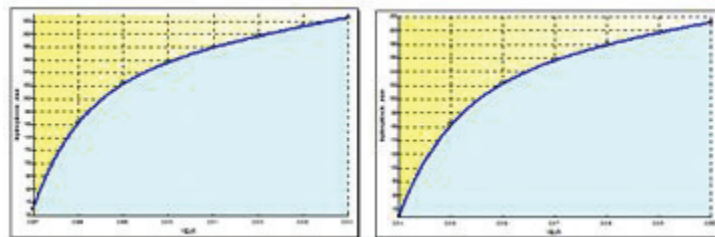


Fig. 3: Graph of simulation results of leptospirosis’ man (cases) in 2007 - 2014 and graph of simulation results predicting the leptospirosis’ man (business as usual) in Demak Regency 2014–2020

The prediction needed in this study is that during 2015, at the start of the implementation of the intervention, until 2020 (six years) considering that the prediction of the incidence of the disease should not be too long. The timing of predictions that are too short will reduce the aspects of system dynamics analyzed, while if it is too long it can reduce its validity.¹⁵

As an initial state for the number of people with leptospirosis in 2014 amounting to 30, the number of people recovered by 25, and the number of healthy humans assumed by the number of people in 2013 plus the average increase in population each year in Demak Regency from 2007 - 2013, so the number in the year 2014 amounting to 1,177,453 people. Without intervention, the number of leptospirosis’ man in 2020 can reach an accumulated number of more than 311 people.

The simulation was based on seven pre-defined scenarios. Interventions offered in the form of scenarios in the form of possible control measures to reduce the number of leptospirosis cases or humans in Demak Regency until 2020.

Scenario 1, the intervention carried out in 2015 was in the form of control of rats both chemically, biologically and mechanically, and made 3 combinations. In this modeling the intervention is biologically in the form of owl maintenance, cat care, natural rodenticide utilization, and the use of Mindi plant extracts to reduce the fertility of female rat. Mechanically in the form of life and dead rat trap installation. Combination 1 (scenario 1a): biologically 10%, chemically 5% and mechanically 20%. In this combination, rat are mechanically controlled more than biological or chemical. Chemical control is done at least considering the impact of using chemicals or rat poisons can cause various disturbances to the environment. In combination 2, efforts to control rat biologically are 50%, chemically 5% and

mechanically 20%. In this combination, biological control of rat is attempted more than chemically or mechanically. In scenario 1c includes biological control efforts 100%, chemically 5% and mechanically 100%. In this combination, control of rat biologically and mechanically is strived to be very maximum compared to chemistry.

Comparison of the difference in the decrease in the number of people with leptospirosis according to the model simulation prediction in Demak Regency in 2016-2020 with the implementation of intervention in the form of controlling rats with three combinations in 2015, is presented in Figure 4.

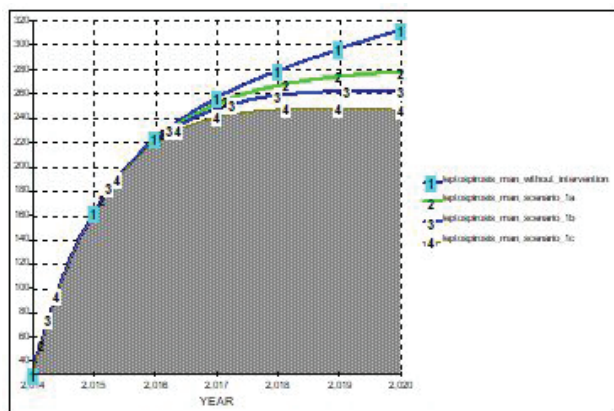


Fig. 4: Comparison of graphs of simulation results predicting the human amount of leptospirosis patients in demak regency 2014-2020 without intervention and with rat control intervention (scenario 1) combinations 1, 2 and 3 in 2015

Both of these results indicate that the rat control intervention that has the greatest leverage in reducing the number of people with leptospirosis in the model in this study is a 1c scenario that combines biological and mechanical control efforts of rat and mechanics optimally while striving for a little control by chemical means. The decrease in the number of people with leptospirosis in 2020 can reach 20.67%.

In scenario 2, the intervention carried out in 2015 in the form of termination or prevention of contact between healthy humans and water in the environment contaminated with leptospira bacteria showed a prediction of a decrease in the number of people with leptospirosis by 2020 of 0.01% per year.

In scenario 3, the intervention carried out in 2015 was wound care. Prediction of the decrease in the number of people with leptospirosis by 2020 is between 0.01 - 1, 6%.

In scenario 4, the intervention carried out in 2015 was the termination or prevention of contact between healthy humans and the urine of infected rat.

Comparison of the graphs from the simulation results of predicting the number of leptospirosis patients without intervention and intervention to prevent contact between healthy humans and urine of infected rat is presented in Figure 5.

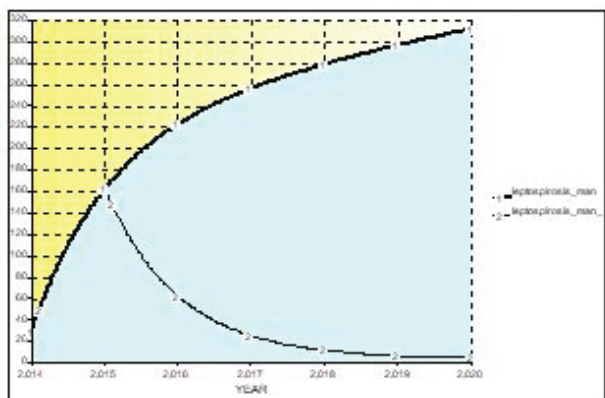


Fig. 5: Comparison of graphs of simulation results of 2014-2020 human leptospirosis patients number without intervention and intervention prevention of contact between healthy humans and infected rat urine

Prediction of the decrease in the number of people with leptospirosis by 2020 is between 71.66 - 98.14%. The graph experienced a decline in 2016 after the intervention in 2015. This very large decrease showed the variable leverage of direct contact with the urine of infected rat was very large in reducing the incidence of leptospirosis.

In scenario 5, the intervention carried out in 2015 was the termination or prevention of healthy human contact with the urine of other infected reservoir animals. Prediction of the decrease in the number of people with leptospirosis by 2020 with the intervention to prevent

direct contact with animal urine in other reservoirs in 2015, showed no decrease in the number of sufferers. These variables have no effect on leptospirosis control for the next five years.

In scenario 6, the intervention carried out in 2015 was in the form of reducing or managing domestic waste which could be a source of food availability for rats in the house. Predictions of a decrease in the number of people with leptospirosis by 2020 were between 0.05 - 1.81%.

In scenario 7, the intervention carried out in 2015 was in the form of a combination or combination of control of combination rats 3, termination or prevention of contact between healthy humans and water in an environment contaminated with leptospira bacteria, wound care and domestic waste management. Comparison of charts in scenario 7 is presented in Figure 6.

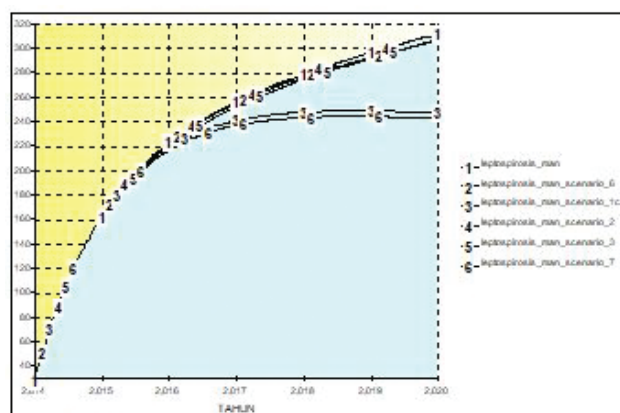


Fig. 6: Comparison of graphs of simulation results of 2014 - 2020 human leptospirosis patients without interventions and with rat control intervention combination 3, prevention of contact between healthy humans and water in leptospira bacteria contaminated environment, wound care, and domestic waste management

Based on Figure 6, prediction of the decrease in the number of people with leptospirosis by 2020 is between 0.05 - 22.07%.

Furthermorw, roughly, it is estimated that the costs necessary to implement these interventions. Scenarios offered in this study along with the magnitude of leverage in reducing the number of leptospirosis sufferers up to 2020 and the estimated costs required to carry out the intervention are presented in Table 1.

Table 1: Comparison of variable powers to decrease the number of leptospirosis cases in 2016-2020 and the estimated cost required for the implementation of the intervention in 2015

Scenarios		Leverage	Estimated cost required
Rodent control	biological 10%, chemical 5%, and mechanical 20%	0.17 – 11.09%	Rp 18,500,000.00
	biological 50%, chemical 5%, and mechanical 20%	0.01 – 16.08%	Rp 60,500,000.00
	biological 100%, chemical 5%, and mechanical 100%	1.56 – 20.67%	Rp 167,000,000.00
2. Contact Prevention with contaminated water		0.01%	Rp 9,010,000.00
3. Wound care		0.01 – 1.6%	Rp 1,400,000.00
Prevention of contact with urine of infected rats		71.66 – 98.14%	Rp 9,500,000.00
Prevention of contact with urine of infected reservoir animals		0.01%	-
Domestic waste management		0.05 – 1.81%	Rp 9,500,000.00
Combination of rat biological control 100%, chemical 5%, and 100% mechanics, prevention of contact with contaminated water, wound care, and domestic waste management		0.05 – 22.07%	Rp 184,910,000.00

There is one possible intervention that can be performed with sufficient leverage to lower leptospirosis cases, technically and economically. It was scenario 6.

The modeling results in this study indicate that the variables that have the greatest leverage and estimated costs of implementing low interventions are direct contact with the urine of infected rat. However, it is necessary to consider the technical ease of implementing the intervention in the community. To find out the urine of infected rat or infected mouse, it is difficult to do, given the lack of in-depth research on leptospirosis in rat in the field, including the mechanism or cycle of transmission between rat and diseased in the environment. Rats or rat infected with leptospirosis do not show specific pain or symptoms. Rat and ceccuruts that are infected will become carriers or carriers of leptospira for the rest of their lives, thus becoming a source of leptospirosis transmission in their habitat. The results of the examination of blood samples of rats caught in the 2014 study showed that only house rats (*Rattus tanezumi*) were found to be positive for leptospirosis, although the results of the survey also obtained rats (*Rattus norvegicus*) and ceccurut (*Suncus murinus*). According to data from the Demak District Health Office, from the examination of kidney samples conducted by BBTCL (environmental health engineering center) Yogyakarta in Demak it was found that 50% of rat got leptospirosis positive, supported by environmental data (water and soil) which were also leptospirosis positive.

Habitat of house rats depends on human settlements. Based on the relationship with humans, the ecological

spread of house rats is included in the domestic type group, because all activities of living rats are inside the house, closed between the walls of the kitchen, cupboard, warehouse, office, market, gutter and others related to human life.¹⁴ The habitat of house and ceccurut rat is very close and depends on human settlements or places of residence, causing the presence of rat and ceccurut which are the main reservoirs of leptospirosis that need to be watched and avoided. Ratproof (anti rat) house arrangement is very necessary as an effort to control rat and prevent contact with rat including contact with urine.

Leptospira bacteria live in the kidneys of rats and the sprays are then removed together with the urine. Actually in the outer environment, leptospira bacteria are also not easy to breed. Leptospira bacteria are of many types and consist of hundreds of serovars. Some are pathogenic and some are not. Leptospira bacteria can live well in the outside environment in conditions that support including acidity, salinity, lighting, and velocity of water flow.¹⁶ With the increasingly known factors that support the growth and proliferation of leptospira bacteria in the environment, the effort to control leptospirosis should also be easier.

The results showed that rats were the main reservoir of leptospirosis. Rat control can be done in various ways, both biologically, chemically and mechanically.¹⁶ Mechanical control using traps in the form of shots, mousetrap with bait, rat glue and batter, has been done by most of the respondents of leptospirosis suspects in Demak Regency. Biological control by raising cats and

owls has also been done in Demak Regency. One of them is owl farms managed by farmer groups, and has been proven to be able to control rats in rice fields up to 50%. However, biological control also has many weaknesses. Maintenance of owls requires considerable costs and is more suitable for controlling rats in rice fields. While from the results of the collection and examination of rat kidney samples in this study, it is known that the type of rat that is leptospirosis positive is *Rattus tanezumi* (house rat). Controlling house rats using predatory properties in owls is not appropriate. Residential areas or settlements will be quite difficult for owls to chase their prey in the form of house rat that will easily hide in habitats that become one with a residence or human home. One of the limitations in this study is that there have been no surveys or arrests of field rat to be taken and examined for kidney samples whether or not leptospirosis is positive. If it turns out that the field rat also have a large contribution to the leptospirosis transmission cycle, then the control of rats using owls will be appropriate.

Efforts to control rat by biologically intervening in the form of raising cats that are known as natural predators of rat, are quite inexpensive. But the effectiveness of the control is now in doubt, given the fondness of eating cats, starting to switch to the types of food that humans eat. In addition, in the cycle and method of transmission of leptospirosis, cats are also a reservoir of leptospirosis.

Efforts to control rat using poisons which are one of the chemical methods, should also be avoided, given some of the side effects they cause. For example, rat that have died from eating poisonous bait, the carcass is not known, so it often disturbs the occupants of the house because of the smell. In addition, rat poison is also dangerous for humans themselves, especially children who may not know the use of these ingredients and are also dangerous for other pets such as dogs and cats that can be wrong targets of bait containing the rat poison.

The distribution of traps to the community as a stimulant has been carried out by the Demak District Health Office in an effort to reduce the incidence and risk of leptospirosis transmission. This good measure should continue to be maintained and developed by activating the role of cadres and community leaders to play a role in socializing leptospirosis along with its causes, modes of transmission, and all related risk factors. Increased knowledge and public awareness about leptospirosis in both endemic areas and regions that have been considered

free of the disease, is one of the basic steps that are important in the effort to control leptospirosis. The few respondents in this study who have never heard of leptospirosis or other names, need to be followed up with an increase in socialization to the lowest levels of society. Various forms of activities and socialization media can be used, not only in the form of leaflets or banners, because not everyone likes or wants to read. Media socialization in the form of documentary films or talk shows, or information inserted in the activities of associations of fathers, mothers, study forums, teaching and learning activities in schools or youth associations can be considered as an alternative effort to control leptospirosis.

According to WHO, transmission of leptospirosis from animal reservoir carrier to humans is not only through direct or indirect contact. The existence of a small body wound that is often unconscious or underestimated can be an entry point for leptospira bacteria.¹⁶ Contact with contaminated water alone does not contribute large enough to allow the transmission of leptospirosis. This contact needs to be supported by the presence of a wound and the amount of liquid that can contaminate. The existence of wounds is not always realized by humans except for large wounds. Contact with sources of transmission supported by the presence of wounds will increase the risk of contracting leptospira bacteria. The combination of interventions between prevention of indirect contact between healthy humans and water contaminated with leptospira bacteria and wound care can reduce the rate of leptospirosis transmission in humans. The results of Sakundarno's study which showed that increasing the knowledge of the community to recognize the wounds on his body and how to care for him, need to be considered.¹⁷ Prevention of contact with contaminated water is carried out by preventing contact with water in the environment, for example by using footwear, boots if carrying out activities related to stagnant water for a long time, for example when farming or gardening or perhaps working to clean the environment, including when doing "Gropyokan" (rat raid together) and when passing through flood and rob (flood of sea water) areas that often occur in Demak and become one of the important risk factors in Demak. Giving disinfectant or chlorination to water which is suspected to be a medium of transmission can also be done, but by fulfilling the requirements and procedures that have been determined according to health and the environment.

Efforts to control rat need to be supported by prevention of contact with contaminated water, wound care, and the management of household waste properly, so that it returns to the importance of awareness and habits to behave in a clean and healthy life, including the simplest, that is diligently washing hands with soap and using footwear while outdoors.

WHO states that there are two things that need to be considered in controlling rats in a home environment, namely eliminating the necessities of life and making or completing the structure of a house with anti-mouse materials.¹⁸ The presence of domestic waste in the house that is left to collect not in a closed container or trash can increase the presence of rats in the house. Management of domestic waste in the home needs to be considered to be properly closed and the frequency of discharge outside the house is quite often done. Another limitation in this study is the neglect of raw materials such as grain (harvest) stored in the house, which can also increase the presence of rat in the house.

By increasing good cooperation between the Health Office and the Agriculture Service, especially in the field of animal husbandry, digging deeper into the results of research and surveys related to information on livestock populations that can become reservoirs of leptospirosis such as data on the number of cows, horses, goats and pets such as dogs and cats in Demak Regency will greatly complement the concept of leptospirosis control model with system dynamics. The results of Warbal's study in 2010 showed that 5% of cats caught in Tridonorejo Village, Bonang District, Demak Regency, were positive for Leptospira. ¹⁹In addition, in this study, the discovery of pomona serovar which is a leptospira serovar in hosts in the form of livestock such as cattle and horses, which was then associated with the results of epidemiological investigations which showed a relationship with the type of work of the patient as a driver or driver Delman, indicating the possibility of a contribution livestock and domestic animals as leptospirosis reservoir in Demak Regency. Another limitation in this study is that there is no blood sample of horses that experience eye pain, which is also kept in the same cage as the pet horse of the sufferer, because the owner is not permitted. Research in the United States in 1999, showed that one of the clinical symptoms of leptospirosis in horses is uveitis which can cause blindness in the eye.²⁰

The results of interviews and observations in this study indicate that not all case data reported during 2011 - 2013 were followed up with epidemiological investigations in the field. Fast, good and integrated coordination between various related parties, both government and private, starting from the first service unit, namely puskesmas and hospitals both in Demak Regency and in areas outside Demak Regency where Demak residents get diagnosis and treatment related to leptospirosis, to Dinas Provincial Health, needs to be improved. One reason for not carrying out an epidemiological investigation into the reported cases, because the patient was examined and received a diagnosis and treatment at a hospital outside the Demak area, then the hospital did not deliver the data to the Demak District Health Office quickly, but the data was new Central Java Provincial Health Office officials obtained data collection as an annual report. The time needed to find out the case data by the Demak District Health Office is long enough, so that epidemiological investigations are felt to be inaccurate and effective to do considering the possibility of bias in the data from interviews and observations. The socialization and training of standard standards for determining the right and fast diagnosis for leptospirosis sufferers and the mechanism of the leptospirosis case reporting system need to be carried out routinely through various meetings involving various parties and related sectors. Periodic changes in leptospirosis management officers need to be accompanied by periodic socialization and refreshing of leptospirosis.

There were some limitation of the study. Diversity of sources can increase the required data source but on the other hand can cause shortcomings for this study. Various sources could be because it includes the source of the results. Beside that, limited of data; limited of leptospirosis' study also become research obstacles. Formulation and simulation techniques require skill, perseverance and experience. Furthermore, the study can not be evaluated whether the results are in accordance with the predicted, or if there are deviations how big the deviation. In addition, cost estimates of intervention activities are only rough, do not use socioeconomic calculations or analysis.

CONCLUSIONS

Factors that influence the control of leptospirosis according to causal loop diagram that is preventing contact with urine of infected mice, controlling mice,

reducing or managing waste properly so as to reduce food availability for mice, and treat wounds. The most influential factor in reducing the incidence of leptospirosis is direct contact with the urine of infected mice. But, technically, practically and economically, domestic waste management was possible.

The availability of routine and complete data on leptospirosis risk factors is needed to increase the validity of the control model with system dynamics. The model was a useful tool to predict the efficiency of leptospirosis control under various intervention scenarios.

ACKNOWLEDGEMENTS

The researchers expressed their gratitude to the Head of the Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia, the Head of the Demak District Health Service and related staff, and many parties who could not be mentioned individually

Conflict of Interest: There was no conflict of interest of this study.

Ethical Clearance: Before the study begins, this research has received ethical approval from the Ethics Committee of the Health Research and Development Agency of the Ministry of Health of the Republic of Indonesia.

REFERENCES

- Djunadi. *Kapita Selekta Penyakit Infeksi: Ehrlichiosis, Leptospirosis, Rickettsiosis, Antraks, Penyakit Pes*. Malang: UMM Press; 2007.
- Dinkes Provinsi Jateng. *Situasi Penyakit Bersumber Binatang Tahun 2006-2008*.; 2008.
- Dinkes Kabupaten Demak. *Penderita Leptospirosis Kabupaten Demak Tahun 2007-2013*.; 2013.
- Priyanto A, Hadisaputro S, Santoso L, Gasem H, Adi S. Faktor-Faktor Risiko Yang Berpengaruh Terhadap Kejadian Leptospirosis (Studi Kasus di Kabupaten Demak).
- Cahyati WH. Hubungan Lingkungan dengan Kejadian Leptospirosis di Demak. In: *Proceeding Seminar Nasional Peran Pendidikan Kesehatan Masyarakat Dalam Konservasi Lingkungan*. Semarang: Jurusan Ilmu Kesehatan Masyarakat, Fakultas Ilmu Keolahragaan, Unnes; 2010.
- Ikawati B, Nurjazuli. Analisis Karakteristik Lingkungan Pada Kejadian Leptospirosis di Kabupaten Demak Jawa Tengah Tahun 2009. *Media KesehatMasy Indones*. 2010;9(1).
- Ningsih R. Faktor Risiko Lingkungan terhadap Kejadian Leptospirosis di Jawa Tengah. 2009.
- Lestari F. Faktor-Faktor yang Berhubungan dengan Kejadian Leptospirosis Studi Kasus Di RSU Sunan Kalijaga Demak. 2009.
- Putri MI. Hubungan Faktor Lingkungan dan Perilaku dengan Kejadian Leptospirosis di Kabupaten Demak Tahun 2009. 2009.
- Soesilo B. *Systems Thinking Dan Systems Dynamics*. Jakarta; 2012.
- Soesilo TEB. System Thinking dan Systems Dynamics. In: *Pelatihan Modelling Pusat Teknologi Intervensi Kesehatan Masyarakat*. Jakarta: Badan Litbangkes Kementerian Kesehatan RI; 2012.
- Dinkes Kabupaten Demak. *Profil Kesehatan Kabupaten Demak Tahun 2011*.; 2011.
- Listyawati S. Sifat Fisik dan Kandungan NaCl Urin Tikus Putih (*Rattus norvegicus* L .) Jantan setelah Pemberian Ekstrak Rimpang Alang- alang (*Imperata cylindrica* L .) secara Oral Physical characteristics and NaCl content of urine white male rat (*Rattus norvegicus* L . 2003;1(1):7-12.
- Suratman, Listyawati S, Sutarno. Sifat Fisik dan Kandungan NaCl Urin Tikus Putih (*Rattus norvegicus* L .) Jantan setelah Pemberian Ekstrak Rimpang Alang- alang (*Imperata cylindrica* L .) secara Oral Physical characteristics and NaCl content of urine white male rat (*Rattus norvegicus* L . *Biofarmasi*. 2003;1(1):7-12.
- Soesilo TEB, Karuniasa M. *Permodelan System Dynamics Untuk Berbagai Bidang Ilmu Pengetahuan, Kebijakan Pemerintah Dan Bisnis*. Jakarta: Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia; 2014.
- Faine S, Adler B, Bolin C, Perolat P. *Leptospira and Leptospirosis*. Melbourne: MediSci; 2000.

17. Sakundarno M. Skin Wounds as A Risk Factor for Leptospirosis in Semarang City: A meta-analysis study. *Adv Sci Lett.* 2017;23(4):3547-3549. doi:10.1166/asl.2017.9164
18. Ristiyanto, Handayani FD, Boewono DT, Heriyanto B. *Penyakit Tular Rodensia*. Salatiga: Gadjah Mada University Press; 2014.
19. Warbal HET. Survei Bakteri Leptospira sp pada Darah dan serum Kucing di Desa Tridonorejo Kecamatan Bonang Kabupaten Demak Tahun 2010. 2010.
20. Faber NA, Crawford M, LeFebvre RB, Buyukmihci NC, Madigan JE, Willits NH. Detection of Leptospira spp. in the aqueous humor of horses with naturally acquired recurrent uveitis. *J Clin Microbiol.* 2000;38(7):2731-2733.

Maternal Height as an Determinant Factors of Children not to be Stunting Until Age 59 Months

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ABSTRACT

Background: Early growth disorders influence the occurrence of stunting, which in turn is at higher risk of obesity at later ages. Maternal height, birth weight and length birth might affect the child growth not to be stunting.

Objective: We examined the proportion and hazard risk the resilience not to be stunting of children since birth to 59 months of age according to birth weight, length birth and maternal height controlled with other factors.

Method: We have performed Life table and Cox regression on 859 children 59 months age from Bogor child growth and development cohort study. Child growth and covariates data were collected every month since infant birth until the age of 59 months.

Results: Maternal height is a significant risk for children stunting until age 59 months after adjusting by sex, exclusive breastfeeding, immunisation, birth weight, length birth, gestation age, maternal age, parity, pre-pregnancy weight. The proportion of children who survive did not become stunting of the mother with height 150 cm or above (49 per cent) more significant than children of the mother with a height below 150 cm (28 per cent). The proportion of children which are not stunting at 23 months of age was no different than at 59 months of age for all risk factors.

Conclusion: Pre-pregnancy BMI, maternal height, birth weight and length birth is a determinant factors child who survives not to be stunted from birth to 59 months.

Suggestion: Nutrition intervention for children with the mother's height less than 150 cm should be done since fetus until the age of child 59 months especially for thousand days

Keywords: children, maternal, height, stunting

INTRODUCTION

Stunting affects one-third of children under five y old in developing countries, and 14% of childhood deaths are attributable to it^[1]. Indonesia as a developing country, during seven years the prevalence of stunting under five children still stagnant at around 37 per

cent (2007 to 2013)^{[2],[3]}. Globally, the prevalence of Indonesia children of stunting was number five in the world^[4]. Stunting children has a high risk to become obesity in later age. It is a reason, globally and national levels were the commitment to reduction malnutrition^[5], especially for stunted children Global Nutrition Targets 2025 is 40% reduction in the number of children under-5 who are stunted^[6].

Many studies demonstrated the prolonged effect of stunting in early life, especially at below two years old age^[7]. Early life contribution to long-term health. Maternal height influences offspring linear growth over the growing period^[5]. These influences likely include genetic and non-genetic factors, including nutrition-

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related intergenerational influences on growth that prevent the attainment of genetic height potential in low- and middle-income countries^[8]. One-third of pregnant women are short with height less than 150 cm^[9], and this is probably related to the prevalence of children under five years of stunting in Indonesia by 37,2 per cent^[9]. Utami has reported that nutritional status at birth (weight and length of birth) and little mother high, is a dominant risk factor which affects stunting among children age 0-23 months. This research has found it the resilience of children to survive not stunting decreases with age increase^[10]. The process of becoming stunting start in utero, even until 2-3 years of age child not stunting. A very short height – usually reflects the persistent, cumulative effects of poor nutrition and other deficits that often span across several generations^[7].

This article is a continuation of the analysis that has been done by Utami in the same location and some of the same respondent, which is to assess the resilience of children not be stunting in children aged 0-59 months and factors that influence it. The influence of the environment on the growth of the child increases with the age of the child^[10]. The objective of this article is to assess whether mother's nutritional status and weight and length of birth still affect the resilience of children not to be stunting at age 0-59 months.

METHOD

Data source: The dataset obtained from data The Bogor Longitudinal Study on Child Growth and Development (BLSCGD) was conducted in Bogor Tengah sub-district, Bogor city, Indonesia. This study conducted since 2012 which is still ongoing. The BLSCGD will cover a sample of 2170 pregnant women by 2030. The analysis in this articles focuses on children aged 0 - 59 months.

Population and samples: The sample size was calculated using formula two population proportions by assuming the proportion^[12] of stunting to be 37,2 per cent^[3], with a 5 % level of significance, a power 80 %. The total sample size needed to analyse was 764 children. Since 2012 to 2017, the total respondent was 1089 child, and 859 respondents eligible for analyses. An inclusion criterion is respondent (pregnant women and children) are willing to take BLSCGD study until the child is 18 years old. The exclusion criteria are children with physical disabilities such as cleft lip and polio. Respondents signed the consent form before they are joining this research.

Data collection: Data collected every month are anthropometry (height and weight), breastfeeding, immunisation status, morbidity, health-seeking behaviour, child growth monitoring, healthcare and eating patterns. As a Utami et al. mentioned, the overall objective of BLSCGD to evaluate determinants factors of child growth and development from birth until aged 18 years. Data collection began in 2012 and is still ongoing. Recruitment of pregnant women aged 15 - 45 years by the community health volunteers (Kader) for each area^[10]. Methods of collection data according to BLSCGD study^{[13],[15]}.

Subjects were interviewed using a questionnaire for socioeconomic characteristics. Anthropometric measurements (weight, height) were taken. Clinical examination by a medical doctor was undertaken each month of pregnancy^[10]. Weight and length birth were measured within 24 hours of birth. Birth weight was categorized as 'low' if <3,000 g^{[14],[10]}, while the birth length was categorised as 'short' if <50 cm^{[3],[10]}. Maternal height was categorised as 'at risk' if it was less than 150 cm^{[3],[15],[10],[16],[17]}.

Mother's education achievement level was categorised as 'low education' (below junior high school) and 'high education' (senior high school or above). Mother pre-pregnancy body mass index (BMI) was calculated from weight and height, and categorised into 'underweight' (BMI <18.5 kg/m²) and Normal-overweight-obese (≥ 18.5 kg/m²)^{[9],[10]}.

Measurements weight using AND digital weighing scale accuracy 50 gram and capacity 200 kg. Length or height measured using multiple measuring boards, accuracy 0,1 cm and capacity 2 meters. Children 2 years or below were measured lying down position (recumbent length), and standing height was measured for older children. Children with height for age Z-score below minus two standards deviations (-2 SD) from the median of the WHO reference population are considered to be stunted (World Health Organization in 2007). The immunisation status of children referred to the compulsory immunisation of children up to the one year of age. Fully immunised refer to government rules.

Health-seeking behaviour is the practice of mothers who seek health services when the child was sick, during the first six months. Child growth monitoring

was based on the date of childbirth and the regularity each month. Children were considered to have ‘regular growth monitoring’ if every month since birth is weighed monthly. Exclusive breastfeeding practices determine used variables patterns, pre-lacteal feeding, current breastfeeding and complementary food, which is collected used 24-hour recall data. They are categorised as ‘exclusively breastfed’ if they got the only breast during the first six months of life (WHO, 2008). Morbidity was determined to the frequency of illness every six months period (0-5 months, 6-11 months, 12-17 months and 18-23 months)^[10].

Data collected by enumerators (diploma of nutrition, nurse and midwives). Enumerator training is conducted regularly twice per year. Every month on the same date (according to date of birth, the respondent comes to the base camp for measurement and interviewed. If the respondent was unable to attend on that date, then there was an allowance to go three days before or three days after the specified date^[10].

Child survival resilience toward not to be stunting was analysed by using the survival statistic test using life table and Kaplan Meier. In this analysis, ‘case’ was the occurrence of stunting. The time variable in this analysis was the time (in months) when the children became stunted. Factors affecting stunting were tested using Cox Proportional Hazards Regression. We did a multicollinearity assessment of the independent variables before running the regression analysis^[10].

RESULTS AND DISCUSSIONS

A one- third of children are born to weight less than 3000 grams, and nearly two-thirds of children with a length birth are less than 50 cm. The proportion of mothers at risk ages (<20 years and > 35 years) by nearly twenty per cent. One- third of m with height less than 150 cm, and two-fifths with thin nutritional status (BMI <18.5 kg / m²). About a quarter of children get exclusive breastfeeding. More than three-quarters of children are entirely, and children are routinely weighed into Posyandu every month. Two-thirds of respondents seeking health services when sick. Two-fifths of mothers with low education (Junior High School down), and most mothers do not work (table 1)

Table 1: Characteristics mother and under-five children (n = 859)

Factors	n (%)
Sex	
Boys	390 (45,4)
Girls	469 (54,6)
Birth Weight	
< 3000 gram	281 (32,7)
≥ 3000 gram	578 (67,3)
Length Birth	
<50 cm	550 (64,3)
≥ 50 cm	306 (35,7)
Mother age	
< 20 years and > 35 years	158 (18.4)
20-35 years	701 (81.6)
Mother Height	
< 150 cm	286 (33,3)
≥ 150 cm	573 (66,7)
BMI Mother (Pre Pregnancy) (kg/m²) (N = 836)	
Underweight (<18,5)	105 (12,5)
Normal-overweight - obesitas (≥18,5)	735 (87,5)
Exclusion Breastfeeding 0-6 bulan (N = 613)	
Yes	473 (77,2)
No	140 (22,8)
Immunization (N = 613)	
Yes	79 (12,9)
No	534 (87,1)
Routine weighing in Posyandu (N = 614)	
Yes	65 (10.6)
No	549 (89.4)
Health seeking (N = 596)	
Health Facility	183 (30.7)
Nin Health Facility	413 (69.3)
Education of Mother (846)	
Low	389 (45.4)
High	467 (54.6)
Work status of Mother (858)	
Work	136 (15.9)
No	722 (84.1)

There is no difference between the resilience of stunting incidence in boys and girls from birth to age 59. At the age of 0 months 60 per cent of children are not stunting and at the age of 59 months becoming 40 per cent (data not shown). Children born weighing ≥ 3000 grams or children born with long births ≥ 50 cm more resistant not to be stunting. The survival rate of stunting incidence at 0-11 months of age in children with less than 50.0 cm birth weight decreased dramatically. This continues until the age of 20 months. Resistance

to stunting in both groups of children tended to remain from the age of 20 months to the age of 59 months. At the initial interval of life 0-5 months, the proportion child not stunting is higher in children born <50.0 cm (39 per cent), whereas in children born ≥ 50.0 cm only 11 per cent. From the age of 30 months the of children not stunting who's born ≥ 50 cm is almost twice than children who are born with length <50 cm.

Table 2: Life tables for surviving not stunting by weight and length birth

Interval start time	Birth Weight		Length Birth	
	≥ 3 kg	< 3 kg	≥ 50 cm	< 50 cm
0	0.78	0.56	0.89	0.61
6	0.67	0.41	0.78	0.48
12	0.54	0.35	0.63	0.39
18	0.50	0.31	0.60	0.34
24	0.48	0.31	0.58	0.33
30	0.47	0.30	0.58	0.32
36	0.47	0.30	0.58	0.32
42	0.47	0.30	0.58	0.32
48	0.47	0.30	0.58	0.32
54	0.47	0.30	0.58	0.32

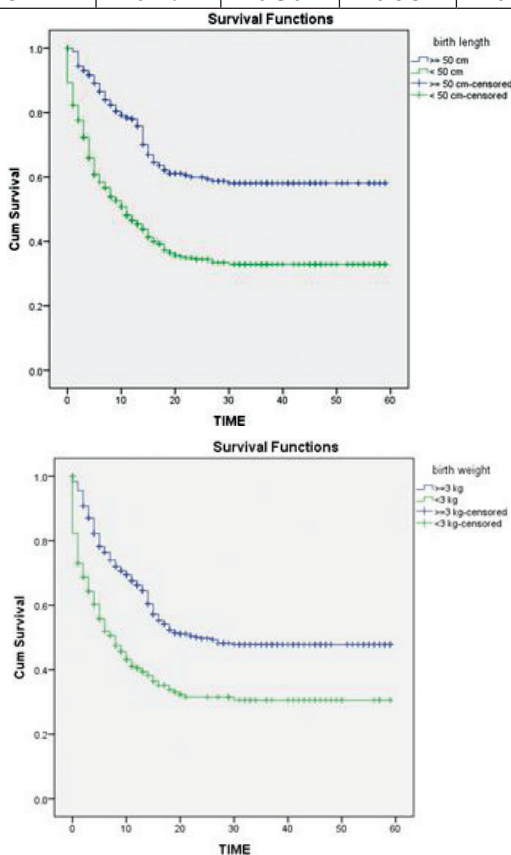


Figure 1: Resistance not to be stunting incidence of children aged 0 - 59 months by Weight and Birth Length (Kaplan Meier analysis)

Table 3 and Figure 2 shows that starting 0 months to 59 months there was no difference for survival not stunting between maternal group aged and exclusive breastfeeding. Children have survived to not stunting in who's have mother age 20-35 years more than who's have mother age < 20 years and ≥ 35 years, which is almost the same for children with exclusive breastfed.

Table 3: Life tables for the proportion of children not to be stunting based on exclusive breastfeeding and mother age

Interval start time	Cumulative Proportion Surviving at the end of Interval			
	Exclusive breastfed		Mother Age	
	Yes	No	20-35 y	< 20 and > 35 y
0	0.75	0.67	0.72	0.67
6	0.60	0.56	0.60	0.53
12	0.50	0.45	0.49	0.42
18	0.47	0.41	0.45	0.37
24	0.47	0.40	0.44	0.36
30	0.44	0.39	0.43	0.36
36	0.44	0.39	0.43	0.36
42	0.44	0.39	0.43	0.36
48	0.44	0.39	0.43	0.36
54	0.44	0.39	0.43	0.36

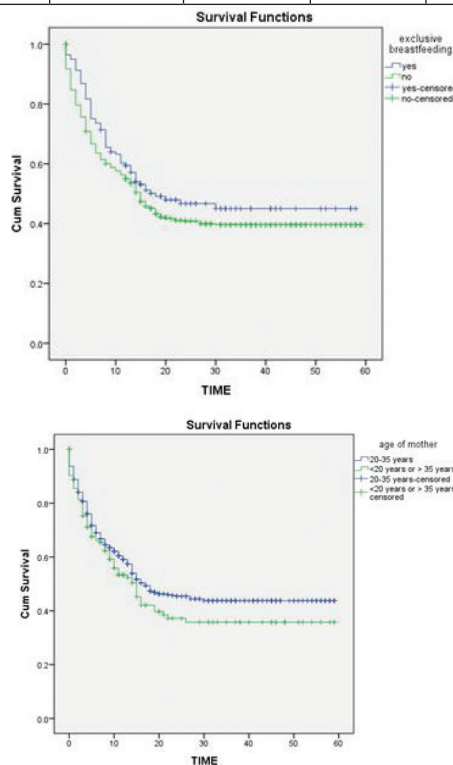


Figure 2: Resistance not to be stunting of children aged 0 - 59 months according to exclusive breastfed and mother age (Kaplan Meier analysis)

Table 4: Life tables for the proportion children not to be stunting based on mother height and pre-pregnancy BMI

Interval start time	Cumulative Proportion Surviving at the end of Interval			
	Height		Pre-Pregnancy BMI	
	≥ 150 cm	<150 cm	≥ 18,5 kg/m ²	< 18,5 kg/m ²
0	0.76	0.61	0.72	0.66
6	0.65	0.46	0.60	0.52
12	0.55	0.33	0.49	0.38
18	0.51	0.29	0.45	0.35
24	0.50	0.28	0.43	0.35
30	0.49	0.28	0.43	0.35
36	0.49	0.28	0.43	0.35
42	0.49	0.28	0.43	0.35
48	0.49	0.28	0.43	0.35
54	0.49	0.28	0.43	0.35

Determinant factors of stunting in children aged 0-59 months: Variable included in a multivariate test using Cox Proportional Hazards Model is p-value <0.25. Table 5 shows mothers with height <150 cm is at higher risk of child stunting and mother. Mothers with pre-pregnancy BMI <18.5 kg m²/kg are at higher risk of stunting. Also, a mother with parity > 2 children is the more significant risk to stunting, and gestational age < 37 weeks are a more significant risk to stunting. Childbirth weight < 3000 gram are a higher risk of stunting than childbirth weight ≥ 3000 gram. Also, childbirth weight < 50 cm are a more significant risk to stunting than childbirth weight ≥ 50 cm.

Table 5: The determinant factor of stunting children at age 0–59 months (N = 859)

Factors	Analysis multivariate cox regression		
	Hazard ratio	95% CI	P value
Sex			
Boys	1,027	(0,827–1,277)	0,808
Girls			
Birth Weight			
< 3000 gram	1,433	(1,126–1,823)	0,003**
≥ 3000 gram			
Length Birth			
<50,0 cm	1,994	(1,545–2,572)	0,000**
≥ 50,0 cm			
Exclusif Breastfeeding 6 months			
No	1,187	(0,910–1,548)	0,206
Yes			
Mother height			
< 150 cm	1,644	(1,295–2,085)	0,000**
≥ 150 cm			
Gestation ages			
< 37 minggu	1,277	(0,959–1,683)	0,082*
≥ 37 minggu			
Parity			
>2 orang	1,231	(0,973–1,558)	0,083*
≤2 orang			
Pre Pregnancy BMI of Mother			
< 18,5 kg/m ²	1,481	(0,967–2,269)	0,071*
≥ 18,5 kg/m ^m			

** significant p<0,005, * significant p<0.100

The main finding was maternal height, pre-pregnancy BMI, birth and length birth as a risk factors child to stunting since 0 to 59 months, confirming that variables persistent since age 23 month^[10]. The proportion of children not stunting from 23 months to age 59 does not change by birth weight, birth length,

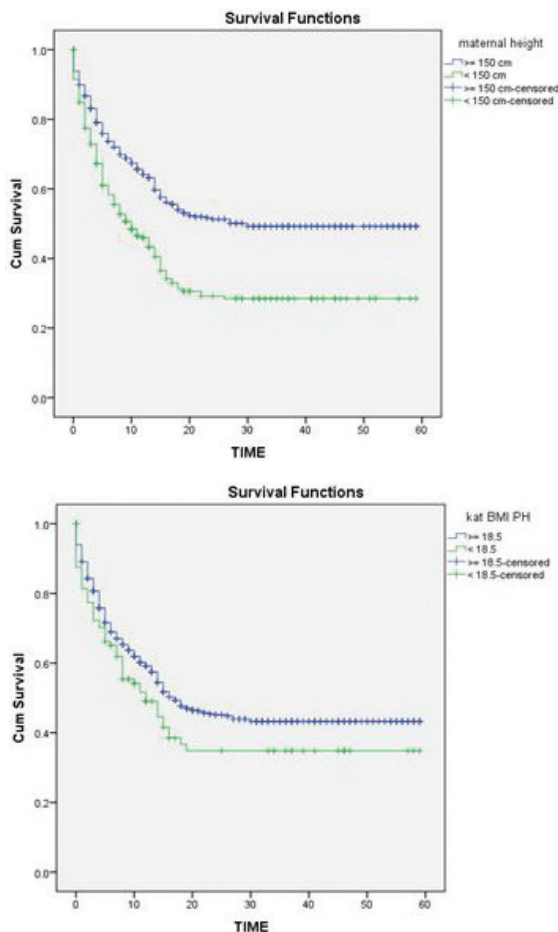


Figure 3: Resistance not to be stunting of children aged 0 - 59 months according to mother height and pre-pregnancy BMI (Kaplan Meier analysis)

mother's height and pre-pregnancy BMI. This proves that the first 1000 days of life play a role in the event of stunting^[1] and a later age a growing child's environment is more influential^{[11],[18]}. During 1000 first life, maternal pre-pregnancy BMI and weight gain during pregnancy as an indicator of reserves for fetal growth^[19] which further affects the low birth weight and the length of birth^{[20][14]}. Other research in West Java, Indonesia also proved that birth weight and length birth as most essential determinants of linear growth^[21]. Low birth weight as a dominant factor of child stunting for 12-23 months^[22], Therefore stunting prevention is focused on intervening during the first 1000 day. It remains that globally the bulk (70%) of the total deficit at five years is caused growth faltering during the first 1000 d. Also, better nutrition, health, and care during the first 1000 d may (at least partially) help avert continued faltering beyond age two years^[16]

Intergenerational effects are evident in this study since the proportion of short children of mothers with <150 cm of height is more significant than children of mothers with a height of ≥ 150 cm. Result study in India showed that LBW infants born to mothers with height ≤ 150 cm had a comparatively higher risk of stunting with lower attained LAZ scores in their infancy, compared to those born to mothers with height ≥ 150 cm, after adjusting for all potential confounding factors^[17]. Mothers who start pregnancies with low nutritional status make it possible to achieve less weight gain, which occurs in low birth weight babies as a study in West Sumatera. The majority of women gained low weight during pregnancy compared to the Institute of Medicine (IOM) recommendations, especially those who had a healthy BMI^[19].

After a 2-year-old child, the environment grows especially the behavior of the child's nutritional status^{[11],[23]}, such as drinking water from unsafe source, occasionally eating animal source food, acute respiratory infection, RI in the past two weeks, late initiation of breastfeeding after one hour after birth, and lack of vaccination were significantly associated with stunting among child 6 – 59 months^[23]. Although this study did not prove significant, there is a tendency of children who get exclusive breastfeed more who can survive no stunting from birth to 59 months. Therefore, an infant needs exclusive breast milk in their first six months. Afterwards, they need complementary food with sufficient quantity and quality^[4].

CONCLUSIONS

Pre-pregnancy BMI, maternal height, birth weight and length birth is a determinant factors child who survives not to be stunted from birth to 59 months.

The proportion child not to stunting almost same from 23 months to 59 months for pre-pregnancy weight, maternal height, birth weight and length birth.

ACKNOWLEDGEMENTS

This data from Study cohort of child growth - development and chronic diseases. The work supported by the head of the Health Research and Development Agency and Head of Center for research and development of health efforts. Many thanks for the support from senior scientist Dr dr Felly P Seenewe and Dr dr Julianty Pradono MS from Center for research and development of health efforts. Special thanks to the all researcher and enumerators involved in this study for six years.

Ethical Clearance: Taken from the ethics committee of the Agency for health research and development. RI Ministry of Health

Sources of Funding: This research was funded Health Research and Development Agencies. RI Ministry of Health

Conflict of Interest: We (authors) declare that have no conflicts of interest.

REFERENCES

1. Danaei G, Andrews KG, Sudfeld CR, Mccoy C, Peet E, Sania A, et al. Risk Factors for Childhood Stunting in 137 Developing Countries : A Comparative Risk Assessment Analysis at Global, Regional, and Country Levels. 2016;1–18.
2. Health Research and Development Agency. Basic Health Research (RISKESDAS) 2007. National Report 2007. 2008; 1–384.
3. Health Research and Development Agency. Basic Health Research (RISKESDAS) 2010. National Report 2010; 1-306
4. Asia SE. Stunting and the Future of Indonesia. 2013;1–4.
5. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, et al. Evidence-based interventions for improvement of maternal and child nutrition:

- What can be done and at what cost? *Lancet*. 2013;382(9890):452–77.
6. States M. Stunting Policy Brief. 2012;(9).
 7. Dewey KG, Begum K. Original Article Long-term consequences of stunting in early life. 2011;7:5–18.
 8. Addo OY, Stein AD, Fall CH, Gigante DP, Guntupalli AM, Horta BL, et al. Maternal Height and Child Growth Patterns. *J Pediatr* [Internet]. 2013;163(2):549–554.e1. Available from: <http://dx.doi.org/10.1016/j.jpeds.2013.02.002>
 9. Health Research and Development Agency. Basic Health Research (RISKESDAS) 2013. National Report. 2013;1–384.
 10. Utami NH, Rachmalina R, Irawati A, Sari K. Short birth length, low birth weight and short maternal stature are dominant risks of stunting among children aged 0-23 months : Evidence from Bogor longitudinal study on child growth and development, Indonesia. *Malaysian Journal of Nutrition* 2018;24(29):11–23.
 11. Cunha MPL, Marques RC, D G. Child Nutritional Status in the Changing Socioeconomic Region of the Northern Amazon, Brazil. 2018;
 12. Lemeshow S, Jr DWH, Klar J, Lwanga SK. Stanley Lemeshow, David W Hosmer Jr, Janelle Klar, and Stephen K. Lwanga.
 13. Irawati, A et al., Cohort study report on child development. Health Research and Development Agency. 2017
 14. Barker DJP, Godfrey KM, Gluckman PD, Harding JE, Owens JA, Robinson JS. Fetal nutrition and cardiovascular disease in adult life. *Lancet* [Internet]. 2017 Aug 19;341(8850):938–41. Available from: [http://dx.doi.org/10.1016/0140-6736\(93\)91224-A](http://dx.doi.org/10.1016/0140-6736(93)91224-A)
 15. Irawati, A et al., Cohort study report on child development. Health Research and Development Agency. 2017
 16. Leroy JL, Ruel M, Habicht J, Frongillo EA. Linear Growth Deficit Continues to Accumulate beyond the First 1000 Days in Low- and Middle-Income Countries : Global Evidence from 51 National Surveys 1, 2. 2018;(July):1460–6.
 17. Sinha B, Taneja S, Chowdhury R, Mazumder S, Rongsen-Chandola T, Upadhyay RP, et al. Low-birthweight infants born to short-stature mothers are at additional risk of stunting and poor growth velocity: Evidence from secondary data analyses. *Matern Child Nutr*. 2018;14(1):1–9.
 18. Monteiro P, Victora C. Rapid growth in infancy and childhood and obesity in later life—a systematic review. *Obes Rev* [Internet]. 2005 [cited 2016 Nov 22]; Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1467-789X.2005.00183.x/full>
 19. Soltani H, Lipoeto NI, Fair FJ, Kilner K, Yusrawati Y. Pre-pregnancy body mass index and gestational weight gain and their effects on pregnancy and birth outcomes: A cohort study in West Sumatra, Indonesia. *BMC Women’s Health*. 2017;17(1):1–12.
 20. Irawati A, Salimar. Pre pregnancy Maternal nutritional status as a prediction of birth weight and length in the Bogor Central District, Bogor City: Child Growth and Development: Prospective Cohort Study 2012-2013. *Food Nutrition Research Journal*. 2014;2013(2):119–28
 21. Schmidt MK, Muslimatun S, West CE, Schultink W, Gross R, Hautvast JGAJ. Nutritional status and linear growth of Indonesian infants in west java are determined more by prenatal environment than by postnatal factors. *J Nutr* [Internet]. 2002;132(8):2202–7. Available from: <http://eutils.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&id=12163663&retmode=ref&cmd=prlinks%5Cnpapers2://publication/uuid/D0C75C25-FB9A-416F-884C-35D6F33E7FF1>
 22. Aryastami NK, Shankar A, Kusumawardani N, Besral B, Jahari AB, Achadi E. Low birth weight was the most dominant predictor associated with stunting among children aged 12–23 months in Indonesia. *BMC Nutr* [Internet]. 2017;3(1):16. Available from: <http://bmcnutr.biomedcentral.com/articles/10.1186/s40795-017-0130-x>
 23. Batiro B, Demissie T, Halala Y, Anjulo AA. Determinants of stunting among children aged 6-59 months at Kindo Didaye woreda, Wolaita Zone, Southern Ethiopia: Unmatched case-control study. *PLoS One*. 2017;12(12):1–15.

A Community-Based Study on the Association *Helicobacter pylori* seropositive to upregulate Cyclooxygenase 2 (COX2) Expression

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ABSTRACT

Helicobacter pylori infection can induce chronic inflammation and impact to release NFkB, and other pro inflammatory cytokine such as cyclooxygenase 2 (COX2). COX2 is a catalisator enzyme to arachidonic acid metabolism. Increase expression COX 2 lead to manifestation of extragastric. Acute *Helicobacter pylori* inflammation wheather also can induce upregulate express ion of cyclooxygenase 2 (COX2) is still unclear. This study aimed to evaluate wheather acute *Helicobacter pylori* infection also can induce upregulate expression COX 2. This research was cross-sectional study conducted from march to june 2018. The inclusion criteria were an age between 17-19 years girl, post menarche, and absence of pregnancy. Ultimately, 105 girl were enrolled in this study. Our procedure is an advance onn current methods and useful ELISA measurement of Ig M and Ig G antibodies diagnosed with *Helicobacter pylori*. ELISA measured serum Cyclooxygenase 2 (COX2) level. Among the subject, forty-five (42.8%) had been diagnosed with *Helicobacter pylori* infection based on Ig M *Helicobacter pylori* seropositive. Otherwise Ig G *Helicobacter pylori* seems to be normal. The subjects with *Helicobacter pyori* infection had higher mean COX 2 than those without *Helicobacter pylori* infection (2.5 ± 1.1 vs 0.6 ± 0.4 , $P = 0.001$). This study can conclude that subjects with *Helicobacter pylori* infection may increase a risk of upregulate COX 2 even in acute inflammation. this results will give a new understanding about pathophysiology of *Helicobacter pylori* infection.

Keywords: *Helicobacter pylori*, Ig M, Ig G, COX 2

INTRODUCTION

Helicobacter pylori (*H.pylori*) is a gram-negative microorganism found in the human gaster. Chronic infection with *H.pylori* will induce an immune response and result in local gastritis or systemic response(1–4). In recent studies, *H.pylori* was also found to be associated with some extradigestive diseases, such as cardiovascular disease, hormonal disorders and reproductive disorders including menstrual pain problem (1,4,5). The mechanism associating *H.pylori* infection and extra

gastric manifestation may be related to immunological cytokines and mediator of inflammation(1,4,6,7).

The prevalence of *H.pylori* is approximately 50-60% all over the world and about 60-70 % in Indonesia (8). *H.pylori* infection can induce changes in gastric epithelial to colonize (9,10). Most patients get *H.pylori* infections during childhood.

Gastric inflammation is highest with cytotoxin-associated gene A (cagA) strain of *H. pylori* (10–12). Chronic inflammation by *H. pylori* infection can induces the upregulate COX 2 through NFkB (6). Cyclooxygenase 2 (COX 2) is a key mediator inflammation that involved in development of gastric cancer (13,14). But the other hand, COX 2 is an enzyme that change arachidonic acid to their metabolit which is prostaglandin (15).

Recent studies have reported the wide range action of prostaglandin, such as fever, pain in dysmenorrhea

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primer, allergy, immune system, blood pressure, atherosclerosis, cardiovascular disease that is a public health problem in Indonesia (8,16,17). It still lack study for association between *H. pylori* infection and prostaglandin. It is necessary accurately adjust the molecular action to evaluate the association between *H.pylori* and prostaglandin that can revealed previously unknown pathway. We hypotesized that colonization with *H.pylori* is ssoociated with a change in prostaglandin due to chronic inflammation and that COX 2 is involved.

METHOD

This study was performed in student girl aged 17-19 years who had studied at the Nasional Institute of Health Science, from March to July 2018. We take 105 subjects were enrolled in this present study (mean age 18.05±0.9) with healthy condition by laboratory and phisical check up who voluntarily participated as subjects in this study. All procedures were approved by the Ethics of Committee of Moewardi Hospital. Each method and the potential risks were explained to the participants in detail, and all subjects gave written informed consent before the study.

In a cross-sectional study, we determined the presence of *H.pylori* infection was determined and evaluated the level of anti-*H. pylori* immunoglobulin M by a serum *H. pylori* antibody detection kit (PLATOS R496, AMP Diagnostics). We determined COX 2 using ELISA method (Elabscience®).

Statistical analysis was used with SPSS 20.0 statistical package (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test had used to assess whether continous data were normally distributed. Continous variables has been presented the mean and standard deviation. T-test was applid for comparing the mean values of two samples. Pearson Correlation test had used to determine the association between *H. pylori* infection and COX 2 and also with PGE 2. Regression linier analysis had used to evaluate the risk factors for increase COX 2 and PGE 2 serum level (backward: Wald; cutoff for entry : 0.05, for removal 0.10). if the differences with P-value of <0.5 was considered to indicate a statistically significant.

Table 1: Characteristics of the study subjects (n = 105)

	mean	p
Age	18.05 ± 0.9	P = 0.061
Body weight	47.6 ± 7.9	P = 0.052

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Body height	154.5 ± 6.0	P = 0.336
<i>H.pylori</i> infection	1.91 ± 1.2	P = 0.1
COX 2	1.48 ± 1.2	P = 0.061

RESULTS AND DISCUSSIONS

A total 105 subjects which were student girl enrolled in this study with age 17-19 years (mean age 18.05±0.9). Charateristics subjects acording to continous variable are ilustrated in Table. 1. Among the subjects, 45 (42.8%) were diagnosed with *H. pylori* infections. Caharacteristics subjects according to categorial variable are ilustrated in Table. 2.

The subjects with *H.pylori* infection had higher mean COX 2 than those without *H.pylori* infection (2.5 ± 1.1 vs 0.6 ± 0.4 , P = < 0.001). See at Table. 3

Table 2: Characteristics categorial vriable (n = 105)

Variable	f	%
<i>H.pylori</i> (+)	45	42.8
<i>H.pylori</i> (-)	60	57.2

As shown in Table 4, Pearson corelation r between *H. pylori* and COX 2 is 0.97 (p = 0.01), which mean there are a strong correlation between *H. pylori* and COX 2 serum level. Higher level of Ig M *H. pylori* causes increase serum COX 2 level.

Table 3: The mean COX 2 values of the subjects with and without *H. pylori* infection

	<i>H. pylori</i> (+)	<i>H. pylori</i> (-)	P
COX 2	2.5 ± 1.1	0.6 ± 0.4	< 0.001
Body weight			
Body Height			

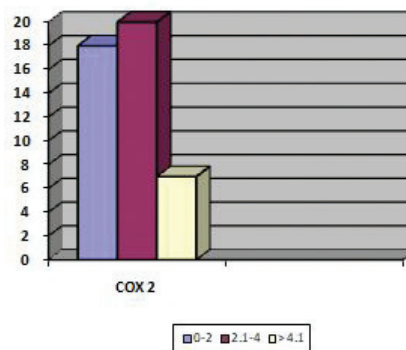


Fig. 1: Association between COX 2 and the prevalence of *h. pylori* infection

Linier regression analysis was performed to evaluate the most strong variable that associated with increase level COX 2 serum. The variables included age, body weight, body height and Ig M *H. pylori*. The results showed that Ig M *H. pylori* is the most variable that associated to increase COX 2 serum level, which is higher serum Ig M *H. pylori* level will cause increase COX 2 serum level (p= 0.01). Variable body weight has no association with COX 2 (p=0.1). Variable body height has no association with COX 2 (p=0.3). Variable age has no association with COX 2 (p=0.6). (Table 5).

Table 4: Association between *H. pylori* dan COX 2

Variable	n	mean	Pearson Coefficient Corelation	P
H. pylori	105	1.91 ± 1.2	0.97	0.01
COX 2	105	1.48 ± 1.2		
Body weight	105	1.91 ± 1.2	0.15	0.1
COX 2	105	1007.8 ± 819.8		
Body Height	105	1.48 ± 1.2	0.08	0.3
COX 2	105	1007.8 ± 819.8		

As illustrated in figure 1, showed that higher level COX 2 at the indeks Ig M range 2.1-4 (seropositive). *H. pylori* was the most variable that more prevalence in the increase COX 2. (Figure 1)

Table 5: Association between *H. pylor* and COX 2

Variable	B	t	R Square	P
age	0.012	0.38		0.7
<i>H. pylori</i>	0.93	47.8	0.95	<0.001
BMI	0.06	35.8		0.4
Body weight	-0.026	-2.04		0.5
Body Height	0.014	-0.32		0.4

Helicobacter pylori is bacterium that cause the most prevalence infection in the world, almost 50 % population (18,19). It cause dyspepsia, cute gastritis, chronic gastritis, peptic ulcer, MALT-lymphoma and gastric adenocarcinoma (3,10). The most virulent strain of *H. pylori* that identified by the presence of cytotoxin-associated gene A (cagA) cause peptic ulcer and gastric carcinoma (4,10).

Recent studies reported the link *H. pylori* infection with manifestation outside from the gaster. More study have been conducted to explore the role of *H. pylori* in cardiovascular disease, insuline resistance, metabolic syndrome that also public health problem (1,4,5).

Extra gastric manifestation of *H. pylori* infection related to chronic inflammation that mediated by NFkB dan COX 2 as a key mediator inflammation. From this, several cytoines and other mediator inflammation to be upregulated (6).

In the current study, 42.8% of the subject were *H. pylori* infection. There is a strong relationship between *H. pylori* infection and increase COX 2 (Tabel 4). Sierra et al. found that *H. pylori* induced COX 2 expression. Akhtar et al. also reported that *H. pylori* stimulate the expression of COX 2 (6,20).

COX 2 is an enzyme promote arachidonic acid into thier metabolite which is prostaglandin. Our data significantly confirm this relationship between COX 2 and PGE. (Tabel 5). COX 2 is the most influences variable that increase PGE 2. There have not any study yet that reported this.

Our data suggested that *H. pylori* infection was significantly linked with the increase PGE 2 (Tabel 4). The mean PGE 2 was higher in subjects with *H. pylori* infection thang those without *H. pylori* infection (Tabel 3).

It might be explained by molecular mimicry that infectious agents may lead to immune reponse that induce chronic inflammation by a variety mechanisms., such as inducing modification of antigen, alteration of the idiootype network, activation of polyclonal T cells (5,21,22).

The additional information provided by this study is that the effect of body weight on decrease PGE 2 serum level. More higher body weight cause more decrease of PGE 2 (Tabel 5).

In conclusion, our findings indicate that *H. pylori* infection significantly associated with increase PGE 2. This findings will explore the other pathway about extra gastrix manifestation of *H. pylori* infection especially to cardiovascular disease, insuline rsistance and metabolic sydrone. Therefore, it become to be preventif effort to public health problem.

CONCLUSIONS

Helicobacter pylori seem to be infected in early age or teenagers. This can be observed in Ig M *H.pylori* increase without increase Ig G *H.pylori*. *Helicobacter pylori* seropositive Ig M may increase risk of upregulate expression COX 2. It seems that increase serum COX 2 level already happens in acute infection of *Helicobacter pylori*.

ACKNOWLEDGEMENTS

This study was supported by grants from Ministry of the Research , Technology and High Studies of Indonesia Replubic. (No. 092/K6/KM/SP2H/PENELITIAN/2018). The author have no competing interests that might be perceived to influence the results and/or discussion reported in this paper.

Conflict of Interest: There no conflict of interst taht relevant to this article was reported.

Ethical Clearance: All procedures performed in studies involving human participants were in accordance with ethical standards of the institutional and/or national research commitee and with the 1964 Helsinki declaration and its later amendments or comparable ethic standards. The Institutional review Board of the Moewardi Hospital approved this research. All participants agreed to the study conditions and provided informed consent before the enrollment in this study.

REFERENCES

- Vijayvergiya R, Vadivelu R. Role of *Helicobacter pylori* infection in pathogenesis of atherosclerosis. *World J Cardiol.* (2015);7(3):134–43.
- Potamitis GS, Axon ATR. *Helicobacter pylori* and Nonmalignant Diseases. *Helicobacter.* (2015);20(1):26–9.
- Kusters JG, Vliet AHM Van, Kuipers EJ. Pathogenesis of *Helicobacter pylori* Infection. *Clin Microbiol Rev.* (2006);19(3):449–90.
- Testerman TL, Morris J. Beyond the stomach: An updated view of *Helicobacter pylori* pathogenesis, diagnosis, and treatment. (2014);20(36):12781–808.
- Papamichael KX, Papaioannou G, Karga H, Roussos A, Mantzaris GJ. *Helicobacter pylori* infection and endocrine disorders : Is there a link ? *World J Gastroenterol* [Internet]. (2009);15(22):2701–7. Available from: url: <http://www.wjgnet.com/1007-9327/15/2701.asp> DOI: <http://dx.doi.org/10.3748/wjg.15.2701>
- Sierra JC, Hobbs S, Chaturvedi R, Yan F, Wilson KT, Peek RM, et al. Induction of COX-2 expression by *Helicobacter pylori* is mediated by activation of epidermal growth factor receptor in gastric epithelial cells. *Am J Physiol Gastrointest Liver Physiol.* (2013);305:196–203.
- Michalkiewicz J, Helmin-basa A, Grzywa R, Czerwionka-szaflarska M, Szaflarska-poplawska A, Mierzwa G, et al. Innate Immunity Components and Cytokines in Gastric Mucosa in Children with *Helicobacter pylori* Infection. Hindawi Publishing Corporation; (2015);2015.
- K Simadibrata M, Makmun D, Abdullah M, Syam AF, Fauzi A. Konsensus nasional Penatalaksanaan Dispepsi dan Infeksi *Helicobacter pylori*.(20140).
- Budzyński J, Kłopocka M. Brain-gut axis in the pathogenesis of *Helicobacter pylori* infection. *World J Gastroenterol.*(2014);20(18):5212–25.
- Karlsson A, Ryberg A, Dehnoei MN, Borch K, Monstein H. Association between *cagA* and *vacA* genotypes and pathogenesis in a *Helicobacter pylori* infected population from South-eastern Sweden. *BMC Microbiol* [Internet]. *BMC Microbiology*; (2012);12(129):1. Available from: *BMC Microbiology*
- Kalaf EA, Al-khafaji ZM, Yassen NY, Al-abbudi FA, Sadwen SN. Study of the Cytotoxin - Associated Gene A (*CagA* Gene) in *Helicobacter Pylori* Using Gastric Biopsies of Iraqi Patients.(2013);19(2):69–74.
- Li H, Zhou Y, Zheng Y, Guo H, Gao L, Chen P, et al. The Gastric Mucosa from Patients Infected with *CagA* + or *VacA* + *Helicobacter pylori* Has a Lower Level of Dual Oxidase-2 Expression than Uninfected or Infected with *CagA* 2 / *VacA* 2. *Dig Dis Sci.* Springer US; (2016);61(8):2328–37.
- Dominguez-bello MG, Hashi K, Murata-kamiya N, Varon C, Francis M. Natural variant of the *Helicobacter pylori* *CagA* oncoprotein that lost the ability to interact with. (2014);105(3).
- Delgado-rosado G, Dominguez-bello MG, Massey SE. Positive selection on a bacterial oncoprotein associated with gastric cancer. *Gut Pathog* [Internet].

- BioMed Central Ltd; (2011);3(1):18. Available from: <http://www.gutpathogens.com/content/3/1/18>
15. Ota Y, Imai T, Hasumura M, Cho Y, Takami S, Oyamada T, et al. Prostaglandin Synthases Influence Thyroid Follicular Cell Proliferation But Not Carcinogenesis in Rats Initiated With N-Bis (2-hydroxypropyl) nitrosamine. *Toxicol Sci.* (2012);127(2):339–47.
 16. Narumiya S. Review Physiology and pathophysiology of prostanoid receptors. *Proc Jpn Acad Ser B.* (2007);83:296–319.
 17. Nørregaard R, Kwon T, Frøkiær J. Kidney Research and Clinical Practice Physiology and pathophysiology of cyclooxygenase-2 and prostaglandin E2 in the kidney. *Kidney Res Clin Pract [Internet]. Elsevier Ltd;*(2015);34(4):194–200. Available from: [http://dx.doi.org/10.1016/j.krcp. \(2015\).10.004](http://dx.doi.org/10.1016/j.krcp. (2015).10.004)
 18. Miftahussurur M, Sharma RP, Shrestha PK, Suzuki R, Uchida T, Yamaoka Y. Molecular Epidemiology of Helicobacter pylori Infection in Nepal : Specific Ancestor. *PLoS One.* (2015);10(7):1–16.
 19. Torres BZ, Lucero Y, Lagomarcino AJ, Orellana-Manzano A, George S, Torres JP, et al. Review: Prevalence and dynamics of Helicobacter pylori infection during childhood. *Helicobacter [Internet]. Wiley Online Library;* (2017);22(5). Available from: <http://https://doi.org/10.1111/hel.12399>
 20. Akhtar M, Cheng Y, Magno RM, Ashktorab H, Smoot DT, Meltzer SJ, et al. Promoter methylation regulates Helicobacter pylori-stimulated cyclooxygenase-2 expression in gastric epithelial cells. *Cancer Res [Internet].* (2001);61(6):2399–403. Available from: http://www.ncbi.nlm.nih.gov/entrez/query.fcgi? db=pubmed & cmd = Retrieve & dopt = Abstract Plus & list_uids = 11289104
 21. Popescu D, Andronescu D, Babeş PA. Association Between Helicobacter pylori Infection and Insulin Resistance. *Rom J Diabetes Nutr Metab Dis.* (2017);24(2):149–54.
 22. Saad MJA, Santos A, Prada PO. Linking Gut Microbiota and Inflammation to Obesity and Insulin Resistance. *Physiology [Internet].* (2016);31(4):283–93. Available from: [http://physiologyonline.physiology.org/ lookup/ doi/ 10.1152/physiol.00041. \(2015\)](http://physiologyonline.physiology.org/ lookup/ doi/ 10.1152/physiol.00041. (2015))

Individual Characteristic and Cadmium Level in Blood on Tradisional Metal Foundry Workers

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ABSTRACT

Cadmium is one type of seriously hazardous heavy metal if inhaled. Acute cadmium poisoning may result from exposure of cadmium oxide vapor during metal melting process. This study aims to determine the factors of individuals characteristic associated with levels of cadmium in the blood of workers. This research is an analytic observation research with cross sectional approach. Samples were taken purposively from 30 metal casting workers. The research variables are smoking habit, BMI, working hours, duration of work and occupation as independent variables and cadmium levels in the blood as dependent variables. Blood cadmium levels were measured using Atomic Absorbtion Spectrophotometer (AAS). Data were analyzed using chi-square. Although there was no correlation between smoking habit and working hours on cadmium blood level (p value > 0,05) but there was correlation between nutritional status, duration of work and occupation to cadmium in blood (P value < 0.05). There is a relationship between BMI, duration of work and type of work with cadmium levels in the blood of metal casting workers, for modification of workplace ventilation and the use of personal protective equipment to increase fume of cadmium in workplace.

Keywords: *cadmium in blood, metal casting, individual characteristics*

INTRODUCTION

Metal foundry industry is one of the industries producing pollutants that can pollute the environment. Sources of emissions of pollutants that exist among them are particles in the form of dust derived from metals such as lead, nickel, cadmium and beryllium¹.

In the process of casting melting of raw materials is done at $\pm 13000C$. At this stage smoke and vapors produced are contained of metal particles (fume) consisting of unused metal powder finishing, steel, silicon, slag and carbon. This is exacerbated by the lack of adequate ventilation to cause workers inhaling the combustion gas continuously²

In addition to products result, the process of casting metals also produces heavy metals such as Cd, Cr, Ni and Pb. This is a risk factor that is harmful to the health of workers because the side effects of heavy metals produced have high toxicity properties³. One of the dangers to be considered in connection with the metal foundry industry is the presence of cadmium. Cadmium is one of the heavy metals from the metal melting process, acute cadmium poisoning usually occurs due to cadmium oxide vapor from cutting of cadmium metal or a cadmium-containing metal mixture⁴.

This study aims to analyze relationship between the characteristics of individuals (Smoking Habit and Body Mass Index) and Occupational Factors (Type of Work, Duration of work and working hours) on levels of Cadmium in the blood of metal foundry workers.

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METHOD

This is Explanatory Research, with cross sectional approach. The sample is the total population of 30 metal foundry workers. Blood sampling assisted by Health Center officer of sub-district Ceper, Klaten, Central

Java. Primary data used in this research is obtained by questionnaire to know variable of individual factor and worker factor. In addition, the primary data were also obtained from the results of laboratory tests for cadmium levels in the blood. This examination was conducted at the Center for Environmental Health Engineering and Disease Control (BBTKLPP) Yogyakarta.

Data analysis used to know the relation of significance between individual factor and worker factor with cadmium level in blood, used Chi Square test.

RESULTS AND DISCUSSIONS

Description of the Research Variable: Based on the results of research obtained by the distribution of respondents based on smoking habits, most respondents have smoking habit as many as 16 respondents (53.3%). While not smoking as many as 14 respondents (46.7%). Data of respondent distribution based on nutritional status, most of respondent have normal status that is 20 respondents (56,7%), while abnormal nutrition status is 10 respondent (33,3%).

Respondents have a working duration for > 5 years as many as 16 respondents (60%). While the duration of work for <5 years as many as 14 respondents (40%) and respondents who have working hours <8 hours / day as many as 21 respondents (70%). While working hours > 8 hours / day as many as 9 respondents (30%), as well as respondents working on the foundry that is as many as 18 respondents (70%). While in the finishing of 12 respondents (30%), respondents who are not exposed to cadmium are 21 respondents (70%), while cadmium exposure is 9 respondents (30%).

Table 1: Distribution of Respondent's Characteristic

No.	Variable	n = 30	%
1.	Smoking Habit		
	a. Smoking	16	53,3
	b. Non Smoking	14	46,7
2.	BMI		
	a. Normal	20	56,7
	b. Not normal	10	33,3
3.	Working Period		
	a. >5 years	16	53,3
	b. ≤5 years	14	46,7

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4.	Working Hours		
	a. <8 hour/day	21	70
	b. ≤8 hour/day	9	30
5.	Type of Work		
	a. Foundry	18	60
	b. Finishing	12	40
6.	Cadmium in Blood		
	a. Exposed	9	30
	b. Not Exposed	21	70

Metal foundry workers are potentially exposed to Cadmium. In the process of casting the metal, in addition to producing metal products, it also produces heavy metals such as Cd, Cr, Ni and Pb, This is a quite harmful risk to the health of traditional metal foundry workers, considering that the heavy metals have the side effects with high level of toxicity.

It is also worsened by the lack of adequate ventilation, thus it makes the workers to inhale gas from burning result continuously. In doing the job, there is no worker who uses personal protective equipment, even having their meals and drinking is also done in the workplace. Therefore, preventive steps should be prepared much earlier to overcome the possible harmful impact to the workers.

Cadmium can cause interference and even able to cause damage to the kidney system. Such damage may occur in the tubules of the kidneys. The symptom of the damage that can occur in the kidney because of the cadmium is the occurrence of amniouria, glucosuria and the calcium and phosphorus urinary abnormalities⁵

Smoking is one of the main sources of cadmium exposure. Therefore we consider the possibility of smoking as confounding variables in exposure to cadmium in non smokers. The exact mechanism is not yet known whether the smoking causes kidney damage. The mechanism that can be explained is that smoking will make the kidneys more sensitive to cadmium toxicity⁶

Table 2: Bivariate Analysis between Smoking Habit, BMI, Type of Work, Working Period, Length of Work, Working Hour and Cadmium Level in Blood

No.	Variable	Cadmium		P	RP	95% CI	
		Exposed	Not Exposed			Lower	Upper
1.	Smoking Habit						
	Smoking	6 (37,5%)	10 (62,5%)	0,440	1,750	0,535	5,729
	Non Smoking	3 (21,4%)	11 (78,6%)				
2.	Body Mass Index						
	Normal	0(0%)	10(100%)	0,013	1,818	1,223	2,703
	Not Normal	9(35%)	11(65%)				
3.	Type of Work						
	Foundry	8(44,4%)	10(55,6%)	0,049	5,333	0,762	37,348
	Finishing	1(8,3%)	11(91,7%)				
4.	Working Period						
	>5 Years	9(56,3%)	7(43,8%)	0,001	0,438	0,251	0,763
	≤5 Years	0(0%)	14(100%)				
5.	Working Hour						
	>8 hour/day	2(22,2%)	7(77,8%)	0,681	0,667	0,170	2,607
	≤8 hour/day	8(28,6%)	15(71,4%)				

Based on bivariate analysis, the proportion of workers who have smoking habit on cadmium exposure in blood is 37.5% or 6 respondents while non-smokers are exposed to cadmium of 21.4% or 3 respondents. Chi Square statistical analysis results obtained P-Value of 0.440 ($> \alpha = 0.05$) showed that there is no relationship between smoking habits against cadmium in the blood of metal foundry workers. The results of this study is similar to the research conducted by Ghazali and Luckett which showed no significant relationship between smoking habit and cadmium content ^{7,8}

Psychology capacity like smoking habit, alcohol and supplement drink consumption greatly affected the performance and productivity of worker ⁹ Smokers prone to have respiratory disorder compared to non smokers when they were in hazardous environment. There were 2000 chemicals in the cigarette, and 1200 of them contain toxic substances for human health. Besides that, exposure to cigarette smoke have strong relations with the DNA damage induced by oxidative stress (oxidative stress) and carcinogenesis¹⁰. Some studies indicate that smoking can caused and increased of cancer in humans, such as lung cancer, mouth, pharynx, laring, esophagus, bladder, stomach, pancreas, kidney, uterus, cervix and myeloid leukemia¹¹.

Harmful substances in cigarettes in addition to triggering direct changes to the kidney organs, also

brings the risk of increasing blood and heart pressure. Increased blood pressure is an important factor in the progression of CKG disease. The mechanism of last renal impairment may be seen histopathologically¹², Smokers are generally exposed to cadmium through inhalation. In a cigarette there is 2 µg of cadmium, where almost 2-10% of it turns into cigarette smoke¹³. Smokers generally have their blood contained with cadmium and the content in the body is twice higher than those who do not smoke¹⁴. In addition, smokers will also have a high cadmium content in their urine¹³.

Based on bivariate analysis, it is found that the proportion of exposed workers cadmium have normal nutritional status of 45% or 9 respondents. Chi Square statistical analysis result obtained P-Value of 0,013 ($> \alpha = 0,05$) with value of RP: 1,818 and CI 95%; 1,223-2,703 which means that people with normal nutritional status have a risk of exposure to cadmium in the blood of 1.818 times compared to people with abnormal nutritional status.

Human weight reflects the nutritional status of a person. Poor nutrition will affect the decrease of one's body endurance and it brings health problems. People with ideal body weight will have enough nutrients that block the presence of cadmium into the body in replacing nutrients (zinc, iron, copper, selenium,

calcium, pyridoxine, ascorbic acid, and protein). Most cadmium toxicities occur due to the deficiency of the above-mentioned elements causing an increase in cadmium absorption¹⁵.

Factors of the body such as immunity, the power of respondents in exhaling, the ability of the cilia to filter out the fume dust produced during the casting process, and the pattern of consumption of eating and drinking, is a factor that affects the existence of high cadmium in the body and the existence of zinc (Zn) enzymes such as Glutathione S-transferase¹⁶.

Entrepreneurs should think about the problems faced by their employees who work over the regulated work hours or carry out the work that is considered heavy, to always provide food security (usually in the form of nutritious food) and extra food (Extra Voeding). Restrictions on working time, the provision of assured regular meal every working day, is an employer's policy to maintain the desired work productivity of the company from its employees.¹⁷

Based on bivariate analysis, the proportion of workers who are exposed to cadmium working in the foundry section was 44.4% or 8 respondents. The result of Chi Square statistical analysis obtained the P-Value of 0,049 ($> \alpha = 0,05$) showed that there was correlation between work type to cadmium substance in blood of metal foundry workers, with RP value: 5,333 and CI 95%; 0.762 - 37.348 which means that people who work in the foundry have a risk of exposure to cadmium in the blood of 5.333 times than people who work in finishing.

OSHA estimates that 300,000 workers exposed to cadmium in the United States are present in industrial sector workers comprising metal smelting, welding and packaging. This study aims to determine factors that are related to cadmium levels in the blood of metal foundry workers.⁴

Based on the bivariate analysis, it is found that the proportion of workers exposed to cadmium has a work period over 5 years of 56.3% or 9 respondents. Chi-Square statistical analysis results obtained P-Value value 0.001 ($> \alpha = 0.05$) showed that there is a relationship between the length of work against cadmium in the blood of metal foundry workers, with the RP value of: 0.438 and CI 95%; 0.251 - 0.763 which means people who work over 5 years have a risk of exposure to cadmium in the blood of 0.438 times compared to people who work under 5 years.

Respondents who suffered from work-related complaints may be caused by work under long working hours and long period time (more than 3 years) and lack of PPE usage¹⁸. From research on working adults in USA show that long working hours indirectly precipitate workplace accidents by inducing fatigue or stress in affected workers and overtime schedules had the greatest relative risk of occupational injury or illness, followed by schedules with extended (>12) hours per day and extended (>60)¹⁹.

Based on bivariate analysis, the proportion of workers exposed to cadmium has working hours over 8 hours / day as many as 22.2% or 2 respondents, while those who have less than 8 hours / day of working hours 33,3% or 7 respondents. Chi Square statistical analysis results obtained P-Value 0.681 ($> \alpha = 0.05$) showed that there is no relationship between working hours of cadmium in the blood of metal casting workers.

This research is similar to the research done by Bagun Sugiharto which explains that there is no relation between work and the number of working hours per week with cadmium level in exhaust welding worker³. This inertial study with the study of Ghazali showed no association between length of service and cadmium content, but there was a significant relationship between the working period and the concentration of lead and arsenic metal⁷.

Exposure to the toxic cadmium (Cd) has adverse health effects an occupational or high level environmental exposure²⁰. Cadmium exposure is an important risk for renal dysfunction, bone disease and cancer, cadmium is associated with cardiovascular disease too²¹. So all workers who in foundry must use Personal Protective Equipment (PPE) to control hazards at work place.

CONCLUSIONS

There is a relationship between nutritional status, duration of work, and type of work to cadmium levels in the blood of metal foundry workers. In order to reduce cadmium exposure in the workplace there is a need to be have adequate ventilation in the workplace and the use of personal protective equipment.

ACKNOWLEDGEMENTS

The author would like to thank to all of respondents in foundry workers at sub-district Ceper, Klaten, Central Java to support of this research and BBTKLPP Yogyakarta for analyzing blood of Cadmium.

Conflict of Interest: The author declare that there is no conflict of interest in this research.

Ethical Clearance: Ethical clearance to conduct this study was obtained from Health Research Ethics Committee, Faculty of Public Health Diponegoro University (No.026/EC/FKM/2018)

REFERENCES

- Buranatrevedh S. Health Risk Assessment of workers exposed to metals from an aluminium production plant, *J Med Assoc Thai*; 2010.Dec :93 Suppl 7: S136-41
- Agency for Toxic Substances and Disease Registry (ATSDR). CERCLA priority list of hazardous substances. Washington DC: Department of Health and Human Services, 2007
- Morris TK.Cadmium exposures at three nonferrous foundries: an unexpected trace source. *J Occup Environ Hyg* 2004 Jan;1(1):39-44
- OSHA. Cadmium, Occupational Safety and Health Administration. USA. 2004
- Akesson A. Lundh, Vahter M, *et al* .Tubular and glomerular kidney effects in swedish women with low environmental cadmium. *Environ Health Perspect* 2005; 113 :1627-31
- Hambach, R.D, Lison, P.C D'Haese,J Weyler,E De Graef, A De Schryver, LV Lamberts, M Van Sprundel. Co-exposure to leads increases the renalresponsetolow levels of cadmium in metallurgyworkers. *Toxicology Letters* 222. 2013: 233-238
- Lockett BG, SuL J, Rood JC, Fonham ET. Cadmium exposure and pancreatic cancer in south Louisiana. *Journal of environmental and public health*. 2012;1-11
- Ghazali AR, Razak A, Ezzazulianie N, Othman MS, thman H, Ishak I, Lubis SH, Mohammad N, Abd Hamid Z, Harun Z, Kamarulzaman F. Study of heavy metal levels among farmers of Muda Agricultural Development Authority, Malaysia. *Journal of environmental and public health*. 2012; 1-4
- Setyaningsih, Y, Husodo A.H, Astuti I, Detection of Urinary 8-hydroxydeoxyguanosine(8-OHdG) levels as biomarker of oxidative DNA damage among home industry workers exposed to chromium. *Procedia Environment Science*. 2015 : Vol 23,pp 290-296
- Patel B.P and U.M.Rawal, Tobacco, antioxidant enzymes, oxidative stress, and genestic susceptibility in oral cancer, *Am. J. Clin. Oncol*. 2018 : vol. 31, pp. 454-459
- Lodovici, M and Bigagli, E . Biomarkers of induced active and passive smoking damage, *Int J Env Res Public Health*.2009: vol. 6, pp. 874-888
- Orth HS. Smoking: a risk factor for progression of chronic kidney disease and for cardiovascular morbidity and mortality in renal patients--absence of evidence or evidence of absence? *Clin J Am Soc Nephrol*. 2008; Jan;3(1):226-36
- Mannino DM, Holguin F, Greves HM, Savage-Brown A, Stock AL, Jones RL. Urinary cadmium levels predict lower lung function in current and former smokers: data from the Third National Health and Nutrition Examination Survey. *US National Library of MedicineNational Institutes of Health. Thorax* 2004 Mar;59(3):194-8.
- Walker, JR Orville . *Marketing Strategy: A Decision-Focused Approach*. Mc Graw-Hill, New York. 2003
- Kobayashi E,Suwazuno Y, Dochi M, Honda R,Kido T, Nagakawa H. Influence of consumption of Cadmium-polluted rice from Jinzu River water on occurrence of renal tubular dysfunct researchion and/or Itai-Itai disease. *Biological Trace Element research*. 2009 27 : 257-268
- Mulder TP, Peters WH. Variability of glutathioneS-transferase α in human liver and plasma.*Clinical chemistry*. 1999 :355-359
- Madeddu R, Solinas G, Forte G Bocca B, Assara Y, Tolu P, et al. Diet and nutrients are contributing factors that influence blood cadmium levels. *Nut Res* 2011; 31(9) :691-72011
- Sagita Q M, Yuliani Setyaningsih, Sulistiyani , Determinant Factors of Work-Related Complaints, *International Journal of Public Health Science (IJPHS)* 2018 :Vol.7, No.1, , pp. 46-50
- A. E. Dembe, *et al.*, The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States,2005 *Occup Environ Med*, vol. 62, pp. 588–597
- Norberg GF, NogawaK, Norberg M. Cadmium In : *Handbook on the Toxicology of Metals* (Nordber GF, Fowler GF, Nordberg M, eds) \$ th ed. Amsterdam, Netherlands .Elsiever 2015 :667-176
- Hsu CW, Ja Liang Lin, Dan Tzu Lin Tan, Wen Huang Huang, Kuan Hsing Chen, Tzung Hai Yen, Association between blood cadmium levels and malnutrition in peritoneal dialysis *BMC Neprology* 2014, 15-17

Pharmacovigilance Study of Antituberculosis Drug Regimens in Adult Patients

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ABSTRACT

The success of pulmonary tuberculosis (TB) treatment in Indonesia was 81,3%. Meanwhile, this number has been not reached the WHO target number of 85%. It was because patients experiencing Adverse Drug Reaction (ADRs) of antituberculosis drugs. Therefore, the government launched a pharmacovigilance program to monitor the ADRs of antituberculosis drugs to improve successful treatment. This study aimed to observe regimens of antituberculosis drug that often caused ADRs and the number event of ADRs. It was non-experimental numerical and analytical descriptive that conducted in outpatient Installation one of Hospital in Klaten, Central Java, Indonesia. Data were collected by interviewing and observing the patients' medical records for two months starting from January to February 2018. The sample was obtained by using purposive sampling method. Then, the data were analyzed by the Liverpool algorithm that interpreted in 4 scales: unlikely, possible, probable, and definite. This study focused on 30 patients, which 23 patients with positive smear and seven patients with negative smear tuberculosis. The result showed that Fix Dose Combination (FDC) of rifampicin, isoniazid, pyrazinamide, ethambutol (RHZE) regimen was the most causing side effects. The number of ADRs were 3-7 in one patient. The most common side effects were reddish urine (90,74%), nausea (90,74%), vomiting (83,33%), shortness of breath (70,37%), and dizziness (22,22%). Almost all antituberculosis drug regimens caused ADRs.

Keywords: *Antituberculosis Drugs, Liverpool Algorithm, Pharmacovigilance*

INTRODUCTION

Tuberculosis (TB) is a chronic granulomatous infectious disease caused by *Mycobacterium tuberculosis* that attacks various organs, especially lungs. Pulmonary tuberculosis remains a significant cause of morbidity and mortality worldwide, uncompleted treatment will lead to severe complications to the risk of death. WHO reported that 8.6 million people of TB in 2014 increase up to 9.6 million people in 2015. Indonesia placet at the second position of high burden country with the percentage

of 10,3%². The success of tuberculosis treatment in Indonesia is 81.3%, it has not reached the target set by WHO (85%)³.

ADRs (Adverse Drug Reaction) is regarded as one of the leading cause of non-adherence to antituberculosis treatment (69,01%)^{4,5}. As a result, ADRs might eventually contribute to the extension of treatment duration, final termination, drug resistance, and treatment failure⁶. It might also increase the number of TB cases and more rarely the number of deaths, posing a challenge to the management of TB patients and TB control. WHO released a study relating to the detection, assessment, understanding, and prevention of ADRs (pharmacovigilance). It aims to improve patients' care and patients' safety about the use of medicines⁷. In pharmacovigilance, there is active surveillance approach to detect the adverse event. Pharmacovigilance is achieved by active follow up after treatment, and the events may be detected by asking patients directly or

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screening patient record. Liverpool causality assessment tool or Liverpool algorithm is new active surveillance pharmacovigilance method, published in 2011. This algorithm or flowchart is based upon dichotomous questions that were issued from Naranjo algorithm with some alterations. Each answer is routed to more specific question resulting in four causality categories: 'unlikely,' 'possible,' 'probable,' and 'definite'⁸. The assessment obtained by the Liverpool algorithm is closer to the consensual expert judgment (probability of 0.95 and 0.98). That tool concerned only 'probable' and 'certain' categories, both considered in favor of drug causation, sensitivity, specificity, negative and positive predictive values remained identical to those of the Naranjo algorithm⁹. This study aimed to observe regimens of antituberculosis drug that often caused side effects, and the number event of ADRs.

METHOD

This study was prospective, non-experimental, numerical and analytical descriptive research conducted in one of the government hospitals in Klaten, Jawa Tengah, Indonesia from January – February 2018 licensed by Health Research Ethics Committee Dr. Moewardi General Hospital School of Medicine Sebelas Maret University No. 134/II/HREC/2018. All adult patients of pulmonary tuberculosis (age >18 years old) which outpatient therapy, were smear positive or negative, not pregnant or breastfeeding, and agree to join in this research were included. Independent variable was antituberculosis drug regimens, and the dependent variable was ADRs of antituberculosis.

Materials that used was ADRs parameter, informed consent, interview form based on Liverpool algorithm and patient medical report. Data obtained from interview and observation of patients' medical record included age, gender, co-morbidities, medical history, an antituberculosis regimen that used, ADRs, and the result of patients' laboratory test data. The ADRs event of every regimen in every prescription calculated to total events of ADRs in the regimen. The total cases of all regimens were calculated from total cases of drug regimens used by patients (one regimen was one case). The result of ADRs analysis in each regimen interpreted based on Liverpool algorithm, consisting of 4 scales: 'unlikely,' 'possible,' 'probable,' and 'definite.'

RESULTS AND DISCUSSIONS

During the two months period, the total of 30 TB patients (23 positive smear pulmonary tuberculosis patients and seven patients with smear-negative pulmonary tuberculosis) were enrolled in this study. Each patient's early diagnosis of pulmonary tuberculosis regimen treatment was observed until February 2018 through the interview and patient medical record. The total of 30 patients showed 54 ADRs (1 patient could get more than one regimen of antituberculosis drugs). This result was suitable to the tuberculosis treatment principle because there was different treatment for intensive and advance phase or drug replacement for patients with severe ADRs.

Characteristics of patient consist of age, gender, and co-morbidities. Table 1 showed the patients' characteristics of pulmonary tuberculosis. Most patients were in the productive age group (15-54 years old) (53,33%). This result was in line with others theory that 75% of pulmonary tuberculosis patients were productive age group¹⁰. Working class were mainly prone to TB, probably because of exposure outside of their homes as they go outside and from work, etc. It could be a serious adverse effect on the socioeconomic status of a country since the reproductive and economically productive age groups were mostly affected⁹.

As a result, the gender distribution of subjects was male 56.67% and female 31.25%. In another research in Indonesia, the majority of TB patients was male¹¹. However, gender was not a significant factor affecting TB¹⁰. The frequency of tuberculosis and ADRs was significantly higher in patients with smoking and drinking alcohol habit. Cigarettes and alcohol could reduce immunity so that it could be more susceptible to pulmonary TB¹². Another study concluded that males were more likely to have poor compliance than females so that it could be increasing the risk of TB¹³. Based on co-morbidities, 19 patients (63.33%) were have not co-morbidities, and four others have co-morbidities either one or more. Co-morbidities have a risk of developing tuberculosis; it could decrease antituberculosis respond in the body because of polypharmacy treatment increasing drug interaction¹⁴.

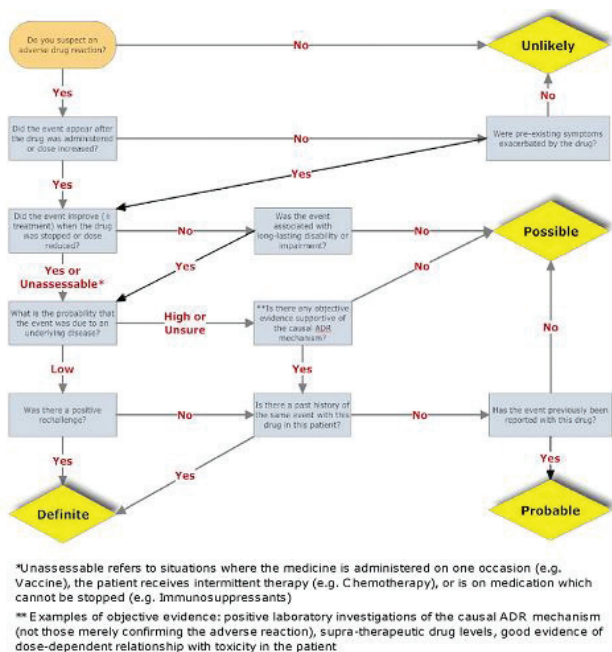


Figure 1: Liverpool Algorithm⁸.

Table 1: Baseline characteristics of the patients smear-positive (n = 23) and smear-negative (n = 7)

Parameters	Variables	Total	
		Smear Positive*	Smear Negative**
Age (years)	Productive (15-54 years)		
	Non productive	14 (60,87%)	2 (28,57%)
	(>54 years)	9 ((39,13%)	5 (71,43%)
Gender	Male	13 (56,52%)	4 (57,14%)
	Female	10 (43,48%)	3 (42,86%)
Co-morbidities	Non co-morbidities	14 (60,87%)	5 (71,43%)
	Pneumonia and anorexia	1 (4,35%)	
	Hepatitis	1 (4,35%)	
	Hypertension	1 (4,35%)	
	Diabetes Mellitus type 2	2 (8,70%)	
	Hypertension and Diabetes Mellitus type 2	1 (4,35%)	
	Typoid and dyspnea	1 (4,35%)	

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Respiratory Tract Infections	1 (4,35%)	
Gout Arthritis		
Crhonic Heart Failur and Chronic Obstructive Pulmonary Disease		1 (14,29%)

Note:

*Smear-positive patients showed positive Mtb In their sputum.

**Smear-negative patients showed positive Tb in their thorax test.

Antituberculosis Regimens: Antituberculosis regimens which used by patients were Fix Dose Combination (FDC) and single dose with duration treatment between 6-9 month. There were eight regimens used by patients showed in table 2. Regimens for the therapy consist of rifampin (R), isoniazid (H), pyrazinamide (Z), ethambutol (E), and streptomycin (S). Patients use not only antituberculosis drug but also use other medications like vitamins, antihistamines, analgetics antipyretics, anticonvulsant, appetite enhancing drugs, proton pump inhibitor, antiasthma, antiemetics, antigout, antihypertension, antidiabetics, antibiotics, corticosteroids, and antianginal based on their co-diagnosis, complaints, ADRs cause antituberculosis drugs and drugs to prevent ADRs.

Table 2: Antituberculosis regimen for smear positive and negative patients (Σ total cases = 54)

Regimen	Dose (mg)	Total Cases of Treatment (n)	
		Smear Positive	Smear Negative
R1	450/300/1000/750	21	7
R2	450/300	5	1
R3	450/300/250	1	0
R4	300/750/750	3	0
R5	450/300/1000/750/750	6	1
R6	450/300/750	7	0

R7	450/300/250	1	0
R8	450/300/1000/750/ 750 +150	1	0
Total		45	9

Note: (R1) FDC (RHZE), (R2) FDC (RH), (R3) (RHE), (R4) (HE)+S, (R5) (RHZE)S, (R6) (RH)S, (R7)(RHE)S,

Pharmacovigilance: Pharmacovigilance method in this study was active surveillance³ using algorithm Liverpool as instrument causality assessment tool to detect ADRs. Antituberculosis regimens which used by patients have various ADRs and more than one events of ADRs. Every regimen calculated with algorithm Liverpool and interpreted with four scales: ‘unlikely,’ ‘possible,’ ‘probable,’ and ‘definite.’ Table 3 showed the interpretation result of algorithm Liverpool of each regimen. This study was already tested with application drug interaction checker (www.drugs.com) to ensure that the incidence in patients was a side effect not causes others

factor. The result of drugs interaction test concluded that there was no drug interaction in each case.

As a result, regimens that caused ADRs were R1, R2, R3, R4, R5, and R6. R7 and R8 that not reported have adverse effects of drug because it was not recorded on a patient’s medical record and based on an interview with patients using this regimen. They explained that they fell familiar with the adverse effect of previous regimens, so they did not feel disturbed by the side effect of two regimens.

Table 4 showed a regimen that is often causing ADRs was R1 with a 3-7 range of events ADRs, each patient. R1 was the highest regimen that producing ADRs compared to others. It was the first line therapy for patients of pulmonary TB, so most patients use this regimen. The more patients use, the more ADRs. It was due to differences of psychology every patient, so antituberculosis drug would cause different ADRs in each patient.

Table 3: Interpretation of algorithm Liverpool (Σ = 54)

Regimen	Total Cases (Σ)	Scales (n)			
		Unlikely	Possible	Probably	Definite
R1a	21	0	15	3	3
R1b	7	0	6	1	0
R2a	5	0	5	0	0
R2b	1	0	1	0	0
R3a	1	0	1	0	0
R4a	3	0	2	0	1
R5a	6	0	6	0	0
R5b	1	0	1	0	0
R6a	7	0	7	0	0

Note: a showed smear-positive patients, and b showed smear-negative patients.

Table 4: ADRs events based on an antituberculosis regimen (Σ = 54)

Regimen	Σ**	n*	Range of Event
R1	28	147	3-7
R2	6	22	3-5
R3	1	4	4
R4	3	10	3-4
R5	7	30	3-6
R6	7	25	2-4

Note: *n = Total of ADR event per Regimen

**Σ= Total of ADR event

Table 5 shows the number of ADRs percentage from each regimen. Common ADRs resulted from this study were redness urine (90.74%), nausea (90.74%), vomiting (83.33%), breathless (70.37%), and dizziness (22.22%). The most common ADRs occurrence was reddish urine, it caused by the use of rifampin¹⁵. This ADRs almost felt by all patients after taking rifampin, but they were not worried or scared because doctors and nurses already gave them an explanation about ADRs. Then, gastrointestinal reactions caused by rifampin and pyrazinamide. These ADRs were not frequent, it starts shortly (2-3 hour) after administration of the drug^{16,17}. Generally, the reaction

in this study was nausea (90.74%), vomiting (83.33%), and abdominal pain (1.85%). According to an interview with patients, they explained that they experienced gastrointestinal symptoms just on the first month after administered the drug. The administration of drug could avoid gastrointestinal symptoms during or immediately after meals¹⁵.

The other ADRs was breathless (70.37%). The reaction suspected because of administration of rifampin. It generally appeared between 3-6 months after the beginning of rifampin treatment, the symptoms appear 1-2 hour after the drug administration with a dose of 10 mg/kgBB¹⁶. The influenza-like syndrome was almost exclusively caused by rifampin. This pseudo influenza syndrome in this study includes dizziness (22.22%), faintness (9.26%), cough (3.7%), fever (3.70%), pain (9.26%), shivering (1.85%), appetite down (1.85%), and itchy throat (1.85%). These ADRs rare occurred in patients. The symptoms appear a similar 1-2 hour after 10 mg/kgBB administration of rifampin¹⁶. Then, other ADRs were skin rash (9.26%) and skin redness (1.85%). The reaction was on grade 1 (Macules/papules covering <10% body surface area with or without symptoms). It generally appeared 1-2 hour after administration dose 600 mg of the drug. That ADRs maybe occurred because of administration of rifampin¹⁶. In contrast, the dose used in this study was less than 450 mg, perhaps it affected the response, or clinical conditions of each patient vary.

Pyrazinamide caused ADRs gout arthritis, like a swollen foot (5,56%) and aches (3.70%). The reaction was on grade 2 (number of uric acids > 10 mg/dL with the psychological disorder). It generally appeared after

administration daily dose 300 mg¹⁸. Then, another ADRs was blurred vision (3.70%) on R1 and R6. It suspected after administration ethambutol. This ADRs generally appeared after administration daily dose 25-35 mg/kgBB (3-5 month after start administration of the drug)¹⁹. This ADRs was reversible. Also, patients also complained of this ADRs 3 month after administration ethambutol. The grade of this ADRs was grade 1 (asymptomatic, only need clinical observation or diagnostic).

The ADRs subsequent was hepatic disorders (3.20%) in R1 characterized by high bilirubin (1.10 mg/dL) from normal conditions (0-0.3 mg/dL). R4 characterized by high direct bilirubin (0.96 mg/dL), ALT 105.4 mg/dL and AST 308.1 mg/dL. Bilirubin was the normal by-product of the breakdown of hemoglobin. SGOT test was a more sensitive indicator of liver damage than serum glutamate pyruvate transaminase (SGPT). The GOT enzyme was primarily in the liver, whereas the GPT enzyme was found in other tissues, especially the heart, skeletal muscle, kidneys, and brain. SGOT or AST and SGPT or ALT show the integration of hepatic cell. Increasing hepatic enzyme showed the extent of hepatic cell damage²². This reaction suspected by isoniazid (1000 mg) with the duration of 21 days²⁰ or may due rifampin at a daily dose (600-900 mg). ADRs of rifampin appeared 1-6 weeks after administration of the drugs¹⁷. Hepatic disorders also caused by pyrazinamide (40-50 mg/kgBB)²¹. Other ADRs such as trembling (12.96%), cold sweat (5.56%), and insomnia (3.70%) could not be ascertained; it because in the list of antituberculosis ADRs from Indonesian Health Ministry was not reported the ADRs. It was possible that the ADRs rare occurred in tuberculosis patients.

Table 5: Percentage of ADRs event on smear positive and negative patients (Σ total cases = 54)

No.	ADRs	Total ADRs Each Regimen(n)								Total Cases (N)	Percentage* (N/ Σ)x100%
		R1	R2	R3	R4	R5	R6	R7	R8		
1.	Redness urine	28	6	1	-	7	7	-	-	49	90,74%
2.	Nausea	27	6	1	3	6	6	-	-	49	90,74 %
3.	Vomiting	25	5	1	3	6	5	-	-	45	83,33%
4.	Breathless	23	2	1	2	5	5	-	-	38	70,37%
5.	Dizziness	9	-	-	1	2	-	-	-	12	22,22%
6.	Trembling	6	1	-	-	-	-	-	-	7	12,96%
7.	Skin rash	4	-	-	-	1	-	-	-	5	9,26%
8.	Faintness	5	-	-	-	-	-	-	-	5	9,26%
9.	Pain	3	1	-	-	-	1	-	-	5	9,26%
10.	Swollen foot	3	-	-	-	-	-	-	-	3	5,56%

Conted...

11.	Cold sweat	2	-	-	-	1	-	-	-	3	5,56%
12.	Insomnia	2	-	-	-	-	-	-	-	2	3,70%
13.	Hepatic disorder	1	-	-	1	-	-	-	-	2	3,70%
14.	Cough	2	-	-	-	-	-	-	-	2	3,70%
15.	Blurred vision	1	-	-	-	-	1	-	-	2	3,70%
16.	Aches	1	1	-	-	-	-	-	-	2	3,70%
17.	Skin redness	1	-	-	-	-	-	-	-	1	1,85%
18.	Itchy throat	1	-	-	-	-	-	-	-	1	1,85%
19.	Abdominal pain	-	-	-	-	1	-	-	-	1	1,85%
20.	Appetite down	1	-	-	-	-	-	-	-	1	1,85%
21.	Fever	1	-	-	-	1	-	-	-	2	3,70%
22.	Shivering	1	-	-	-	-	-	-	-	1	1,85%

Note: n = Total ADRs Each Regimen, N = Total Cases, *percentage(%) = (N)/(∑) x 100%, **∑= Total of ADRs event

CONCLUSIONS

This study showed that antituberculosis regimen which used by patients were FDC RHZE, FDC RH, RHE, (HE)+S, (RHZE)S, (RH)+S, RHE+S, and (RHZE) S+R. The most antituberculosis regimen used was FDC RHZE with range 3-7 ADRs events every patient. Six from eight antituberculosis regimens were FDC RHZE, FDC RH, RHE, (HE)+S, (RHZE)S, (RH)+S caused ADRs like redness urine (90.74%), nausea (90.74%), vomiting (83.33%), breathless (70.37%), and dizziness (22.22%).

ACKNOWLEDGMENTS

The authors wish to thank Mr. Wisnu Kundarto, S. Farm., M. Biomed., Apt and Mrs. Marufah, S.Farm., M.Sc., Apt for their advice in writing this paper. Thanks to Department Pharmacy, Faculty of Mathematics and Natural Sciences, Sebelas Maret University. Thank outpatient Installation in one of Hospital in Klaten, Central Java. No sources of funding were used to assist in the preparation of the manuscript. This paper was self-financed.

Conflict of Interest: All author has approved this paper, and there was no conflict of interest

Ethical Clearance: This study was approved by the Health Research Ethics Committee Dr. Moewardi General Hospital School of Medicine Sebelas Maret University No. 134/II/HREC/2018.

REFERENCES

1. WHO. 2015.WHO Approach to Pharmacovigilance of Anti-TB Drugs. 2015. Geneva: WHO Press.
2. Indonesia Health Ministry.Health Profil of Indonesia. 2015. Jakarta: Indonesia Health Ministry
3. Marx F.M, Dunbar, R., Enarson, D.A., and Beyers, N.The Rate of Sputum Smear-Positive Tuberculosis after Treatment Default in a High-Burden Setting: a Retrospective Cohort Study. 2012. *Plos One*. 7(9): 1-9.
4. Sinha, K., Marak, I.T.R., and Singh, W.A. Adverse Drug Reactions in Tuberculosis Patients Due to Directly Observed Treatment Strategy Therapy: Experience at an Outpatient Clinic of a Teaching Hospital in The City of Imphal, Manipur, India.2013. *The Journal of Association of Chest Physicians*. 1(2): 50-53.
5. Marx F.M, Dunbar, R., Enarson, D.A., and Beyers, N. The Rate of Sputum Smear-Positive Tuberculosis after Treatment Default in a High-Burden Setting: a Retrospective Cohort Study. 2012. *Plos One*. 7(9):1-9.
6. WHO.APractical Handbook on The Pharmacovigilance of Medicines Used in The Treatment of Tuberculosis. 2012. France: WHO Press.
7. Gallagher, R.M., Kirkham, J.J., Mason, J.R. *et al*. Development and Inter-Rater Reliability of The *Liverpool* Adverse Drug Reaction Causality Assesment Tool. 2011. *Plos One*. 6(12): 1-8.
8. Theophile, H., Andre, M., and Ghada, M.S. Comparison of Three Methods (An Updated

- Logistic Probabilistic Method, the *Naranjo* and *Liverpool* Algorithms) for the Evaluation Routine Pharmacovigilance Case Reports Using Consensual Expert Judgement as Reference. 2013. DOI 10.1007/s40264-013-0083-1 access on November, 1st 2017.
9. Hiregoudar, V., Raghavendra, B., Karinagannavar, A., Khan, W., Kamble, S., and Goud, T.G. Proportion and Determinants of Tuberculosis among Human Immunodeficiency Virus-Positive Patients Attending The Antiretroviral Therapy Center Attached to A Medical College in South India. 2016. *J Family Community Med.* 23(2): 88-93.
 10. Balasubramanian, R., Garg, R., and Santha, T. Gender Disparities In Tuberculosis: Report From A Rural DOTS Programme in South India. 2004. *International Journal for Tuberculosis and Lung Disease.* 8:323-332.
 11. Syarifah, Mutiara E., Novita S., Characteristics of Multi-drug Resistant Tuberculosis (MDR-TB) Patients in Medan City in 2015–2016. 2018. *Indian Journal of Public Health Research & Development.* 9(6): 484-489.
 12. Agrawal, A., Bhosale, U.A. A Prospective Pharmacovigilance Study to Evaluate Adverse Effect Profile of First Line Anti-Tubercular Drugs in Newly Diagnosed Sputum Positive Patients. 2018. *International Journal of Basic & Clinical Pharmacology.* 7(2): 283-287.
 13. Somrat and Lertmaharit. 2005. Factors Associated with Compliance among Tuberculosis Patients in Thailand. 2005. *Journal of The Medical Association of Thailand.* 4(88):149-156.
 14. Kang, Young Ae. Tuberculosis Treatment in Patients with Comorbidities. 2014. *Tuberculosis and Respiratory Diseases.* 76:257-260.
 15. Vieira, D.E.O., Gomes, M. Adverse effects of tuberculosis treatment: experience at an outpatient clinic of a teaching hospital in the city of São Paulo, Brazil. 2008. *Journal Brasileiro de Pneumologia.* 34(12):1049-1055.
 16. Grosset, J., and Leventis, S. Adverse Effects of Rifampin. 1983. *Review of Infection Disease.* 5(3): 440-445.
 17. Arbex, M.A., Varella, M.C., Siquera, H.R., dan Mello, F.A. Antituberculosis Drugs: Drug Interactions, Adverse Effects, and Use in Special Situations Part 1: First-Line Drugs. 2010. *Journal Brasileiro de Pneumologia.* 36(5): 1-5.
 18. Antony., Doan, A., and Andersen, M. Pyrazinamide Induced Hyperuricemia. 2014. *Pharmacovigilance Forum.* 39(10): 695-715.
 19. Chan, R., and Kwok, A. Ocular Toxicity of Ethambutol. 2006. *Hong Kong Medical Journal.* 12(1): 56-60.
 20. Wagner, L.B., and Green, R.M. Evaluating Elevated Bilirubin Levels in Asymptomatic Adults. 2015. *JAMA.* 313(5): 516-517.
 21. Ramappa, V., dan Aithal, G.. Hepatotoxicity Related to Anti-tuberculosis Drugs: Mechanisms and Management. 2012. *Journal of Clinical and Experimental Hepatology.* 3(1):37-49.
 22. Saukkonen, J.J. Cohn, D. L., Jasmer, R.M. *et al.* An Official ATS Statement: Hepatotoxicity of Antituberculosis Therapy. 2006. *American Thoracic Society.* 174: 935-952.

Noise Exposure Assessment and Estimated Excess Risk of Cabin Personnel in the Locomotive-CC205

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ABSTRACT

Train is one of the most environmentally friendly mode of transportation. However, currently there are still some types of locomotive designed to be opened (such as CC201); hence, the generated noise can potentially affect the health of the workers, particularly cabin personnel (i.e. train driver and assistant of driver). The objective of this study are to analyze the noise levels exposed to cabin personnel and to estimate the excess risks of occupational noise-induced hearing loss in the locomotive. The cabin personnel were considered as exposed group while the office workers of the train station (Poncol Station) was the control group. The noise levels were measured continuously during the working hours using noise dosimeter. The audiometry test was also conducted to both case and control group. The data were analyzed using chi-square statistical test and NIOSH 1998 method of excess risk estimation. The measured noise exposure level in the locomotive-CC205 during the working hours (4-5 hours) ranged from 71.2 dBA until 123.4 dBA. However, the excess risks of the respondents were only 0.75% higher than the control group. This might be due to the short working period of the participants (no more than 10 years). The noise exposure to the case group workers were higher than time-weighted average noise level. Based on the chi-square statistical test, it is concluded that the noise levels affect the noise-induced hearing loss of the cabin personnel.

Keywords: *train, noise, noise-induced hearing loss, excess risk*

INTRODUCTION

Competition in the era of globalization requires that every activity must pay attention to environmental aspects. This global orientation of global development demands the initiators and managers of the industry, both the manufacturing industry and the service industry to change the mindset and aspiration of its business activities toward modern, environmentally sound business concerning safety and health, including railway companies. The railways not only have a positive impact on the workers, but also the potential negative impacts such as health impacts due to noise and vibration. This situation will potentially affect the health of workers working around the railway or working in the station.

Area Operation IV Semarang or abbreviated as DAOP IV Semarang and DAOP IV SM or D4 SM Release Tobu Hope is one of the Indonesian railway operations area, under PT Kereta Api Indonesia (Persero), or PT KAI, led by an Executive Vice President (EVP). The highest noise intensity is felt by train drivers because the cabin position is at a very close distance to the rail diesel engine.

Harrington¹ argued that noise can affect health such as hearing function, changes in the frequency of heartbeat, changes in blood pressure, and the level of sweat excretion. In addition, noise can also be associated with the occurrence of hypertension²⁻⁴. People who are exposed to noise, tend to have unstable emotions then emotional instability will lead to stress². Yoon et al⁵ also proved that noise in the work environment was closely related to mental health conditions. Long-term stress will cause the narrowing of blood vessels, so the heart must work harder pumping blood throughout the body. In a long time, blood pressure will rise, and this is called hypertension. Furthermore, it is found that there is significant associations between noise exposure, noise-induced hearing loss, and work-related accidents⁶.

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In this study the selected location is a cabin of train driver with the object of cabin personnel. The selected route was from Semarang to Tegal as a short-haul train at DAOP IV Semarang Poncol. The route of Semarang-Tegal was chosen because it was the longest path that can be reached from Semarang Station in one day. The objectives of this study are to analyze the noise levels exposed to cabin personnel and to estimate the excess risks of occupational noise-induced hearing loss in the locomotive.

METHOD

This research was an analytic research comparing between case group and control group based on noise exposure. The history of exposure in this study can be known from the medical register or based on interviews of the study respondents. The sampling technique of respondents was done by using purposive sampling method with the object of cabin personnel in DAOP IV PT KAI short-distance route.

DATA COLLECTION

Noise Level Measurement: The noise level data collection was done by direct measurement. Noise level measurement was conducted in the railway locomotive cabin of CC205 from Semarang to Tegal by placing the Noise Dosimeter on the cabin personnel. The reading was done every five seconds during the roundtrip. This reading was in accordance with Decree of Ministry of Environment No. 48/1996 on Noise Level Thresholds. Noise Dosimeter used in this study was Lutron DS-2013SD, that is capable of recording noise data. The noise data were recorded in the form of a diagram for easy reading. Measurement of noise data started from the initial departure station (the Semarang Poncol Station) until Tegal Station.

Audiometry test: Cabin personnel perform audiometric tests to determine the degree of deafness of cabin personnel as case group. The results were recorded in an audiogram, where the horizontal line represents the frequencies and vertical lines describing the intensity. This was also applied to officers at the Poncol Station as a control. The audiometric test organizing was assisted by audiologist and certified specialist technician. Cabin personnel were also asked to fill in some questions from questionnaires in the form of a complete list of questions about identity, health status, working period, working duration, residence history, and others with a definition

of each question to facilitate the respondents to fill in the questionnaire.

Determination of respondents in the population used purposive sampling method with inclusion and exclusion criteria. Exclusion criteria are the characteristics of respondents who can not be included in the research, as for exclusion criteria, such as respondent refused to participate, respondent was sick or did not come during the study. Meanwhile, inclusion criteria are the characteristics of respondents who can be included or eligible for study, as for inclusion criteria, including:

1. **Age⁷:** Controlled by selecting workers aged 18-50 years. The older the working age the more vulnerable to exposure to work environment and occupational diseases.
2. **Working period⁷:** Controlled by selecting workers whose working period is >3 years due to the fragile working period of occupational diseases between 2-6 years.
3. **Health condition:** Controlled by selecting workers who have healthy status and no history of hearing diseases

Cabin personnel performed audiometric tests to determine the degree of perceived hearing threshold. Officer of the station who became the respondent was the officer with morning shift until the afternoon. Cabin personnel respondents were cabin personnel on duty as backup engineers. Questionnaire survey and audiometric inspection were done at the origin station (Semarang Poncol) for the station personnel whereas the office staff of UPT Crew Semarang for cabin personnel. The recording of the audiometry test results were carried out at frequencies from 500 Hz to 6000 Hz and taken average values to 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz each right ear and left ear. A reference value determined whether the respondent had normal hearing, light deafness, moderate hearing, or severe deafness according to the classification of hearing impairment degree.

DATA ANALYSES

Noise Level Assessment: The noise level metric used was Leq (equivalent continuous noise level) in dBA and LN (statistic noise level) such as L5, L10, L50, L90. By definition, the L10 value is the noise level achieved for 10% of the measurement time and describes the peak

noise. The L50 value is the noise level achieved for 50% of the measurement time and describes the median (middle value) of the noise level. And the L90 is a noise level achieved for 90% of the measurement time, describing residual noise.

Relation between Noise exposure and Hearing Loss: In this case, the independent variable was noise and the dependent variable was hearing loss. Meanwhile Chi Square test was used to analyze the relationship between noise level and the status of hearing loss of cabin personnel. Chi-Square test is a statistical technique used to test the hypothesis when the population consists of two or more classes in the form of categorical data.

The significant level used is 95% with a significance value of 5%. Criteria value (p-value) generated was compared to the value of significance selected with the following criteria:

If Sig. > α , H_0 is accepted

If Sig. < α , H_0 is not acceptable yet

Or in sentence form is as follows:

H_0 : There is no relationship between the noise level and the hearing impairment of cabin personnel

H_1 : There is a relationship between the noise level and the hearing loss of cabin personnel

Estimation of Excess Risks: Attributable risk is another term from Risk Difference, Excess Risk, and also Rate Difference. Attributable risk is the level of disease in population who are exposed, reduced by people who are not exposed. In the current study, the respondents were those exposed to noise (cabin personnel) and those not exposed to noise (station officers). Excess Risk is the most relevant association measure when making decisions for individuals. For example, in determining whether workers who are working in the high noise section, analysis is carried out to determine the amount of risk of injury that must be borne by the worker 's participation in carrying out a job. The risk of developing a disease that can be caused by specific exposure, or how the disease occurred due to exposure to certain factors. Estimation of excess risk of hearing loss was calculated from the measured audiometric test data. The calculation was based on 1998 National Institute of Occupational Safety and Health model (NIOSH 1998)⁸ because NIOSH is the most commonly used reference in Indonesia. These models determine the average hearing loss for the Frequency range (0.5-4.0 kHz) representing 0% and hearing 100% disability limit respectively. The lowest limit of 25 dBA is

normal hearing. The calculation used an online calculator developed by Kavanagh^{9,10} and can be accessed at <http://www.occupationalhearingloss.com>.

RESULTS AND DISCUSSION

Locomotive-CC201 Specification (Semarang-Tegal Route): Kaligung Railway (KA Kaligung) or Locomotive CC201 is one of the trains owned by PT KAI serving Semarang-Tegal and Tegal-Semarang route as far as 148.1 km. There are 50 bridges traversed by KA Kaligung along the journey from Semarang Poncol Station to Tegal Station. Settlements traversed by KA Kaligung is a settlement located close to the area of the station, as well as settlements located in urban areas. The train passes several stations, namely Semarang Poncol Station, Weleri Station, Pekalongan Station, Pemalang Station, and finally at Tegal Station.

Kaligung Train is one type of economic train that has air conditioner and two-seat for more comfort to passengers. Beginning February 1, 2012 PT KAI DAOP 4 Semarang adds KA Kaligung has two roundtrips Tegal-Semarang and is usually pulled by Locomotive CC201. KA Kaligung's locomotive numbered CC201 means that it is using two bogies with each three driving wheels and using electrically series diesel locomotive type 01. The average travel time from Semarang to Tegal is for 2.5 hours.

Noise Level Assessment: The statistical results of the cabin noise level rating of KA Kaligung are shown on the graph in Figure 1.

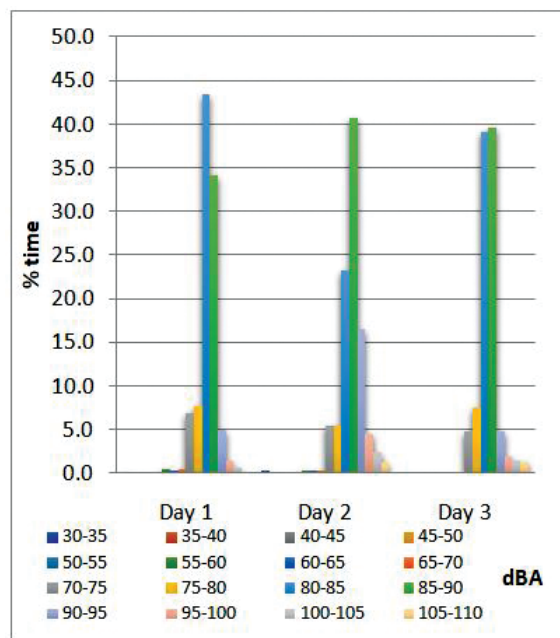


Figure 1: Statistics of Noise Level in the Cabin of Locomotive-CC201

On the first day (Friday), 43.9%, 1.4%, 34.5%, and 6.9% of travel time along the engineering department accounted for 80-85 dBA, 95-100 dBA, 85-90 dBA, and 70-75 dBA, respectively. If it is compared to second day (Saturday) and third day (Sunday), there was noise level ranged from 105-110 dBA accounted for 1.2% of travel time. It can be inferred that during weekend, the noise level became higher than weekday (Friday). Because noise levels often fluctuate over a wide range and over time, single-value descriptors like Leq become important. The statistic results of the measurement of the noise level in the driver cabin is described in Figure 2. The Leq in the locomotive cabin was ranged from 87.5 to 93 dBA, while L10 was more than 90 dBA. According to the field observation, the noise source were not only came from the engine, but also the horn, rolling noise, aerodynamic noise, background noise, and other noise source. According to Platon and Tudor⁹, the noise exposure from diesel engine and the locomotive air compressor is a risk factor for the driver in the first place because it can affect concentration and decision of the driver.

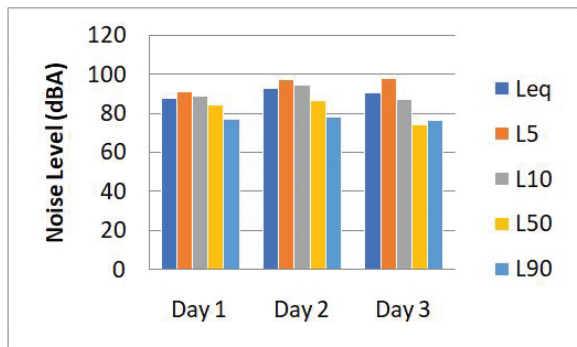


Figure 2: Summary of Noise Level Data Measurement in the Cabin of Locomotive-CC201

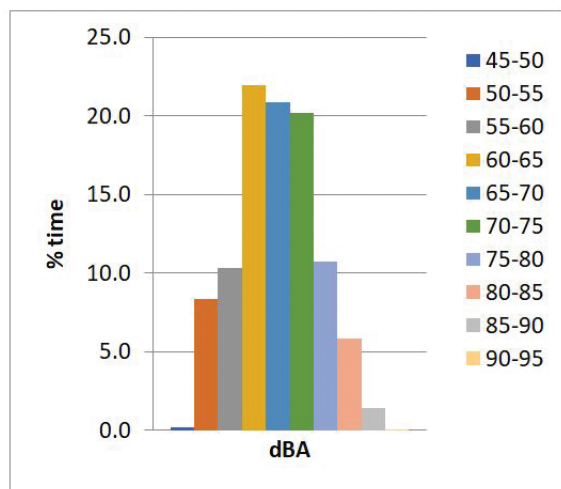


Figure 3: Noise Level Data Measurement in Semarang Poncol Station

Meanwhile, in the Semarang Poncol Station, the measured noise level (Leq) was 74.78 dBA, L10 was 78.5 dBA, L50 was 67.2 dBA and L90 was 56.1 dBA. It can be inferred that noise at the station was less than the threshold limit for 8 working hours and was relatively lower than the noise in the locomotive or driver cabin. Therefore, the officers in Poncol Station can be considered as control group of this study.

Relation between Noise Exposure and Hearing Loss: Chi Square Analysis of Noise and Hearing Loss Relationships. Using the following hypothesis:

H₀: Noise level has no effect on hearing loss

H₁: Noise level affects hearing loss

At the level of significance $\alpha = 0.05$ if the value of Sig. $< \alpha$, H₀ is rejected, meaning that there is noise level effect on hearing loss. Based on the Chi-Square Tests table, it is obtained that Chi-square (X^2) = 7.680 and Sig. = .006 then H₀ is rejected so that in concluded at the level of significance 0.05 or 5%, there is noise level effect on hearing loss. According to the noise measurement in Semarang Poncol Station (inside the office), the noise level exposure was below 85 dBA (75 dBA). Meanwhile, in the cabin of locomotive CC-201 namely 87.5 – 93 dBA.

Estimation of Excess Risks: Based on the calculation, the average value of the highest estimated excess risk hearing loss is 0.75% for cabin personnel and 0% for station officers, with the equation of the 1998 NIOSH model. This model calculates the average excess hearing risk decrease in audiometric test frequency of 1, 2, 3 and 4 kHz. This finding was validated by the fact that the threshold test for both ears was the highest on the 4 kHz frequency for 60 cabin personnel. Detailed audiometric analysis based on the type of work also showed that more than 90% of station staff had no excess risk of hearing loss, while more than 30% of cabin personnel had excess risk of hearing loss. It can be concluded that the average excess risk estimation of cabin personnel hearing loss is higher than that of the control group (station officer) due to the influence of work hazard (noise) exposed to cabin personnel.

The meaning of the average value of 0.75% is that that people who exposed to noise (cabin personnel) are 0.75% more at risk of hearing loss, while 0% is estimated to be at risk of hearing loss to the station officers. In other words, cabin personnel are at risk of

hearing loss if they continue to be in a state of the same noise exposure, while station officers are not at risk. This is due to the considerable noise level difference between the locomotive cabin that exceeds the threshold (± 90 dB) felt by cabin personnel, and the station noise level is still below the threshold (75 dB). However, the risk of 0.75% might be considered as underestimation because the working period of cabin personnel was relatively low (no more than 10 years).

Presbycusis is sensorineural hearing loss or hearing loss naturally caused by aging⁸. In audiometry, presbycusis has no effect on the frequency of 4000 Hz but higher frequency. From audiometric test data it is known that there is a relationship between decreased hearing ability and age. For example, a 46-year-old respondent with 4.06% hearing ability and 27.24% presbycusis. This means that there is a high potential that the respondent is affected by decreased hearing ability due to aging.

Excess risk estimation of hearing loss in cabin personnel causes consideration of risk management actions. Risks that occur within PT KAI are an integral part of the organizational process, risk control is an integral part of management's responsibilities, in ensuring the achievement of organizational goals. Therefore, risk control can improve the effectiveness and efficiency of management, because all the risks that can disturb the organizational process have been well identified, then the way to overcome the disruption of organizational processes has been anticipated in advance, so that if the disturbance does occur then the organization is ready to handle it properly. A proper measure to control occupational noise has been conducted in Norwegian railway company that the risk of noise-induced hearing loss of the workers during period 1991-2014 has been negligible¹¹. This can be adapted to Indonesian Railway Company (PT KAI) if there is further countermeasure to noise exposure toward railway workers. For optimizing the investment, a thorough life-cycle assessment can be conducted because the impacts and values of noise mitigations can vary from urban area to rural area network¹².

CONCLUSIONS

The noise sources on the Kaligung Locomotive CC201 which can affect the hearing of cabin personnel are the horns (110-123.4 dBA), the sound of the rail engines (86.4-99.6 dBA), and during braking (71.2

dBA). Based on analysis of Chi Square Test, the risk factors that can cause hearing impairment in DAOP IV Semarang (KA Kaligung Locomotive CC201) was the noise level, Estimation of excess risk of hearing loss in cabin personnel in DAOP IV Semarang by 0.75% that is higher than control group (0%).

Conflict of Interest: Nil

Source of Funding: The authors would like to sincerely thank Faculty of Engineering, Diponegoro University for the funding support of this study under Strategic Research Scheme, Fiscal Year 2018.

Ethical Clearance: This study did not take ethical clearance since it is not a biomedical research.

REFERENCES

1. Harrington JM, Gill FS. Pocket Book of Occupational Health. Ohio: EGC; 2005.
2. Black DA, Black JA, Issarayangyun T, Samuels SE. Aircraft noise exposure and resident's stress and hypertension: A public health perspective for airport environmental management. *J Air Transp Manag.* 2007;13(5):264–76.
3. Chang T, Hwang B, Liu C, Chen R, Wang V. Original Contribution Occupational Noise Exposure and Incident Hypertension in Men : A Prospective Cohort Study. 2013;177(8):818–25.
4. Sørensen M, Hvidberg M, Hoffmann B, Andersen ZJ, Nordsborg RB, Lillielund KG, et al. Exposure to road traffic and railway noise and associations with blood pressure and self-reported hypertension : a cohort study. 2011;1–11.
5. Yoon J, Won J, Lee W, Jung PK, Roh J. Occupational Noise Annoyance Linked to Depressive Symptoms and Suicidal Ideation : A Result from Nationwide Survey of Korea. 2014;9(8).
6. Picard M, André S, Simard M, Larocque R, Leroux T, Turcotte F. Association of work-related accidents with noise exposure in the workplace and noise-induced hearing loss based on the experience of some 240 , 000 person-years of observation. 2008;40:1644–52.

7. Majumder J, Mehta CR, Sen D. International Journal of Industrial Ergonomics Excess risk estimates of hearing impairment of Indian professional drivers. 2009;39:234–8.
8. NIOSH. Occupational Noise Exposure (Revised Criteria 1998). Cincinnati; 1998.
9. Kavanagh KT. Evaluation of occupational hearing loss and presbycusis using a microcomputer. J Am Acad Audiol. 1992;3(3):215–20.
10. Kavanagh KT. Evaluation of Hearing Handicaps and Presbycusis using World-Wide-Web Based Calculators. J Am Acad Audiol. 2001;12(10):497–505.
11. Platon SN, Tudor A. Noise control on locomotive driver workstation. Rom J Acoust Vib. 2014;11(1):71–4.
12. Valente M, Kaewunruen S. Life cycle analysis of mitigation methodologies for railway rolling noise and groundbourne vibration. J Environ Manage [Internet]. 2017;191:75–82. Available from: <http://dx.doi.org/10.1016/j.jenvman.2016.12.075>

Forgiveness Meditation as an Effort in Improving Mental Health among College Students

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ABSTRACT

College students as emerging adulthood may experience both mental and physical health problems due to maladaptive adjustments. Both mental and physical health problems are mutually reinforcing that cause marked impairment in everyday life functioning. Efforts to deal with mental health problem are expected to promote general health. Either forgiveness or meditation is separately proven effective in improving mental and physical health, but the efficacy of forgiveness meditation has not been adequately researched. This study aims to examine the effect of forgiveness meditation toward mental health improvement among college students, as indicated by the declined of distress. This study used one-group pretest-and-posttest quasi-experimental design with follow-up measurements two weeks after treatment ended. Measurements were conducted using the short version of General Health Questionnaire (GHQ-12). Samples were obtained using purposive sampling techniques, as many as 9 college students from The Faculty of Public Health, Diponegoro University, Semarang, Indonesia. The analysis using statistical test of Wilcoxon T-test between pre-test and post-test, and pre-test and follow-up, showed significant decrease (respectively were $Z=-2.670$, $p=.008$; $Z=-2.675$, $p=.007$), while between post-test and follow-up did not ($Z=-.256$, $p=.798$). The result showed a significant decrease in distress after treatment ended. This result remained significant up to follow-up measurements, though the difference between post-test and follow-up was not significant. Forgiveness meditation may have sustainable and increasing effect if it is regularly practiced. A sustained decrease in distress, which indicates the improvement of mental health, is further expected to support the improvement of physical health, adaptive adjustment, and optimal functioning.

Keywords: *emerging adulthood, distress, mental health, forgiveness meditation*

INTRODUCTION

College students as emerging adult (approximately 18 to 25 years of age) are characterized by experimentation and exploration¹. While there is a development in cognitive abilities and awareness² that strengthens career path, identity formation, and lifestyle choices to be adopted, emerging adult remains at risk for psychological problems. Greater risk occurs in adolescents who experience accumulated adverse life

experience and psychological distress, due to differences in cognitive appraisal and emotion regulation³. The presence of diverse capabilities to modulate emotions^{4,5} makes the adjustment during transition to adulthood even more difficult and potentially problematic². As the result, they may become prone to both mental and physical problems.

Rumination and poor emotion regulation can lead to low distress tolerance, thus making psychological distress implicate in the emergence of psychopathology among college students. The preliminary research result showed that 45.7% of 495 undergraduate students in Diponegoro University, Semarang, Indonesia were at risk of having psychological distress⁶. Among university students, psychological distress has a direct effect on the emergence of depressive symptoms⁷. Low distress tolerance further mediates between depression and trauma, and the emergence of alcohol drinking problems in young adult⁸.

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A study that reviewed epidemiological papers for 15 years on psychiatric disorders showed a trend in psychopathology across the adolescent years to adulthood⁹. It mentioned that about one in five adolescent had a psychiatric disorder. There was an increase in rates of depression, panic disorder, agoraphobia, and substance use disorder from childhood to adolescence. While from adolescence to early adulthood there was a further increase in panic disorder, agoraphobia, substance use disorder.

Psychopathology may also be developed through the adoption process as a result of psychological distress against non-normative life events. The findings of several studies on left-behind children, for example, showed that the adolescents had higher scores in anxiety¹⁰, loneliness¹¹, fear, and self-blame¹². In addition to psychiatric disorders such as hyperactivity and conduct problems¹³, depression characterized by low self-esteem and increased risk for suicidal behaviors¹⁴, psychological distress in these adolescents were often leads to the adoption of maladaptive behavior, such as substance use disorder and internet addiction¹⁵ or engaging in illegal and criminal activity¹⁶.

Besides mental and behavioral problems, the psychological distress negatively impacts sleep¹⁷ and increases health risk behavior, ie through higher levels of physical inactivity and skipping breakfast¹⁵. A similar study indicates the impact of psychological distress on nutrition indicators (ie of fruit, vegetable, and takeaway food consumption), thus implicating health status¹⁸. Finally, psychological distress further increases the risk of occurrence of chronic diseases such as cardiovascular disease which is largely explained by behavioral processes, ie through the occurrence of health risk behavior¹⁹.

Mental health problem that develops as a result of maladaptive adjustment when encountering psychological distress is also followed by change in health status. Both mental and physical health issues are mutually reinforcing, causing marked impairment in everyday life functioning. As in the case of major depressive disorders who were often reported to have functional deficits in domains of employment status, occupational productivity, interpersonal relationships, autonomy, and global functioning^{20,21,22}. Therefore efforts to improve the ability to deal with psychological distress are expected to promote general health.

Forgiveness meditation is one of the many psychological interventions developed to forgive through meditation, which emphasizes the intrapersonal process. Meditation is one of the professional deep relaxation which involves easily sustaining focus on a very simple stimulus²³. Meditation cultivates focused attention and moment-to-moment awareness of one's experience in order to heighten the capacity to bring conscious choice to responses and reactions²⁴. While forgiveness is freeing from a negative attachment to the source that has transgressed against a person²⁵. In an interpersonal context, it is defined as "a willingness to abandon one's right to resentment, negative judgment, and indifferent behavior toward one who unjustly hurt us, while fostering the undeserved qualities of compassion, generosity, and even love toward him or her"²⁶.

Meditation alone has been tested to reduce psychological distress²⁷ and perceived stress, as well as improve forgiveness²⁸. On the other hand, people who have higher levels of forgiveness are reported to have lower levels of anger and psychological distress, where the state anger largely mediates the association between forgiveness and psychological distress²⁹. Forgiveness itself is meant not only for others in the context of interpersonal transgression, but also for oneself as well as situations²⁵.

Forgiveness meditation has been developed^{30,31} but research on the efficacy of this intervention is still limited. Similar research interventions are loving-kindness meditation and compassion meditation, ie exercises oriented toward enhancing unconditional, positive emotional states of kindness, and compassion³². The literature suggests that these two interventions are associated with various benefits, including those improving positive affect, reducing distress and negative affect such as anxiety and mood symptoms, and being useful for treating interpersonal problems.

Research on forgiveness meditation is expected to support the efficacy of this intervention, in this case, to alleviate the psychological distress, thereby reducing the risk of physical problems and further mental and behavior problems. The present study aimed to examine the effect of forgiveness meditation toward mental health improvement among college students, which was an emerging adult, as indicated by the declined of psychological distress. Specifically, it was hypothesized that there was a significant decrease in psychological distress in the group receiving forgiveness meditation intervention.

METHOD

This study used one-group pretest and posttest quasi-experimental design. Follow-up measurement were also conducted to see the effect of intervention up to two weeks after the end of treatment.

The selection of participants in this study was conducted using purposive sampling technique by considering some characteristics and initial measurement results. Participants in this study were 9 undergraduate students of The Faculty of Public Health, Diponegoro University in Indonesia. The inclusion criteria, namely (1) emerging adult (18-25 years), (2) experiencing psychological distress based on the measurement results (cut-off score 10/11), (3) had never been involved in psychological therapy and drug therapy for treatment of psychological problems, and (4) willing to engage in interventions completely and voluntarily, as indicated by the signing of informed consent.

Measurements of psychological distress were performed using the short version of General Health

Questionnaire (GHQ-12). GHQ-12 is a 12-item self-report which measures of psychological morbidity, both in community settings and non-psychiatric settings to detect psychiatric disorders³³. Not only was it widely used to perform unidimensional measurements, the GHQ-12 instead assesses psychological morbidity in two (positive and negative items) or three dimensions (“social dysfunction”, “anxiety and depression”, and “loss of confidence”)³⁴. Respondents had to choose one of the four offered scales, that is 1) less than usual, 2) no more than usual, 3) rather more than usual, 4) much more than usual how frequently they experienced recently the different symptoms listed on the scale. Cronbach α in this study = .841.

The data were processed quantitatively by descriptive, and inferential statistical methods using the Wilcoxon t-test by means of the Statistical Package for the Social Sciences (SPSS) Windows Version 22. The tests were performed to see differences in measurements on pretest and posttest, pretest and follow-up, as well as posttest and follow-up, within group with limited subjects.

Table 1: Forgiveness meditation intervention procedures

Day (Total Duration in minutes)	Topic (Duration in Minutes)	General Objective	Activity	Methods
1 (150 minutes)	Opening (30 minutes)	Opening an intervention with a set of administrative procedures	Opening and introduction (research teams and participants)	Lecture, Q & A
			Explanations of the research and intervention, contracts, and informed consent	
	Facilitating negative emotions (45 minutes)	Increasing awareness of the importance of forgiveness meditation	Explanations of forgiveness meditation backgrounds: negative emotions and their impact on life	Lecture, Reflexion
			Relaxation and facilitation of negative emotions	Practice of relaxation, Worksheet
			Writing down negative emotional experiences Ranking the negative emotions	
	Practice of forgiveness meditation (60 minutes)	Practicing and evaluating forgiveness meditation	Practicing forgiveness meditation	Practice
			Evaluation of practice	Reflexion, Q & A
	Closing (15 minutes)	Increasing participant involvement up to the next meeting	Assigning homework: Listening to the audio of forgiveness meditation Recording the evaluation of practice and self-monitoring	Lecture, Q & A
			Planning next meeting time and closing statement	Summarizing

Conted...

2 and 3 (90 minutes)	Opening (15 minutes)	Opening the 2 nd and 3 rd session of intervention	Opening and discussion of the practice experiences at home	Lecture, Q & A
	Practice of forgiveness meditation (60 minutes)	Practicing and evaluating forgiveness meditation	Practicing forgiveness meditation	Practice
			Evaluation of practice	Reflexion, Q & A
	Closing (15 minutes)	Increasing participant involvement up to the next meeting	Assigning homework (same as the assignment on the 1 st day)	Lecture, Q & A
			Planning next meeting time and closing statement	Summa- rizing
4 (90 minutes)	Opening (15 minutes)	Opening the 4 th session of intervention	Opening and discussion of the practice experiences at home	Lecture, Q & A
	Practice of forgiveness meditation (60 minutes)	Practicing and evaluating forgiveness meditation	Practicing forgiveness meditation	Practice
			Evaluation of practice	Reflexion, Q & A
	Termination of intervention (15 minutes)	Increasing participant involvement in the intervention independently	Encouraging participants to practice independently and on an ongoing basis Closing and termination of intervention.	Lecture, Summa- rizing

Forgiveness meditation was carried out in group, as many as four meetings in two weeks, with duration of 90-150 minutes. Forgiveness meditation was guided by a therapist that was a clinical psychologist who had had at least five years of practicing experience. Forgiveness meditation was began by evoking negative experiences through reflection and relaxation techniques, followed by practice of forgiveness meditation performed periodically. Participants were given the audio recording of forgiveness meditation instruction as a means to assist the daily practice before the subsequent meeting. Participants were also asked to complete a diary that aimed to self-monitor and evaluate each time the practice ended. Table 1 shows the overall procedure of forgiveness meditation in this study.

RESULTS AND DISCUSSIONS

Participants in this study consisted of 78% female (N=7; $M_{age} = 20.86$; $SD_{age} = .38$) and 22% male (N=2; $M_{age} = 20$; $SD_{age} = 0$). Descriptive statistics in Table 2 show a decrease in GHQ-12 mean score from pretest to posttest which also indicates a decrease in distress. The decrease

in distress is supported by the decreased of mean score in each dimension (ie social dysfunction, anxiety and depression, and loss of confidence). While a comparison between posttest and follow-up measurements indicates that the effect of the intervention can be maintained until two weeks after treatment ended.

The results of Wilcoxon t-test between pretest and posttest using SPSS 22, as listed in Table 3, shows a significant decrease in GHQ-12 mean score ($Z = -2.670$; $p = .008$), on the social dysfunction dimension ($Z = -2.533$ $p = .011$), and on the dimension of anxiety and depression ($Z = -2.446$; $p = .014$). Conversely, the decrease in the mean score on the dimensions of loss of confidence is not significant ($Z = -1.838$; $p = .066$). However, the decrease in the mean score from the pretest to the follow-up on all measurements is significant (GHQ-12 with $Z = -2.675$, $p = .007$; social dysfunction dimension with $Z = -2.694$, $p = .007$; dimension of anxiety & depression with $Z = -2.273$, $p = .023$, and dimension of loss of confidence with $Z = -2.716$, $p = .007$). Furthermore there is no significant difference between posttest and follow-up on any measurement.

Table 2: Descriptive statistics of measurement results

No.	Initial	Sex	Age	Total Score GHQ-12			Dimensions								
							Social Dysfunction			Anxiety & Depression			Loss of Confidence		
				Pre-	Post-	FU	Pre-	Post-	FU	Pre-	Post-	FU	Pre-	Post-	FU
1.	FI	F	21	12	9	7	6	6	4	5	2	3	1	1	0
2.	IS	F	21	14	6	8	8	1	3	2	4	4	4	1	1
3.	AL	F	21	18	10	7	10	3	4	6	3	3	2	4	0
4.	EL	F	20	13	3	1	6	3	1	5	0	0	2	0	0
5.	IN	F	21	17	11	10	8	7	6	6	3	3	3	1	1
6.	AR	F	21	11	1	4	7	0	4	2	0	0	2	1	0
7.	ME	F	21	13	6	6	10	6	5	2	0	1	1	0	0
8.	DI	M	20	19	3	3	9	3	3	6	0	0	4	0	0
9.	ZU	M	20	20	7	11	11	3	6	6	2	4	3	2	1
Mean		20.67		15.22	6.22	6.33	8.33	3.56	4.00	4.44	1.56	2.00	2.44	1.11	0.33
Std. Dev.		0.50		3.31	3.42	3.24	1.80	2.35	1.58	1.88	1.59	1.73	1.13	1.27	0.50
Minimum		20		11	1	1	6	0	1	2	0	0	1	0	0
Maximum		21		20	11	11	11	7	6	6	4	4	4	4	1

Table 3: Inferential statistics of measurement results

		Posttest-Pretest	Follow-Up-Pretest	Follow-Up-Posttest
Total Score GHQ-12	Z	-2.670 ^b	-2.675 ^b	-.256 ^c
	Asymp. Sig. (2-tailed)	.008	.007	.798
Social Dysfunction	Z	-2.533 ^b	-2.694 ^b	-.566 ^c
	Asymp. Sig. (2-tailed)	.011	.007	.572
Anxiety & Depression	Z	-2.446 ^b	-2.273 ^b	-1.633 ^c
	Asymp. Sig. (2-tailed)	.014	.023	.102
Loss of Confidence	Z	-1.838 ^b	-2.716 ^b	-1.890 ^b
	Asymp. Sig. (2-tailed)	.066	.007	.059
a. Wilcoxon Signed Ranks Test				
b. Based on positive ranks.				
c. Based on negative ranks.				

The result of this study supports the efficacy of forgiveness meditation intervention in reducing psychological distress, particularly in university students in their emerging adulthood, when research on this intervention is still quite limited. Explanation of the proven hypothesis that has been proposed in this study can be reviewed from various sides related to psychological distress.

Mastery of life stress, especially the adverse life event, has a protective effect that buffers the lack of adjustment to psychological distress³⁵. In contrast, psychological problems develop as a result of low level

of emotion regulation and distress tolerance³⁶. The emergence of internalizing problems (ie depression and anxiety) and externalizing problems (ie substance abuse), as well as the presence of worse coping strategies, are associated with poor emotion regulation³⁷. In times of adverse life experiences impacting low level of emotion regulation, concurrent cognitive processing in the form of expressive suppression and rumination also contributes to the emergence of psychological distress³. Psychological responses also influence physiological reactivity^{38,39}, so that decisions under distress becomes more difficult and not adaptive³⁹.

The function of factors associated with psychological distress above may seem to be improved through meditation practice. Previous researches have supported that meditation improves brain functioning by increasing brain integration and restoring working memory, improves positive affect and emotional functioning, improves self-regulation, as well as reduces stress reactivity and psychological distress^{27,40,41}. Changes that occur in terms of improvement of cognitive, emotional, and even physiological functioning further help improve coping strategies to be more adaptive⁴².

Meditation practice has also been shown to improve positive characteristics such as gratitude⁴⁰ and forgiveness²⁸. Forgiveness which is also a concern in intervention in this study, separately from meditation has also been widely studied, both as a form of intervention based on forgiveness and as a positive psychological construct. Beyond the general usage of this term in an interpersonal context, forgiveness is agreed as an intrapersonal process⁴³. The benefits of forgiveness extend beyond the dissipation of anger and hostility^{44,45}. Forgiveness is effective in reducing stress, distress, anxiety, and depression^{45,46}, promoting positive affect⁴⁵ and in turn improves mental health and well-being^{45,47,48}.

In addition, other studies also support forgiveness in overcoming cognitive and behavioral problems. Forgiveness as a coping response for negative peer experiences in early adolescence, as example, is positively associated with concurrent self-esteem and negatively associated with social anxiety. Cognitively, this is associated with less rumination when experiencing an offense⁴⁹. Forgiveness also helps to overcome the feelings of shame and guilt that is often experienced by people with behavioral problems, as in the case of drug and/or alcohol problems, and are associated with better recovery⁵⁰.

The implications of forgiveness also appear in physical health as indicated by fewer physical symptoms. Fewer physical symptoms are presented as a result of changes in overall reductions in blood pressure level, heart rate, and may aid in cardiovascular recovery from stress associated with higher rates of forgiveness^{44,51}.

Finally, the benefits of forgiveness have been used extensively either in the scope or disposition of forgiveness of others in the context of interpersonal transgression, self-forgiveness against one's self mistake, and forgiveness of situation beyond one's control^{29,52}.

Forgiveness meditation in groups can be applied in educational settings, in this case for university students as emerging adult who are at high risk of experiencing psychological distress. Forgiveness meditation may have sustainable and increasing effect if it is regularly practiced. The audio recording of instruction is expected to facilitate the practice carried out independently. Self-evaluation and self-monitoring are also expected to raise awareness of perceived change as a result of intervention. A sustained decrease in distress, which indicates the improvement of mental health, is further expected to support the improvement of physical health, adaptive adjustment, and optimal functioning.

Limitation in this study is still less attention to the long-term impact. The limited subject also influences the expansion of the use of this intervention in similar populations. Future study is expected to see the long-term impact of intervention on the reduction of distress, ie by taking follow-up measurements in longer time range. In addition, further researchers are expected to examine the efficacy of forgiveness meditation in a larger group, as well as consider the design of a double pretest or assigning a control group to provide a higher significance level.

CONCLUSIONS

The result of this research showed a significant decrease in psychological distress after the treatment of forgiveness meditation ended, which indicated mental health improvement. The decrease in distress remained significant up to follow-up measurements, though the difference between posttest and follow-up was not significant. Additional results indicated a significant decrease in the dimensions of "social dysfunction" as well as the dimensions of "anxiety and depression" after treatment ended, up to follow-up measurement. While the mean decrease in the dimensions of "loss of confidence" was not significant after treatment ended, but then became significant in the follow-up measurements compared to pretest. Differences in posttest and follow-up on all dimensions were not significant.

ACKNOWLEDGEMENTS

We would like to thank the dean and the managers of the Faculty of Public Health, Diponegoro University, Semarang, Indonesia; all participants; and research assistants.

Conflict of Interest: We as the authors state that there is no conflict of interest in this article if published.

Ethical Clearance: Ethical clearance in this country is not commonly used in psychological intervention studies with minimal risk. Culturally speaking, meditation has become part of eastern people. This meditation technique is basically part of asian culture. There is no harm in this practice of forgiveness meditation. Conversely, the use of ethical clearance is generally carried out on research participants in the hospital to ensure that they are protected from the risk of harm. The participants in this study was willing to engage in interventions completely and voluntarily, as indicated by the signing of informed consent voluntarily. Preparation of the intervention module in this study was carried out carefully by involving expert judgment, trying it out to the similar participants, and paying attention to the therapist's qualifications.

Source of Funding: This research was funded by the source of Diponegoro University DIPA PNPB funding, No: SP DIPA-042.01.2.400898/2016, dated 7 December 2015, Fiscal Year 2016.

REFERENCES

1. Santrock JW. Adolescent, 15th ed. NY: McGraw-Hill Education; 2014.
2. Steinberg RJ. Multiple intelligences in the new age of thinking. In: Goldstein S, Princiotta D, Naglieri JA. (Eds.) Handbook of Intelligence: Evolutionary Theory, Historical Perspective, and Current Concepts. New York: Springer Science+Business Media; 2015. 229-142 p.
3. Boyes ME, Hasking PA, Martin G. Adverse Life Experience and Psychological Distress in Adolescence: Moderating and Mediating Effects of Emotion Regulation and Rumination. *Stress Heal.* 2015;32(4):402–10.
4. Calkins SD. Regulatory competence and early disruptive behavior problems: Role of physiological regulation. In: Olson SL, Sameroff AJ. (Eds.) Biopsychosocial Regulatory Processes in the Development of Childhood Behavioral Problems. New York: Cambridge University Press; 2012. 86-115 p.
5. Thompson RA. Socialization of Emotion and Emotion Regulation in the Family. In: Gross J. (Ed.) Handbook of emotion regulation, 2nd ed. New York: Guilford; 2014. 173-186 p.
6. Salma, Rahmandani A, La Kahija YF. Psychological distress among university student: An exploratory study. *Adv Sci Lett.* 2017;23(4):3471–3.
7. Kaloeti DVS, Rahmandani A, Sakti H, Salma S, Suparno S, Hanafi S. Effect of childhood adversity experiences, psychological distress, and resilience on depressive symptoms among Indonesian university students. *Int J Adolesc Youth [Internet].* 2018;00(00):1–8. Available from: <https://www.tandfonline.com/doi/full/10.1080/02673843.2018.1485584>
8. Holliday SB, Pedersen ER, Leventhal AM. Depression, posttraumatic stress, and alcohol misuse in young adult veterans: The transdiagnostic role of distress tolerance. *Drug Alcohol Depend [Internet].* 2016; Available from: <http://dx.doi.org/10.1016/j.drugalcdep.2016.02.030>
9. Costello EJ, Copeland W, Angold A. Trends in psychopathology across the adolescent years: What changes when children become adolescents, and when adolescents become adults? *JCPP.* 2011;52(10):1015–25.
10. Zhao X, Chen J, Chen M, Lv X, Jiang Y, Sun Y. Left-behind children in rural China experience higher levels of anxiety and poorer living conditions. *Acta Paediatr.* 2014;103:665–70.
11. Jia Z, Tian W. Loneliness of left-behind children: a cross-sectional survey in a sample of rural China. *Article O. Child.* 2010;812–7.
12. Liu X, Zhang Y, Song A, Liang Y, Zhai J, Li Y, et al. Meta analysis on mental health of left behind children. *Chinese J Child Heal Care.* 2013;21(1):68–70.
13. Fan F, Su L, Gill MK, Birmaher B. Emotional and behavioral problems of Chinese left-behind children: A preliminary study. *Soc Psychiat Epidemiol.* 2010;45(6):655–64.
14. Hardt J, Herke M, Schier K. Suicidal Ideation, Parent-Child Relationships, and Adverse Childhood Experiences: A Cross-Validation Study Using a Graphical Markov Model. *Child Psychiatry Hum Dev.* 2011;42:119–33.

15. Gao Y, Li LP, Kim JH, Congdon N, Lau J, Griffiths S. The impact of parental migration on health status and health behaviours among left behind adolescent school children in China. *BMC Public Health*. 2010;10(1):1-10.
16. Fund UNCs. The impacts of migration on children in Moldova. In: Salah MA. (ed.) *United Nations children's fund*; 2008.
17. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep Patterns and Predictors of Disturbed Sleep in a Large Population of College Students. *J Adolesc Heal* [Internet]. 2010;46(2):124–32. Available from: <http://dx.doi.org/10.1016/j.jadohealth.2009.06.016>
18. Leske S, Strodl E, Harper C, Clemens S, Hou X. Psychological distress may affect nutrition indicators in Australian adults. *Appetite* [Internet]. 2015;90:144–53. Available from: <http://dx.doi.org/10.1016/j.appet.2015.02.003>
19. Hamer M, Molloy GJ, Stamatakis E. Psychological Distress as a Risk Factor for Cardiovascular Events: Pathophysiological and Behavioral Mechanisms. *JAC* [Internet]. 2008;52(25):2156–62. Available from: <http://dx.doi.org/10.1016/j.jacc.2008.08.057>
20. Bortolato B, Carvalho AF, McIntyre RS. Cognitive dysfunction in major depressive disorder: a state-of-the-art clinical review. *CNS Neurol Disord - Drug Targets*. 2014;13(10):1804–18.
21. Evans VC, Iverson GL, Yatham LN, Lam RW. The relationship between neurocognitive and psychosocial functioning in major depressive disorder: A systematic review. *J Clin Psychiatry*. 2014;75(12):1359–70.
22. McIntyre RS, Lee Y. Cognition in major depressive disorder: A “Systemically Important Functional Index” (SIFI). *Curr Opin Psychiatry*. 2016;29(1):48–55.
23. Smith JC. *Relaxation, Meditation, & Mindfulness. A Mental Health Practitioner's Guide to New and Traditional Approaches*. New York: Springer Publishing Company, Inc.; 2005.
24. Kristeller JL. *Meditation and Stress*. *Encyclopedia of Stress*. 2007;678–85.
25. Thompson LY, Snyder CR, Hoffman L, Michael ST, Rasmussen HN, Billings LS, et al. Dispositional Forgiveness of Self, Others, and Situations. *J Pers*. 2005;73(2):313–60.
26. Enright RD, Freedman S, Rique J. The psychology of interpersonal forgiveness. In: Enright RD, North J. (eds.) *Exploring Forgiveness*. Madison: University of Wisconsin Press; 1998. 46-62 p.
27. Travis F, Valosek L, Konrad A, Link J, Salerno J, Scheller R, et al. Effect of meditation on psychological distress and brain functioning: A randomized controlled study. *Brain and Cognition*. 2018;125(March):100–5.
28. Oman D, Shapiro SL, Thoresen CE, Plante TG, Flinders T. Meditation Lowers Stress and Supports Forgiveness Among College Students: A Randomized Controlled Trial. *J Am Coll Health*. 2008;56(5):569-78.
29. Carson JW, Keefe FJ, Goli V, Fras AM, Lynch TR, Thorp SR, et al. Forgiveness and Chronic Low Back Pain: A Preliminary Study Examining the Relationship of Forgiveness to Pain, Anger, and Psychological Distress. *The Journal of Pain*. 2005;6(2):84–91.
30. Kornfield J. *A Path with Heart: A Guide Through The Perils And Promises of Spiritual Life*. New York: Bantam Books; 1993.
31. Regents of the University of Minnesota. *Taking Charge of Your Health & Wellbeing, Forgiveness Meditation*. takingcharge.csh.umn.edu; 2013.
32. Hofmann SG, Grossman P, Hinton DE. Loving-kindness and compassion meditation: Potential for psychological interventions. *Clin Psychol Rev* [Internet]. 2011;31(7):1126–32. Available from: <http://dx.doi.org/10.1016/j.cpr.2011.07.003>
33. Goldberg D, Williams P. *A user's guide to the General Health Questionnaire*. UK: NFER-Nelson; 1988.
34. Lesage F, Martens-resende S, Deschamps F, Berjot S. Validation of the General Health Questionnaire (GHQ-12) adapted to a work-related context. *OJPM*. 2011;1(2):44–8.
35. Verger P, Combes J, Kovess-Masfety V, Choquet M, Guagliardo V, Rouillon F, et al. Psychological

- distress in first year university students: socioeconomic and academic stressors, mastery and social support in young men and women. *Soc Psychiatry Psychiatr Epidemiol.* 2009;44:643–50.
36. Pearte C. Temperament, emotion regulation, and distress tolerance as related correlates of psychological symptoms. *Electronic Theses and Dissertations.* 2015. Available from: <http://stars.library.ucf.edu/etd/1166>
 37. Resurrección DM, Salguero JM, Ruiz-Aranda D. Emotional intelligence and psychological maladjustment in adolescence: A systematic review. *J Adolesc [Internet].* 2014;37(4):461–72. Available from: <http://dx.doi.org/10.1016/j.adolescence.2014.03.012>
 38. Campbell J, Ehlert U. Acute psychosocial stress: Does the emotional stress response correspond with physiological responses? *Psyneuen.* 2012;37:1111-34.
 39. Kassam KS, Koslov K, Mendes WB. Decisions Under Distress: Stress Profiles Influence Anchoring and Adjustment. 2009;20(11):1394-99.
 40. Galla BM. “Safe in My Own Mind:” Supporting Healthy Adolescent Development Through Meditation Retreats. *J Appl Dev Psychol [Internet].* 2017;53(April):96–107. Available from: <http://dx.doi.org/10.1016/j.appdev.2017.09.006>
 41. Travis F, Haaga DAF, Hagelin J, Tanner M, Nidich S, Gaylord-King C, et al. Effects of Transcendental Meditation practice on brain functioning and stress reactivity in college students. *Int J Psychophysiol [Internet].* 2009;71(2):170–6. Available from: <http://dx.doi.org/10.1016/j.ijpsycho.2008.09.007>
 42. Nidich SI, Rainforth MV, Haaga DAF, Hagelin J, Salerno JW, Travis F, et al. A randomized controlled trial on effects of the transcendental meditation program on blood pressure, psychological distress, and coping in young adults. *Am J Hypertens [Internet].* 2009;22(12):1326–31. Available from: <http://dx.doi.org/10.1038/ajh.2009.184>
 43. Hook JN, Worthington EL, Utsey SO, Davis DE, Gartner AL, Jennings DJ, et al. Does forgiveness require interpersonal interactions? Individual differences in conceptualization of forgiveness. *Pers Individ Dif [Internet].* 2012;53(5):687–92. Available from: <http://dx.doi.org/10.1016/j.paid.2012.05.026>
 44. Lawler-Row KA, Karremans JC, Scott C, Edlis-Matityahou M, Edwards L. Forgiveness, physiological reactivity and health: The role of anger. *Int J Psychophysiol.* 2008;68(1):51–8.
 45. Akhtar S, Barlow J. Forgiveness Therapy for the Promotion of Mental Well-Being: A Systematic Review and Meta-Analysis. *Trauma, Violence, Abus.* 2018;19(1):107–22.
 46. Ghahari S, Rad MM. Effectiveness of forgiveness skill on anxiety and depression among women victims of sexual abuse in childhood. *Asian J Psychiatr [Internet].* 2018;(2010). Available from: <https://doi.org/10.1016/j.ajp.2018.04.014>
 47. Brannan D, Davis A, Biswas-Diener R. The Science of Forgiveness: Examining the Influence of Forgiveness on Mental Health. *Encycl Ment Heal Second Ed.* 2016;2:253–6.
 48. Griffin BJ, Worthington EL, Lavelock CR, Wade NG, Hoyt WT. Forgiveness and mental health. In: Toussaint LL, Worthington EL, Williams DR. (eds.) *Forgiveness and health: Scientific evidence and theories relating forgiveness to better health.* London: Springer Science+Business Media; 2015. 77-90 p.
 49. Flanagan KS, Vanden Hoek KK, Ranter JM, Reich HA. The potential of forgiveness as a response for coping with negative peer experiences. *J Adolesc [Internet].* 2012;35(5):1215–23. Available from: <http://dx.doi.org/10.1016/j.adolescence.2012.04.004>
 50. McGaffin BJ, Lyons GCB, Deane FP. Self-forgiveness, shame, and guilt in recovery from drug and alcohol problems. *Subst Abus.* 2013;34(4):396–404.
 51. Friedberg JP, Suchday S, Shelov DV. The impact of forgiveness on cardiovascular reactivity and recovery. *Int J Psychophysiol.* 2007;65(2):87–94.
 52. Hirsch JK, Webb JR, Jeglic EL. Forgiveness, depression, and suicidal behavior among a diverse sample of college students. *J Clin Psychol.* 2011;67(9):896–906.

Psychometric Measurement of Perceived Stress among Midwives at Primary Health Care Province of Central Java Indonesia

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ABSTRACT

Introduction: Midwives at Primary Health Care (PHC) are a unique profession. They have some complex responsibilities and must standby 24 hours/day to provide medical and administrative maternal and child health care at PHC and community. In addition, the government regulation on PHC accreditation requires skills and concentration of midwives. These responsibilities are thought to contribute to the incidence of stress on them. Objectives: to determine characteristics of midwives and their relationship with perceived stress.

Method: The study included 231 midwives working with PHC from Province of Central Java who responded the online questionnaire for two weeks. A structured questionnaire was used to know midwives' characteristics and assessed perceived stress by perceived stress scale (PSS) instrument. The data was analyzed using SPSS version 20.

Results: Mean age of midwives are 40 years and they are working at accredited PHC (91.3%), only 36.8% who get a training of Basic Obstetric Neonates Emergency (BONE). Almost $\frac{3}{4}$ midwives have perceived stress in the moderate category (mean= 16.5 SD= 5.08). There were no significant correlation between variables age, number of patients per day, training of BONE, accreditation status of PHC and education with perceived stress ($p > 0.05$). The correlation between administrative responsibilities by midwives and PSS scores was significant ($p < 0.05$).

Conclusions: PSS was reliabel to measure perceived stress among midwives at PHC (Cronbach's Alpha > 0.7). Future research should address to know what kind of administrative task that contribute perceived stress of midwives at PHC.

Keywords: *Perceived Stress Scale, Midwife, Primary Health Care (PHC)*

INTRODUCTION

A midwife is an individu a person, typically a woman, having been regularly accepted to a midwifery school programme that is based on the ICM Essential Competencies for Basic Midwifery Practice and the

structure of the ICM Global Standards for Midwifery School and is approve in the state where it is located, who has acquired the required qualifications to be registered and/or official licensed to practice midwifery and use the name 'midwife'; and who implement competence in the practice of midwifery.¹

Midwives at Primary Health Care (PHC) in Indonesian are a unique profession within healthcare. Midwife as health workers that have a role as Government spearhead in serving public health, especially in organizing midwifery service and woman reproduction. According to Permenkes RI Number HK.02.02/ Menkes/ 149/ 2010, than this profession must

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be doing by a woman. They must implement 9 main task. They have to do midwifery care toward pregnant woman (antenatal care), implementing physiological maternity care toward maternity woman (postnatal care), organizing service toward neonatal (neonatal care visits), efforting partnership cooperation with shaman maternity or traditional birth attendance in PHC working areas, giving education by reproductive health and midwifery counseling, implementing family planning care toward fertile age woman, implement tracking and referrals caring toward high risk pregnant woman, efforting "Audit Maternal Perinatal (AMP)" discussion in case of maternal and neonatal death, implementing integrated documentation and report.

There is a government regulation on accreditation of PHC for increasing PHC quality service have to be gained. PHC must be accredited periodically at least every 3 years. PHC accreditation required skills and concentration of midwives to implement their task both taking care for woman and child and administratively. This task according to midwife's role and authority as implementers, administrator, educators and investigator in the field of midwifery service. Midwives have some complex responsibilities. They must standby 24 hours/day to provide medical and administrative maternal and child health care at PHC and community. Midwife's workforce is suspected to be heavy because needed professional ability that demanding concentration and skills.²

Midwifery care had a important role in the reduction of maternal and newborn mortality and morbidity.³ Mortality becomes one of the condition that causes stress and anxiety in the midwifery practice in developing countries. It can impair their cognitive function,⁴ decision-making skills, safe and high-quality care so that affecting their professional quality of life and clinical practice.^{5,6}

Midwives are subjected to multiple stressors,⁷ resulted from physical, psychological and social aspects of the working environment.⁸ The development of stress which may contributed by job demand, which is simply one of "psychosocial hazards".⁹ High stress level were reported by 57% the community midwife (CMW).¹⁰ Women reported significantly more stress than men.¹¹

Measurement of stress using self report can be done quickly and equally for getting structured response.¹² Instrument Perceived Stress Scale (PSS) was developed

by Cohen in 1983 and it has shown sufficient reliability and validity to assessment of an individual's perception of psychological stress,¹³ across both clinical and non-clinical samples.¹⁴ The aim of this study was to determine characteristics of midwife and their relationship with perceived stress.

METHOD

A cross-sectional study was conducted with the research subject. The study included 231 midwives were working with PHC from Province of Central Java Indonesia who responded the online questionnaire for two weeks goes throw Midwifery Association of Indonesian around central Java province. Midwifery is defined as "skilled, knowledgeable and compassionate care for childbearing women, newborn infants and families across the continuum from pre-pregnancy, pregnancy, birth, postpartum and the early weeks of life".¹⁵ A structured questionnaire was used to collect data of demography, administrative responsibility and stress perception was assessed by instrument PSS. Measuring reliability of the PSS instrument by Cronbach's alpha test.

PSS was used to measure 10 stated items (1-10) of PSS that was based on 5 point Likert rating scale. Scaling: 0 = Never; 1 = Almost Never; 2 = Sometimes; 3 = Fairly often; 4 = Very often. There are four positively stated items (items 4, 5, 7, & 8) so the PSS scores were obtained by reversing responses (0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0) and then summing across all scale items. Total individual score on the PSS 0 to 40. Lower scores indicating lower perceived.

Midwife have to be responsible for the clinical care administration. This describes the time that needed for documentation activities for each patient's data served by the midwife also the average of mother that served by the midwife for one week. The data gather time is adjusted to the working conditions of the midwife in Public Health Service areas, at that time midwife must making reports of service result in addition routine service activities, preparation of Public Health Service accreditation and implementation of healthy family registration program. The data was analyzed using SPSS version 20. The compare means test (independent t test & ANOVA) was used to compare category variables (BONE training, PHC status, education) for stress scores. The Pearson correlation test used to know correlation numeric variabel with stress scores.

RESULTS AND DISCUSSIONS

Out of a total 421 midwives responded the online questionnaire, 231 answered completely the questionnaires on time (55%). PSS instrument was valid and reliable to measure perceived stress among midwives of PHC. (Cronbach's Alpha > 0.7)

The mean age of study subjects was 38.9 years old (SD= 7.6) and were working at accredited PHC status (91.3%). Only 36.8% who got a training of Basic Obstetric Neonates Emergency (BONE) and 61.9% was graduated education by Diploma of Midwifery Program (Table 1).

Table 1: Characteristics variables (n =231)

Variables	Mean (SD)
Age, years	38.9 (7.6)
Administrative task of each patient (minute)	12.0 (6.2)
Number of patients each day	18.2 (22.7)
	n (%)
Work at accredited PHC	
Yes	211 (91.3)
No	20 (8.7)
Training BONE	
Yes	85 (36.8)
No	146 (63.2)
Education	
Diploma of Midwifery Program (D3)	143 (61.9)

Conted...

Applied Science of Midwifery Program (D4)	82 (35.5)
Bachelor (Masters)	6 (2.6)

Subject who answered "sometimes" to all item of PSS (1-10) questions is the largest percentage. The highest average score (mean=1.88; SD =1.05) to the question item. " In the last month, how often have you felt nervous and "stressed"?. Meanwhile, the less average score (mean=1.44; SD =0.96) to the question item " In the last month, how often have you felt confident about your ability to handle your personal problems?"

About three fourth subjects had perceived stress in the moderate category (75.8%). The mean perceived stress score of all was 16.5; SD= 5.08 (Table 2). There were no significant correlation between variables age, number of patients each day, training of BONE , accreditation status of PHC and education with perceived stress (p > 0.05). The correlation between Administrative responsibilities by midwives and PSS scores was significant (p < 0,05). See table 3.

Table 2: Variables by Score of PSS

Variables	p
Age, years	0.86 ^a
Administrative responsibility	0.011 ^a
Number of patients each day	0.74 ^a
Work at accredited PHC	0.18 ^b
Training BONE	0.74 ^b
Education	0.99 ^c

^a = pearson correlation ^b = t test ^c = anova test

Table 3: Responses to the perceived stress score and category (n = 231)

No.	Statement	Never (0)	Almost never (1)	Some-times (2)	Fairly often (3)	Very often (4)	Mean (SD)
		n (%)	n (%)	n (%)	n (%)	n (%)	
1.	In the last month, how often have you been upset because of something that happened unexpectedly?	28 (12.1)	51 (22.1)	111 (48.1)	31 (13.4)	10 (4.3)	1.76 (0.98)
2.	In the last month, how often have you felt that you were unable to control the important things in your life?	48 (20.8)	72 (31.2)	84 (36.4)	24 (10.4)	3 (1.3)	1.46 (0.97)
3.	In the last month, how often have you felt nervous and "stressed"?	25 (10.8)	53 (22.9)	93 (40.3)	45 (19.5)	15 (6.5)	1.88 (1.05)

Conted...

4.	In the last month, how often have you felt confident about your ability to handle your personal problems?	38 (16.5)	88 (38.1)	75 (32.5)	25 (10.8)	5 (2.2)	1.44 (0.96)
5.	In the last month, how often have you felt that things were going your way?	21 (9.1)	71 (30.7)	105 (45.5)	28 (12.1)	6 (2.6)	1.68 (0.89)
6.	In the last month, how often have you found that you could not cope with all the things that you had to do?	17 (7.4)	62 (26.8)	112 (48.5)	35 (15.2)	5 (2.2)	1.78 (0.86)
7.	In the last month, how often have you been able to control irritations in your life?	28 (12.1)	77 (33.3)	99 (42.9)	24 (10.4)	3 (1.3)	1.55 (0.88)
8.	In the last month, how often have you felt that you were on top of things?	23 (10.0)	81 (35.1)	99 (42.9)	27 (11.7)	1 (0.4)	1.58 (0.84)
9.	In the last month, how often have you been angered because of things that were outside of your control?	15 (6.5)	65 (28.1)	102 (44.2)	42 (18.2)	7 (3.0)	1.83 (0.9)
10.	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	23 (10.0)	71 (30.7)	111 (48.1)	21 (9.1)	5 (2.2)	1.63 (0.87)
Perceived stress			n (%)		mean (SD)		
Low stress (Scores 0-13)			53 (22.9)				
Moderate stress (Scores 14-26)			175 (75.8)				
High stress (Scores 27-40)			3 (1.3)				
Scores					16.5 (5.1)		

The aim of this study was determine characteristics of midwives and their relationship with perceived stress. The results show mean age of subject (38.9 year olds) was a working age as those a 15 to 64 year olds. The literature review noted that age might contribute some components of the stress process at work.¹⁶ The number of patient should be care for is related to the time that to be used of midwife in administration tasks. For example, documentation about the data of midwifery care. Midwifery documentation is one of recording and reporting of midwifery care as a professional midwife. It is a crucial for them to know and understand what they had done and the important thing on documentation as a legal aspect.¹⁷

The responsibility on the administration tasks is correlated to perceived stress of midwives The ability in documentation and administration impacts to the quality of midwifery clinical practice. It is doing by midwife in order to reduce the maternal and infant mortality rate. In addition, it can prevent in increasing the number of midwifery cases that supporting MMR, such as postpartum hemorrhagic, preeclampsia, and other pregnancy complications. So that, it is a need to improve

the educational background of midwife especially at Primary Health care. Most of midwives who work at accredited PHC and nor have to be as a professional midwife as their level of education and competencies. Studies have shown that competent midwives can provide 87% of essential cares for women and babies.¹⁸ It is a prove that midwives whoa have high educational background in midwifery, in house training, and have a licensed midwife have a positive impact on the quality of midwifery services. It is hoped that it can reduce quickly the maternal and infant Mortality rate.¹⁹ One of in house training to improve the level of knowledge on reproductive in health care and community based is training BONE. The goals are to prevent maternal mortality rate and infat moratlity rate. The training was arranged to prepare health care provider to manage maternal and neonatal Emergencies cases at the primary health services level. Providers skilled in BONE services might be essential, especially in countries with a high burden of maternal and newborn mortality.²⁰ All midwives felt guilty if they faced on maternal death. The level of anxiety at the highest score (93%).⁵ Anxiety is a pchycological respon from stress.⁸ PSS instrument gives a lot of information about the midwife's level of stress

and nervous during they work in PHC, involving less and moderate level of stress.

CONCLUSION

Psychometric measurement by PSS was valid and reliable to measure perceived stress among midwives who worked at PHC (Cronbach's Alpha > 0.7). Future research should address to know what kind of administrative task that contribute perceived stress of midwives at PHC.

Conflict of Interest: There are no conflict of interest

Ethical Clearance: This study received ethical approvals from the Public Health Faculty University of Diponegoro (No: 053/EC/FKM/2018)

Source of Funding: Self

REFERENCES

1. The International Confederation of Midwives. ICM International Definition of the Midwife. Available at: <http://internationalmidwives.org/who-we-are/policy-and-practice/icm-international-definition-of-the-midwife/>.
2. Cross-Sudworth, F., Williams, M., Bird, I. & Gardosi, J. Community midwife caseloads and their effect on stress and performance. *Arch. Dis. Child. - Fetal Neonatal Ed.* **95**, Fa98 LP-Fa98 (2010).
3. Sato, K. & Adachi, K. Occupational stress experienced by Japanese midwives. *Br. J. Midwifery* **21**, 801–806 (2013).
4. Filby, A., McConville, F. & Portela, A. What prevents quality midwifery care? A systematic mapping of barriers in low and middle income countries from the provider perspective. *PLoS One* **11**, 1–20 (2016).
5. Muliira, Rhoda; Sendikadiwa, Vito; Lwasampijja, F. Predictors of Death Anxiety Among Midwives Who have Experienced Maternal Death Situations at Work. *Matern. Child Heal. J.* **19**, 1024–1032 (2015).
6. Bánovčinová, Ľ. Work-Related Stress and Coping Among Midwives in Slovakia. *Cent. Eur. J. Nurs. Midwifery* **8**, 667 (2017).
7. Banovcinova, L., Baskova, M., Soriano, E., Sleeter, C. & Casanova, M. A. Sources of work-related stress and their effect on burnout in midwifery. *Procedia - Soc. Behav. Sci.* **132**, 248–254 (2014).
8. Banovcinova, L. & Baskova, M. Sources of Work-related Stress and their Effect on Burnout in Midwifery. *Procedia - Soc. Behav. Sci.* **132**, 248–254 (2014).
9. Wendy, M. The Impact of Job Demands and Workload on Stress and Fatigue. *Aust. Psychol.* **38**, 102–117 (2011).
10. Zander, B., Dobler, L. & Busse, R. The introduction of DRG funding and hospital nurses' changing perceptions of their practice environment, quality of care and satisfaction: comparison of cross-sectional surveys over a 10-year period. *Int J Nurs Stud* **50**, (2013).
11. Andreou, E., Alexopoulos, E. C., Lionis, C. & Varvogli, L. Perceived Stress Scale : Reliability and Validity Study in Greece. *Environ. Res. Public Heal.* **4**, 3287–3298 (2011).
12. Stanton, J. M., Balzer, W. K. & Smith, P. C. A general measure of work stress: the stress in general scale. **61**, 866–888 (2001).
13. Cohen, S., Kamarck, T. & Mermelstein, R. A Global Measure of Perceived Stress. *Journal of Health and Social Behavior* **24**, 385–396 (1983).
14. Jovanović, V. & Gavrilov-Jerković, V. More than a (negative) feeling: Validity of the Perceived Stress Scale in Serbian clinical and non-clinical samples. *Psihologija* **48**, 5–18 (2015).
15. Renfrew, M. J. *et al.* An Executive Summary for The Lancet 's Series ' Midwifery is a vital solution to the challenges of providing high-quality maternal and newborn care for all women and newborn infants , in all countries '. *Lancet* **6736**, 1–8 (2014).
16. Krumm, S., Thielgen, M. & Hertel, G. *Age and work stress: A review and meta-analysis. Journal of Managerial Psychology* (2012). doi:10.1108/JMP-07-2013-0251
17. Dike, F. M., Onasoga, O. A., Njoku, E. & Dike, F. M. Documentation in labour among midwives in Madonna university teaching hospital elele , rivers state , Nigeria. **4**, 1404–1409 (2015).

18. Boerma, T. & Mason, E. Foreword, Midwifery Educator Core Competencies. *World Heal. Organ.* 4 (2014).
19. World Health Organization (WHO), International Confederation of Midwives (ICM) & White Ribbon Alliance (WRA). *Midwives' Voices Midwives' Realities: Findings from a global consultation on providing quality midwifery care.* (2016).
20. Otolorin, E., Gomez, P., Currie, S., Thapa, K. & Dao, B. Essential basic and emergency obstetric and newborn care: From education and training to service delivery and quality of care. *Int. J. Gynecol. Obstet.* **130**, S46–S53 (2015).

Is Nutritional and Socioeconomic Status Related with Tooth Eruption of First Incisive Permanent Mandibular among School and Special Need Students?

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ABSTRACT

Permanent tooth replacement is an important process which stimulate children growth and development. The first permanent eruption tooth is first Incisive of lower jaw (I1 LJ). The eruption time of each child is different, divided into premature loss, on time and delayed which influenced by several factors include nutrition of children and parents socioeconomic status (SES). Purpose of research was to find relation of eruption time of I1 LJ based on nutritional and economic status on school and special need students. Research design was analytic observational with cross sectional approach. Sample was 58 children aged 6-7 years old, divided into two groups 29 school students and 29 students with special need. Questionnaire was used to measure economic status, nutrition status measured by weighed height and weight and also an interview was done to find time tooth eruption. Spearman and Mann Whitney was used as a statistical tool. There was a difference of nutritional and economic status of normal and special need students (Sig: 0.045 and 0.04). There was a different of timing tooth eruption of both groups with Significance of 0.03. There was a relation of nutritional and economic status with timing of tooth eruption (Sig: 0.001 and 0.04). Most of school students had normal nutritional status with on time tooth eruption while on students with special need had o nutritional status, delayed tooth eruption. Children with good nutrition and economic status will influence their physical growth. Children with special need usually has systemic disease which influence their growth. Nutritional and economic status related with timing of I1 LJ on school and special need students.

Keywords: *Nutritional, economic status, First Incisive Permanent Lower Jaw, Eruption, students with special need*

INTRODUCTION

Dental eruption is a state of tooth appearance between gums in the oral cavity. Tooth eruption begins after the formation of crown followed by root formation during the tooth life and continues even though the tooth has reached occlusion with its antagonist.¹ Permanent teeth eruptions is gradually with age. The first permanent tooth appears in the oral cavity is the first permanent Incisive mandible at the age of 6-7 years.² Every child's

teeth eruptions are not always the same, some are too fast, some are on time and some are delayed. Teeth that appear prematurely are called premature and teeth that appear late are called retardations.³ Factors affecting tooth eruption include heredity, race factor, gender, nutrition, premature birth, socioeconomic , height and weight, hormones, and systemic diseases.⁴ In one study there was a significant correlation between nutritional status with permanent teeth eruption in elementary school students with good, fat and overweight nutritional status more have permanent teeth erupted on time according to age compared to those skinny.⁵ A research conducted by Clements and Thomas found students with higher social economic background show earlier tooth eruption than students with low social economic status.⁶ Growth of students are divided into normal and special need students. Students with special needs are those who need special care related to their specialty permanent or temporary.⁷ Studies earlier were conducted at students

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at elementary school. No study found which compare timing tooth eruption of group students at elementary students and school of students with special need. Purpose of recent study was to compare socioeconomic background, nutritional status and timing of eruption first Incisive lower jaw at students elementary school (SD Sendang Mulyo 01 Semarang Indonesia) and students with special need (SLB Negri Semarang Indonesia).

METHOD

Research design was observational analytic with cross sectional design was a research approach. Research population was 105 elementary students SD N Sendangmulyo 01, Tembalang Semarang (Normal students) and 35 students with special need at SLB Semarang. Both group was students at 6-7 in age. Sample size was determined with Slovin formula and found 29 students each group with random sample collection. Instruments used for measuring socioeconomic status (SES) was questionnaire which asked about parents salary and number of family and broken into two middle down and middle up. Body Mass Index (BMI) was calculated using individual height, weight, age and gender as variables to determine nutritional status and classified into four as follows BMI z-score <-2; percentile 0 +1 and ≤ +2; percentile > 85 and ≤ 97: overweight; • BMI z-score > +2; percentile > 97: obese.⁷ To determine differences of SES, nutritional status and timing II LJ eruption at normal and special need students was evaluated using Chi Square test and to find association of SES, nutritional status with II LJ eruption using Spearman test.

RESULTS AND DISCUSSIONS

Result of data collection is displayed descriptively as follows:

a. Univariate

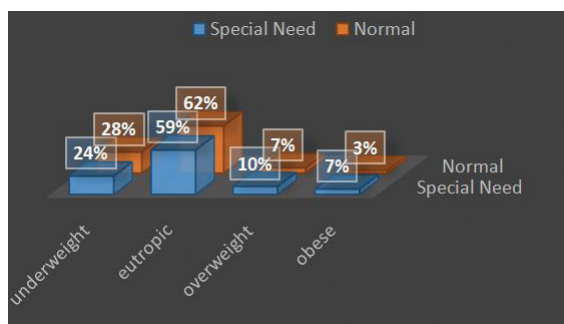


Figure 1: Distribution Frequency of nutritional status of normal and special need students

Most of school and special need students are at normal weight, however 17% of students with special need are classified as overweight.

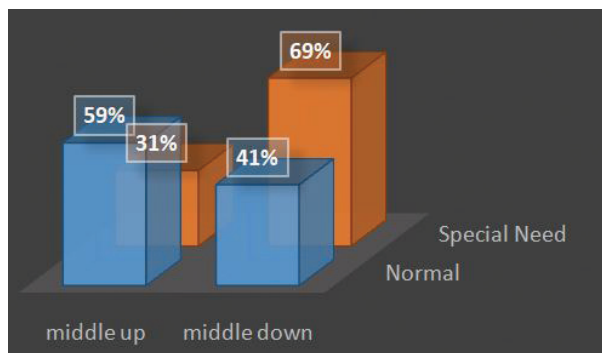


Figure 2: Distribution Frequency of socioeconomic background of normal and special need students

The figure shown school students are most at middle up socioeconomic background while at special need students are more at middle down category.

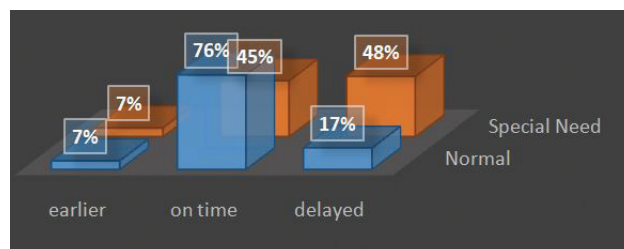


Figure 3: Distribution Frequency of timing I1 Lower Jaw of normal and special need students

Figure describe frequency of eruption of first incisive lower jaw of school students 76% are on time in emergence. Students with special need has different figure, their timing eruption of first incisive are more delayed (48%).

b. Bivariate: Result of differences and association between variables are as follows:

Table 1 shown number of students with special need is higher at middle down socioeconomic status than normal students, otherwise economic background of normal students is more at middle up. Variable nutritional status showed most students at normal weight both group, however number of overweight and obese is more at special need students. There was no differences at nutritional status and socioeconomic background of both group.

Table 1: Differences of Socioeconomic and Nutritional status of special need and normal students

	Special need	Normal	P value
Socioeconomic status			
a. middle up	9	17	0.04*
b. middle down	20	12	
Nutritional status			
a. underweight	6	8	0.06
b. Normal	17	18	
d. Overweight	3	2	
e. Obese	2	1	

*Chi Square significant at $p \leq 0.05$

Differences of time eruption of Incisive 1 Lower jaw of normal and special need students is presented at table 2. Most students with special need is delayed at their I1 mandibular emergence, otherwise most normal students is emerged on time age.

Table 2: Differences of First Incisive Permanent Mandibular eruption of special need and normal students

Timing I1 LJ eruption	Special need	Normal	P value
Earlier	2	2	0.03*
On Time	15	22	
Delayed	12	5	

*Chi Square significant at $p \leq 0.05$

Relationship of nutritional status and SES with eruption time of I1 LJ of special need students is showed at table 3. Students at middle down SES has delayed tooth eruption while those who has middle up economic their I1 timing eruption is earlier and on time. It can be seen that a relation of socioeconomic background and nutritional status

Table 3: Associations of nutritional status and socioeconomic status with Timing of I1 LJ eruption of Special need students

Variables	Timing of I1 LJ Eruption			P Value
	Earlier	On Time	Delayed	
Socioeconomic Status				
a. middle up	2	7	0	0.04*
b. middle down	0	8	12	

Conted...

Nutritional status				0.001*
a. Underweight	0	0	7	
b. Normal	0	11	6	
c. Overweight	1	2	0	
d. obese	1	0	1	

*Spearman significant at $p \leq 0.05$

Relationship of nutritional status and socio economic background is clearly seen on table 4 which has p value ≤ 0.05 which mean two variables relate with time of eruption Incisive 1 lower jaw at special need students.

Table 4: Associations of nutritional status and socioeconomic status with Timing of I1 LJ eruption of normal students

Variables	Timing of I1 LJ Eruption			P Value
	Earlier	On Time	Delayed	
Socioeconomic Status				
a. middle up	2	7	0	0.04*
b. middle down	0	8	12	
Nutritional status				
a. Underweight	0	5	3	0.001*
b. Normal	0	16	2	
c. Overweight	1	1	0	
d. obese	1	0	0	

*spearman significant at $p \leq 0.05$

a. Differences of socioeconomic and Nutritional status of special need and normal students:

There was a difference in nutritional status of normal students and students with special needs due to their growth are different. Special need students include deaf, blind, disabled students have physical abnormalities that will affect the food consumption and fulfillment of nutrition. Disabled students are known to be at high risk for developing malnutrition, which may partly explain the growth retardation often encountered in such students.⁸ The most common problems associated with malnutrition in disabled students, are inadequate nutrient intake either due to feeding problems or poor feeding knowledge among care providers.⁹ This result in accordance with another research which explain lack of nutritional rate

special need students.¹⁰ There was a differences of nutritional status of special need and normal students. Socioeconomic status is a form of family lifestyle, adequate family income can meet nutritional needs of students because all the necessary substances needed by the body can be fulfilled better life and health services, therefore will support the growth and development of students. Poverty is one of the factors which cause students experiencing disability disorders, due to low socioeconomic level can affect the lack of nutritional fulfillment.¹¹

b. Differences of first Incisive Permanent mandibular eruption of special need and normal students: Students with special needs tend to experience delays of tooth eruption (48%). Tooth delay may be affected by late eruption of the deciduous tooth and ultimately affects the permanent tooth eruption. Premature birth is also one of the factors that make late eruption when eruption of deciduous teeth in premature birth students is slower than normal child.¹² Delay in the eruption of the deciduous tooth also affects permanent tooth eruption as the result of the study says the time of permanent tooth eruption is related to the eruption of the deciduous teeth. Slow or faster eruption of the first tooth in a mouth resulting of delayed or faster eruption.¹³ The period of eruption of teeth in normal students with students with special needs has differences in terms of factors that affect the delay of eruption of teeth which states one of the factor is a child syndrome down.

c. Associations of nutritional status and socio economic status with Timing of IJ eruption of Special need and normal students: There was a relationship of nutritional status and socio economic status with time of first permanent eruption both on special need students and normal students. The nutritional status of students is strongly influenced by food intake and the frequency of food that will support growth. Growth of students with special needs is same with normal students only they have shortcomings at their physical ability which may affect their intake. Based on the research there are several factors that can affect the growth of the permanent teeth in students, include gender, nutrition, premature birth, socioeconomic factors,

height and weight, hormones, and systemic diseases. A research found similar result which found poor nutrition affect tooth eruption and resulted in delayed emergence of teeth.¹⁴ This study conducted at Sumatra Indonesia found a relation on nutritional status and permanent eruption of first molar lower jaw at elementary students (normal students). The teeth eruption is influenced by several factors which include nutritional, hormonal, hereditary or genetic factors.¹⁵ Socioeconomic and nutritional factors have also been found to have some effect on the eruption of permanent teeth. Students from high social economy has earlier tooth emergence, the reason students has better health care and affect their tooth development.¹⁶ Normal students are students at Elementary Scholl Tembalang Semarang which most of them are middle up family, otherwise special need students are students aged 6-7 years old which most of them are from middle down family. Lower social economy will affect the first Incisive permanent lower jaw eruption. On contrary a research revealed that there is no correlation of timing of the eruption of permanent teeth with the nutritional status of an individual.¹⁷

CONCLUSIONS

1. There was a difference in nutritional status of school students and students with special needs, school students are more at normal weight compared to special need students which are more overweight
2. There was difference socioeconomic background of school students and students with special needs, school students are more at middle up socio economic background
3. There was a Differences of First Incisive Permanent Mandibular eruption of special need and normal students. Time of eruption of school students are more on time than special need children are delayed tooth eruption
4. Nutritional status and socioeconomic background related with eruption of first Incisive lower jaw

ACKNOWLEDGEMENTS

Special thanks for students and parents of both schools which participate in this research and also teachers who assists collecting data,

Conflict of Interest: There is no conflict of interest related with this publication.

Ethical Clearance: EC has been.

REFERENCES

1. Nanda RC. Eruption of human teeth. *Am J Orthod.* 1960;46:363–78.
2. Bali RK dan Kohli A, *Textbook of Dental and Oral Anatomy, Physiology and Occlusion with Multiple Chois Question.* 2002. New Delhi: Jaypee Brother Medical Publisher, pp: 36, 318.
3. Chaerita M dan Enterprise J, *Kiat Merawat Gigi Anak.* Jakarta: PT Alex Media Komputindo Kelompok Gramedia, 2005, p: 3.
4. Almonaitiene R, Balciuniene I, dan Tulkaviene J (2010). Factors influencing permanent tooth eruption. *Stomatologija Baltic Dental and Maxillofacial Journal*, Vol 12: 67-71.
5. Lantu V, Kawengian S dan Wowor V (2015). Hubungan Status Gizi dengan Erupsi Gigi Permanen Siswa SD Negeri 70 Manado. Prodi Kedokteran Gigi, Universitas Sam Ratulangi Manado, *Jurnal e Gigi.* Vol 3 No 1, <https://ejournal.unsrat.ac.id/index.php/egigi/article/view/6849>.
6. Clements EMB, Davies-Thomas E, Pickett KG. Time of eruption of permanent teeth in british students at independent, rural, and urban schools. *Br Med J* 2009;1:1511-3.
7. Juliana Arid, Mariana Cecília Vitiello, Raquel Assed Bezerra da Silva, Léa Assed Bezerra da Silva, Alexandra Mussolino de Queiroz , Erika Calvano Küchler , Paulo Nelson-Filho, Nutritional status is Associated with Permanent Tooth eruption Chronology, *Brazilian Journal of Oral Sciece*, 2017, vol 16, P 1-7, www.bibliotecadigital.unicamp.br/document/?down=80480
8. Abdullah AM, El-Sherbeny SSA, Khairy S. Nutritional status of mentally disabled students in. *Egyptian J Hospital Med.* 2007;29:604–615.
9. Suzuki M, Saitoh S, Tasaki Y, Shimomura Y, Makishima R, Hosoya N. Nutritional status and daily physical activity of handicapped students in Tokyo metropolitan schools for deaf, blind, mentally retarded and physically handicapped individuals. *Am J Clin Nut.* 1991;54(6):1101–1111.
10. Shinta A, Pola Konsumsi Pangan Penyandang Disabilitas di Kota Malang. Universitas Brawijaya, *Indonesian Journal of Disabilities Studies.* 2014, Vol 1 (1).
11. Lawal H, Anyebe EE, Oblako OR, Garba SN, Socio Economic Challenges of parents of Students With Neurological Disorders: A Hospital based Study in North West Nigeria, *International Journal of Nursing and Midwifery*, 2014, 6 (4): 58-66.
12. Soewondo W dan Effendi SH , Erupsi Gigi Sulung pada Anak dengan Riwayat Lahir Prematur, Berat Badan Lahir Rendah. Universitas Padjadjaran Bandung, *Jurnal.* 2014, Vol 46 No 1.
13. Poureslami H, Aminabadi NA, Deljavan AS, Erfanparast L, Sohrabi, Jamali Z, Oskouei SG, Hazem K dan Shirazi S, Dose Timing of Eruption in First Primart Tooth Correlate with that of First Permanent Tooth. *Journal Dent Rest Dent Clin Dent Prospect.* 2015, 9 (2): 79-85
14. Syukra Alhamda. Relationship between nutritional status and eruption of first permanent mandibular molar teeth among the school students in Indonesia South East Asia *Journal Of Public Health* 2012;2(2):85-86
15. Boenjamin, Situmorang N, Nasution L. Malnutrition. *Dentika Dent J* 2006;1:110.
16. Ruta Almonaitiene, Factors influencing permanent teeth eruption. Part one – general factors, *Stomatologija, Baltic Dental and Maxillofacial Journal*, 2012, 12: 67-72.
17. Savior Selva Suresh, Daniel rajendran, Shanmugasundaram Sivakkumar, The effect of nutritional status of an individual over the eruption of permanent teeth among school students in Cinnai, *International Medical Journal*, 2017, vol 4 (3), p 365-367.

Survey of Satisfaction on School Health Unit Service at Elementary School

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ABSTRACT

Background: Various kinds of health problems appear in children aged elementary school, but the usual problems that are related to healthy life behavior. School Health Unit (Usaha Kesehatan Sekolah = UKS) is one of the vehicle to improve health degree of students. The purpose of this study was to analyze the level of satisfaction of students, UKS's teachers, and parents of school health unit consisting of services: health education, health service and healthy school environment at the elementary school in work area of Public Health Center Kedungmundu Semarang.

Method: This research is a descriptive research, which is a type of conclusive design that aims to describe the character or function of research on a group. Descriptive analysis conducted to illustrate the gap between the importance and satisfaction of the school community on the effort of implementing the school health unit. To know the level of customer service satisfaction, used Gap Analysis and Cartesius Diagram.

Result: The result was that the students were satisfied with the school health service because two of the best items were health education and anthropometric measurement. UKS's teachers are satisfied with the service of School Health Unit because the two best items are the counseling and directing on the implementation of health education as well as the variables of guidance and guidance on the implementation of health services. The parents are satisfied with the service of School Health Unit because the two best items are student's knowledge about healthy life behavior variable and habit of healthy daily living variable.

Keywords: *Satisfaction, School Health Unit, Services*

INTRODUCTION

One of the serious problems facing Indonesian nation is health problem especially health problem of school age children. The population of primary school-aged children is an important component in the community, given the large number of about 23% or one-third of the total population of Indonesia. Common health problems that occur in school-age children are usually related to personal hygiene and environment such as brushing teeth in right way, personal hygiene, and handwashing

habits.¹⁾ One of the containers to develop the promotion of Healthy Living Behavior (Perilaku Hidup Bersih dan Sehat = PHBS) of school-aged children is the School Health Unit (Usaha Kesehatan Sekolah = UKS) Service

UKS is part of the school-age health program which has three main programs: health education, health services and healthy school environment.²⁾ According to Surat Keputusan Bersama Kementerian Pendidikan, Kementerian Kesehatan dan Kementerian Agama Republik Indonesia No : 1 / U / SKB / 2003 No : 1067 / Menkes / SKB / VII / 2003 No : MA / 230 A / 2003 No : 26 Tahun 2003 Tanggal 23 Juli 2003 tentang Pengembangan dan Pembinaan UKS, UKS is an integrated effort in order to improve the ability of healthy life which then form the healthy behavior of school-aged children who are in school. UKS plays a role in providing health-related knowledge to the students so that in the future it is hoped that they can practice healthy lifestyle everywhere.³⁾

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The UKS service includes public services, with school community service users including: Students, UKS's Teachers and Student Parents. One of the efforts that must be done in the improvement of public services is to conduct a Public Satisfaction Survey to service users.⁴⁾ By knowing the level of school community satisfaction to the service of UKS, will be able to improve the quality of service, so hope to improve healthy life behavior among elementary school student can be achieved.³⁾

The purpose of this research is to know the satisfaction of school society consisting of: students, UKS's teachers, and parents on the quality of UKS Service.

METHOD

This research is an observational research which the data is analyzed by Frequency and Descriptive to describe gap (gap) between interest / expectation and performance / customer satisfaction toward service

quality of School Health Enterprises.⁵⁾ To know the level of customer service satisfaction, used Gap Analysis and Cartesius Diagram.⁶⁾

The population of this research is the community of elementary schools in the work area of Public Health Center Kedungmundu Semarang in 31 schools. So the respondents of this study include: 31 students (one student from each school), who was accompanied by 31 parents, and 31 teachers of UKS coach.

RESULTS AND DISCUSSIONS

1. Actual and Expectations of Respondents (Students) to School Health Unit Services: In

this study, respondents were asked to assess the importance and performance of School Health Unit Enterprises in the provision of services that include: health education services, health services, and healthy school environments. The results are as follows:

Table 1: Student Satisfaction Analysis of School Health Unit Service

No.	Component of	Service Quality	Category	Satisfaction Level	Category	Degree of Conformity (%)
1.	Health education about disease, its causes and prevention	4.65	Very important	3.82	Satisfied	82.11
2.	Health education about Healthy Living Behavior	4.59	Very important	3.77	Satisfied	82.24
3.	Health education about clean and healthy environment	4.56	Very important	3.87	Satisfied	84.90
4.	Health education on nutrition and healthy food	4.62	Very important	3.84	Satisfied	83.13
5.	Anthropometric Measurement	4.58	Very important	3.83	Satisfied	83.55
6.	General Health/Dental Examination	4.57	Very important	3.77	Satisfied	82.55
7.	Referral service	4.57	Very important	3.62	Satisfied	79.09
8.	Adequate school infrastructure and school environment	4.55	Very important	3.51	Satisfied	77.31
	Average	4.59	Very important	3.75	Satisfied	81.87

Next, the average value of importance and performance is analyzed on the Importance-Performance Matrix, in which the x-axis represents perception whereas the y-axis represents expectations. Then the results obtained in the form of images as follows:

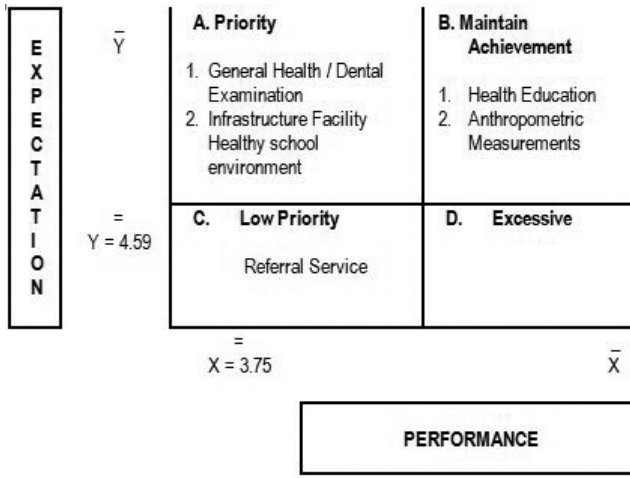


Figure 1: Cartesian Diagram of Service Quality and Student's Performance/Satisfaction of School Health Unit Service

Based on the calculation of student satisfaction scores that have been done can be known two best items include health education and anthropometric

measurement conducted by UKS in the working area of Public Health Center Kedungmundu Semarang. With the analysis of Importance - Performance Analysis (IPA), it can be seen that the things that must be improved in the future, include: general and dental health check up service and healthy school environment facilities.

2. Actual Performance and Expectations of Respondents (UKS's Teachers) to School Health Unit Services: In this study, respondents were asked to assess the importance and performance of School Health Unit Enterprises which include: counseling and directing the implementation of health education, guidance and direction on the implementation of health services, guidance and direction the implementation of healthy environment coaching, operational funds funding infrastructure of healthy schools, and the implementation of crash programs for urgent cases such as dengue fever, vomiting etc. The results are as follows:

Table 2: Analysis of UKS Teacher Satisfaction with School Health Service

No.	Component of	Quality Service	Category	Satisfaction	Category	Level Degree of conformity (%)
1.	Guidance and direction on health education implementation	4.68	Very Important	4.05	Satisfied	86.57
2.	Guidance and direction on implementation health services	4.55	Very Important	3.88	Satisfied	85.28
3.	Guidance and guidance on the implementation of healthy school environment	4.66	Very Important	3.66	Satisfied	78.49
4.	Operational fund for healthy school infrastructure	4.73	Very Important	3.89	Satisfied	82.41
5.	Implementation of program crashes for urgent cases such as fever bleeding, vomiting etc.	4.70	Very Important	3.81	Satisfied	80.98
6.	Average	4.66	Very Important	3.86	Satisfied	82.73

Furthermore the average value of importance and performance is analyzed on Importance-Performance Matrix, where the x axis represents perception whereas the y-axis represents expectation. The results obtained in the form of drawings as follows:

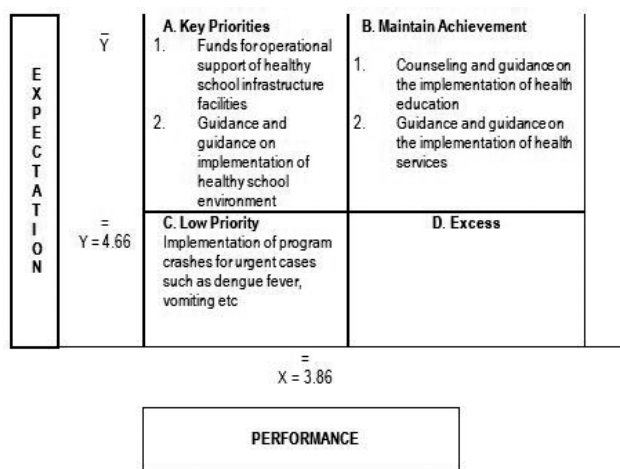


Figure 2 :Cartesian Diagram of Service Quality and Performance/ Satisfaction of UKS’s Teachers toward School Health Unit Services

Based on the results of the calculation of satisfaction scores UKS’s teachers who have done can be known two best items, that are the guidance and direction of

the implementation of health education and guidance on the implementation of health services conducted by School Health Unit Services . With the analysis of Importance - Performance Analysis (IPA), it can be seen that there are still things that must be improved in the future, namely: Operational Funds for the facilities of healthy school infrastructure and guidance and direction on the implementation of healthy school environment.

3. Actual Performance and Expectations of Respondents (Parents) to School Health Unit Services: In this study, respondents were asked to assess the importance and performance of School Health Efforts that include: Students ‘knowledge of healthy living behaviors, healthy students’ daily hygiene habits, increased physical activity of students , clean and healthy school environment as well as special programs such as school’s cadre, field trip and rehabilitation service. The results are as follows:

Table 3: Parents Satisfaction Analysis of School Health Unit Service

No.	Component	Quality of Service	Category	Satisfaction	Category	Level Degree of Conformity (%)
1.	Student’s Knowledge of Healthy Living Behavior	4.59	Very Important	3.78	Satisfied	82.22
2.	Student Habits Clean Healthy Day -days	4.54	Very Important	3.63	Satisfied	79.85
3.	Increased student physical activity	4.58	Very Important	3.80	Satisfied	82.85
4.	Clean and healthy school environment	4.63	Very Important	3.85	Satisfied	83.13
5.	Special programs such as school’s cadre, field trip and rehabilitation service	4.54	Very Important	3.70	Satisfied	81.60
6.	Average	4.58	Very Important	3.75	Satisfied	81.94

Furthermore the average value of importance and performance is analyzed on the *Importance-Performance Matrix*, where the x-axis represents perception whereas the y-axis represents expectations. Then the results obtained in the form of images as follows:

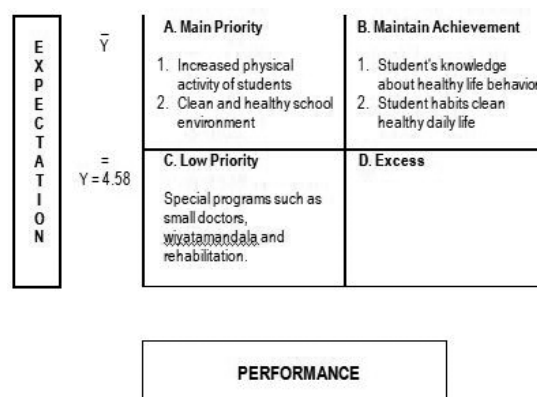


Figure 3: Cartesian Diagram of Service Quality and Performance/Parents Satisfaction to School Health Unit Services

Based on the results of the calculation of parents' satisfaction scores that have been done can be known two best items, that are student knowledge about the healthy life behavior and student's clean healthy living everyday. With the analysis of Importance-Performance Analysis (IPA) it can be seen that things that still need to be improved in the future, are the increase of physical activity of students and school environment clean and healthy.

The theory of customer satisfaction and dissatisfaction is formed from the expectation disconfirmation model, which explains that customer satisfaction or disparity is the impact of the comparison between customer expectations before the actual purchase obtained from the customer of the product or service.⁷⁾ Customer expectations when buying actually consider the function of the product (product performance). Product functions include:⁸⁾

1. Product can function better than expected, called positive disconfirmation (*positive disconfirmation*). When this happens then the customer will feel satisfied.
2. The product can work as expected, called *simple confirmation*. The product does not give a sense of satisfaction and the product does not disappoint so the customer will have a neutral feeling.
3. Product can function worse than expected, called negative disconfirmation (*negative disconfirmation*). When this happens it will cause disappointment, so that customers feel not satisfied.

In this study the student respondents were satisfied with the school health service because two of the best items were health education and anthropometric measurement. This means students perceive the school health unit service in health education services and anthropometric measurements to function better than expected, or called positive disconfirmation.⁹⁾

To note, customer satisfaction is the result of accumulation from consumers or customers in using products and services.¹⁰⁾ Therefore, any transaction or new experience, will have an effect on customer satisfaction. Similarly, customer satisfaction has a time dimension because of the result of accumulation. Therefore, whoever is involved in customer satisfaction,

he has been involved in long-term affairs. The effort to satisfy the customer is a long experience that knows no deadline.¹¹⁾

In this research, UKS's teacher are satisfied with the services of School Health Unit because the two best items are the guiding and directing on the implementation of health education as well as guidance on the implementation of health services. So it can be said that the two items mentioned above have a good quality of service so as to meet the expectations of respondents, in this case the UKS's teachers.

The respondents of parents are satisfied with the service of School Health Unit Service because the two best items are student's knowledge about healthy life behavior and healthy daily living. So it can be said that the two items mentioned above have a good quality of service so as to meet the expectations of respondents, in this case the parents of students.

Quality of service is the level of excellence expected and control over the level of excellence to meet customer desires.^(12,13) In other words, there are two main factors that affect the quality of services, namely expected service and perceived service.¹⁴⁾ If the service received or perceived (service perceived) in accordance with the expected, then the quality of services perceived good and satisfactory. If the service received exceeds the customer's expectations, then the quality of service is perceived as the ideal quality. Conversely, if the service received is lower than expected, then the service quality is perceived poorly. Thus, whether the quality of services depends on the ability of service providers to meet customer expectations consistently.¹⁵⁾

Conclusions

1. The student were satisfied with the school health unit service because two best items were health education and anthropometric measurement.
2. UKS's teacher are satisfied with the service of School Health Unit Service because two best items are the counseling and directing on the implementation of health education as well as guidance on the implementation of health services.
3. The parents are satisfied with the service of School Health Unit Service because the two best items are student's knowledge about healthy life behavior and healthy daily living.

Conflict of Interest: Nil

Ethical Clearance: Taken from Bioethics Committee Medical Faculty of Islamic University Sultan Agung (UNISSULA) Semarang

Source of Funding: Self

REFERENCES

1. Priya Devadas Nakre and A. G. Harikiran, *Effectiveness of oral health education programs: A systematic review*, J Int Soc Prev Community Dent. 2013 Jul-Dec; 3(2): 103–115.doi: 10.4103/2231-0762.127810
2. Vinay Kumar Bhardwaj, Kapil Rajiv Sharma, Rajeshwar Prasad Luthra, Pravesh Jhingta, Deepak Sharma, and Ashish Justa, *Impact of school-based oral health education program on oral health of 12 and 15 years old school children*, Journal of Education and Health Promotion, 2013, 2 : 33
3. Ramseook-Munhurrun P, Lukea-Bhiwajee SD, Naidoo P, *Service Quality in the Public Service*. Int J Mark Res. 2010;3(1):37–50.
4. Archambault LZ. *Measuring Service Performance, Student Satisfaction and its Impact on Student Retention in Private, Post-Secondary Institutions*. EDU-COM Int Conf Sustain High Educ Dir Chang [Internet]. 2008;(November):19–21. Available from: <http://ro.ecu.edu.au/ceducom/2>
5. Maykel Verkuyten, Jochem Thijs, *School Satisfaction of Elementary School Children: The Role of Performance, Peer Relations, Ethnicity and Gender*, Social Indicators Research 59: 203–228, 2002.
6. Butt BZ, Rehman KU, *A study examining the students satisfaction in higher education*. Procedia - Soc Behav Sci [Internet]. 2010;2(2):5446–50. Available from: [http:// dx.doi.org/ 10.1016 /j.sbspro.2010.03.888](http://dx.doi.org/10.1016/j.sbspro.2010.03.888)
7. Ogunnaike OO, Borishade TT, Jeje OE, *Customer Relationship Management Approach and Student Satisfaction in Higher Education Marketing*. J Compet [Internet]. 2014;6(3):49–62. Available from: <http://www.cjournal.cz/index.php?hid=clanek&cid=175>
8. Mahmood WN, Ridhuan M, Dangi M, Anuar K, Ali M, *Investigating Students ' Satisfaction Level on Implicit Services of Malaysian Public Higher Education Institutions*. 2014;18(1):41–59.
9. Tóth ZE, Jónás T, *Enhancing student satisfaction based on course evaluations at budapest university of technology and economics*. Acta Polytech Hungarica. 2014;11(6):95–112.
10. Sahin O, Page, *An Investigation of Student Satisfaction Factors*. Quest Journals J Res Bus Manag [Internet]. 2014;2(6):8–12. Available from: www.questjournals.org
11. Herdlein R, Zurner E, *Student Satisfaction, Needs, and Learning Outcomes: A Case Study Approach at a European University*. SAGE Open [Internet]. 2015;5(2). Available from: [http:// sgo.sagepub. com/ lookup/ doi/ 10.1177/ 2158244015580373](http://sgo.sagepub.com/lookup/doi/10.1177/2158244015580373)
12. List BP, *an Exploratory Study of Predictors of Student Satisfaction*. 2015;1–7.
13. Saif NI, *The Effect of Service Quality on Student Satisfaction : A Field Study for Health Services Administration Students*. Int J Humanit Soc Sci. 2014;4(8):172–81
14. Doo-Seok Park, Seon-eung Kim, *Elementary School Students' Class Satisfaction toward Teaching Styles of Physical Education Specialists*, Journal of physical education (Dayton, Ohio) 11(2):25-36 · December 2015

Effectiveness of Disinfectant A and B on the Growth of Bacteria in the Area of Central Surgical Installation of Hospital X in Kudus City

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ABSTRACT

Background: There is a limit of using centralized AC in surgical rooms that requires hospital to control the growth of microorganism by using disinfectant A. Disinfectant A has been used for so long and has tested for its effectiveness, so hospital X held effectiveness test by comparing disinfectant A with other disinfectant. The aim was to analyze the effectiveness of disinfectant A and B to the growth of bacteria in Central Surgery Unit Hospital X Kudus City.

Method: The research was a quasi-experimental research with one group pre-test post-test. The number of samples was 36 samples. Data collection was conducted with laboratory observation. The data were then analyzed by Wilcoxon Test.

Result: Statistical result shows that there is no significant difference on the effectiveness of disinfectant A and B in surgical room ($p > 0,05$) for both centralized and split AC. There are three identified bacteria in surgery room namely Staph. Aureus, Staph. Epidermidis dan Baccilus Sp. From the observation, the number of bacteria before using disinfectant A and B in rooms with split AC was Staph. Epidermidis 0,66 CFU/cm², Staph. Aureus 0,67 CFU/cm² and Baccilus Sp 1,67 CFU/cm², While in rooms with centralized AC, the observed number of bacteria can be seen as follows: Staph. Epidermidis 0,66 CFU/cm², Staph. Aureus 0,33 CFU/cm² and Baccilus Sp 1,67 CFU/cm². After 20th and 240th minute using disinfectant A and B, in rooms with centralized and split AC, there was no growth of bacteria (-).

Conclusion: The observation on the effectiveness of disinfectant A and B shows no growth of bacteria on the 20th and 240th minute which means that disinfectant B can be the alternative of disinfectant in surgery room.

Keywords: Disinfectant, number of bacteria, effectiveness, surgery room, AC

INTRODUCTION

The operating room is the place where elective and acute surgical procedures are held, thus requiring sterile conditions and other special conditions. Based on the technical guidelines for hospital buildings, the operating

room is divided into several zones. This zoning system is intended to minimize the risk of spreading infection (infection control) by microorganisms from dirty areas of the hospital to the operating room. In addition, the operating room has special requirements for its building components such as floors, doors, walls, ventilation systems, lighting systems, electrical systems to minimize exposure to organisms in the operating room.¹

The result of preliminary examination in Hospital X shows that the number of germs in labor and delivery room was 38 CFU/cm², in ICU 112 CFU/cm², and in operating room 12 CFU/cm². The Regulation of the Minister of Health of the Republic of Indonesia Number

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1204/MENKES/SK/X/ 2004 established that a room is considered eligible for room floor and wall if the number of bacterial colonies in hospital is 0-5 CFU/cm² and in ward 5-10 CFU/ cm². From examination result mentioned above, Hospital X has not met the required number as stated in the regulation.

During microorganism inspection in Hospital X, Kudus City, *Staphylococcus aureus*, *Bacillus subtilis*, *Staphylococcus epidermis*, and *E. Coli* were detected in ward and operating room. In several study, in some studies, these bacteria are the cause of nosocomial infections or act as the vector in the process of infection by certain microbes.²

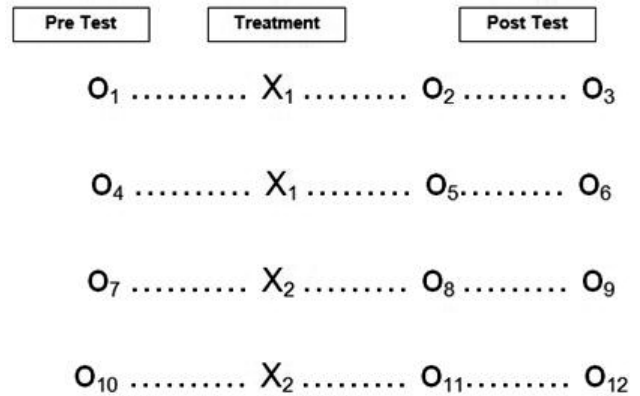
By default, operating room should be equipped with a ventilation system. The ventilation system filters or cleanses the air. Recirculation can be done through HEPA (*High Efficiency Particulate Air Filter*) Filter, before the air recirculates into the room at least six times per hour.¹ In Hospital X, HEPA Filter has not been used optimally in 24 hours due to the limited operation of central AC system in operating room to reduce maintenance and operational costs of electricity costs. Split AC system is used daily to maintain temperature and humidity of the operating room

Meanwhile, to maintain the sterile condition of the operating room from the growth of microorganisms, disinfectant A is used. Disinfectant, A which contains sodium hypochlorite, is easy to use and able to kill gram-positive bacteria and gram-negative bacteria.³

Besides that, disinfectant A has its disadvantages because the disinfectant is made from chlorine. Disinfectant A can cause corrosion and the disinfectant easily becomes inactive if exposed to certain organic compounds.³ As disinfectant A has been used in the operation room for a long time and its effectiveness had not been tested, Hospital X needed to perform effectiveness test by looking for an alternative. Hospital X chose disinfectant B as the alternative as it contains similar materials to disinfectant A, quaternary ammonium derivative. Disinfectant B has several advantages, such as low toxicity, solubility in large water, stable in aqueous solution, colorless, and does not cause corrosion in metal tools.⁴

METHOD

The research was a quantitative research using *quasi-experimental studies*. The research design *one group pre-test post-test design*.⁵



Gambar 3 2 Rancangan Penelitian

Where:

- O₁ : Testing for number of germs before the treatment using disinfectant A in rooms with central AC system
- X₁: Treatment using disinfectant A
- O₂: Testing for number of germs after the treatment using disinfectant A in rooms with central AC system in the twentieth minute
- O₃: Testing for number of germs after the treatment using disinfectant A in rooms with central AC system in the 240th minute
- O₄: Testing for number of germs before the treatment using disinfectant A in rooms with split AC system
- X₁: Treatment using disinfectant A
- O₅: Testing for number of germs after the treatment using disinfectant A in rooms with split AC system in the twentieth minute
- O₆: Testing for number of germs after the treatment using disinfectant A in rooms with split AC system in the 240th minute
- O₇: Testing for number of germs before the treatment using disinfectant B in rooms with central AC system
- X₂: Treatment using disinfectant B
- O₈: Testing for number of germs after the treatment using disinfectant B in rooms with central AC system in the twentieth minute

- O₉: Testing for number of germs after the treatment using disinfectant B in rooms with central AC system in the 240th minute
- O₁₀: Testing for number of germs before the treatment using disinfectant B in rooms with split AC system
- X₂: Treatment using disinfectant B
- O₁₁: Testing for number of germs after the treatment using disinfectant B in rooms with split AC system in the twentieth minute
- O₁₂: Testing for number of germs after the treatment using disinfectant B in rooms with split AC system in the 240th minute

The study population was the floor of operating room. The operating room has an area of 5 x 5 m² so that the sample was chosen using quota sampling technique. Experimental replication was calculated by the following formula:⁶

$$(t - 1)(r - 1) > 15$$

The univariate and bivariate analysis were performed to analyze the result of the study. To see the difference in the effectiveness of disinfectants A and B on the growth of bacteria in Central Surgery Installation of Hospital X, Kudus City, Wilcoxon signed-rank Test was applied as data were not normally distributed. Shapiro–Wilk Test was then conducted to test for data normality.

RESULTS AND DISCUSSIONS

Table 1 presents the result of bacterial identification in IBS operating room of Hospital X, Kudus City before using disinfectant A and disinfectant B.

Table 1: Bacterial Identification in Operating Room of Hospital X, Kudus City

Desinfektan A	Desinfektan B
Staphylococcus Aureus	Staphylococcus. Aureus
Staphylococcus Epidermidis	Staphylococcus Epidermidis
Bacillus Sp	Bacillus Sp

Bacterial identification shows that there are *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp*. in operation room of Hospital X, Kudus City before using any disinfectant. The finding is in line with previous microorganism examination that the floor of the operating room was contaminated with *Staphylococcus*

aureus, *Bacillus subtilis*, *Staphylococcus epidermis*, and *E. Coli*. Another study in Central Surgery Installation of Sanglah Hospital, Denpasar stated that there are various kinds of bacteria identified from isolation from bacteria contaminating the floor of the operating room. Those are negative-gram bacteria categorized in Enterobacteriaceae dan *Pseudomonas aeruginosa*.⁷

Bacteria found in hospital are various depending on the number of microorganism as well as their types in various air volume based on location, condition, pollutant, like human respiratory tract through coughing and sneezing. Air is a medium of spreading for microorganism. The most widely distributed microorganism in free air is bacteria, fungi (including yeast) and microalgae. Air is not the natural habitat for microorganism. The number of microorganism on air is relatively small if compared to microorganism found in water or in soil.

Air microorganism can be categorized into outdoor microorganism and indoor microorganism.⁸ Besides that, the presence of bacteria is caused by various activities of surgery and a kind of “dirty” surgery that makes possible for bacteria causing any infections.⁹

Staphylococcus is common since the species is a flora on skin, respiration tract, and digestive tract so every person has the species on skin, nose, and throat.¹⁰ Infection by *Staphylococcus epidermidis* is usually difficult to cure because some of the strains have become resistance to most antibiotics (multi-resistant). *Staphylococcus aureus* is circle gram-positive bacteria having 0,7-1,2 µm diameter. The bacteria grow in an optimum temperature of 37 °C, The bacteria develop their best pigment at room temperature (20-25 °C).¹¹ The average temperature of operating room is 22°C with 40-45% humidity. The condition is perfect for *Staphylococcus aureus* to grow.

Bacillus Sp is generally found in soil, water, air and plants. The bacteria grow on medium in the right state of temperature and water content on dusty and hard surfaces. *Bacillus Sp* is a rod-shaped bacteria, classified as gram-positive, motile, producing spores that are usually resistant to heat, aerobic (some species are facultative anaerobes), catalase positive, and has varied oxidation.¹¹

There are several contributing factors to bacterial growth like temperature, humidity, and light. The more humid the air, the more likely the microbial content in

the air is because water particles can move the cells on the surface. Besides that the temperature affects the growth rate and the total amount of growth. If bacteria reach the optimum temperature, the condition allows the incubation of bacteria for a short period, which is between 12 and 24 hours.¹¹

A. Examination Result of Bacteria for Disinfectant A

Table 2: Examination Result of Bacterial Colonies before and after using Disinfectant A in Operating Room of Hospital X Kudus City using Split AC System

Type of Bacterial	Number of Bacterial Colonies in Repetition			Mean
	1	2	3	
Before				
<i>Staph. Aureus</i>	7	6	8	7,00
<i>Staph. Epidermidis</i>	9	8	8	8,33
<i>Bacillus Sp</i>	2	4	6	4,00
After 20th minute				
<i>Staph. Aureus</i>	Negatif	Negatif	Negatif	-
<i>Staph. Epidermidis</i>	Negatif	Negatif	Negatif	-
<i>Bacillus Sp</i>	Negatif	Negatif	Negatif	-
After 240th minute				
<i>Staph. Aureus</i>	Negatif	Negatif	Negatif	-
<i>Staph. Epidermidis</i>	Negatif	Negatif	Negatif	-
<i>Bacillus Sp</i>	Negatif	Negatif	Negatif	-

Table 2 shows that the number of bacteria before using disinfectant A in operating room with Split AC system is *Staphylococcus Epidermidis* 8,33 CFU/cm² in average, *Staphylococcus Aureus* rata-rata 7,33 CFU/cm² in average, and *Bacillus Sp* rata-rata 4 CFU/cm² in average. After using disinfectant A, the examination in the 20th minute and 240th minute shows negative results for *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp*. It means that the bacterial examinations, which were, conducted in three repetitions shows no bacteria in the operating room.

The Regulation of the Minister of Health of the Republic of Indonesia Number 1204/MENKES/SK/X/ 2004 established that a room is considered eligible for room floor and wall if the number of bacterial colonies in hospital is 0-5 CFU/cm². The examination result for disinfectant A shows that the operating room has met the requirement based on the criteria for operating rooms.

Table 3: Examination Result of Bacterial Colonies before and after using Disinfectant A in Operating Room of Hospital X Kudus City using Central AC System

Type of Bacterial	Number of Bacterial Colonies In Repetition			Mean
	1	2	3	
Before				
<i>Staph. Aureus</i>	4	3	2	3,00
<i>Staph. Epidermidis</i>	2	3	3	2,67
<i>Bacillus Sp</i>	1	2	1	1,33
After 20th minute				
<i>Staph. Aureus</i>	Negatif	Negatif	Negatif	-
<i>Staph. Epidermidis</i>	Negatif	Negatif	Negatif	-
<i>Bacillus Sp</i>	Negatif	Negatif	Negatif	-

Conted...

After 240 th minute				
Staph. Aureus	Negatif	Negatif	Negatif	-
Staph. Epidermidis	Negatif	Negatif	Negatif	-
Bacillus Sp	Negatif	Negatif	Negatif	-

The examination which were conducted in three repetitions before using disinfectant A in operating room with Central AC system resulted in the number of bacteria *Staphylococcus Epidermidis* is 2,67 CFU/cm² in average with standard deviation at 0,577. The number of *Staphylococcus Aureus* is 3,00 CFU/cm² in average with standard deviation at 1,000 and the number of *Bacillus Sp* is 1,33 CFU/cm² in average with standard deviation at 0,577.

The examination conducted at the 20th and 240th minute resulted in negative value for *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp*.

B. Examination Result of Bacteria for Disinfectant B

Table 4: Examination Result of Bacterial Colonies before and after using Disinfectant B in Operating Room of Hospital X Kudus City using Split AC System

Type of Bacterial	Number of Bacterial Colonies In Repetition			Mean
	1	2	3	
Before				
Staph. Aureus	7	6	8	6,33
<i>Staph. Epidermidis</i>	9	8	8	7,33
<i>Bacillus Sp</i>	2	4	6	2,33
After 20th minute				
<i>Staph. Aureus</i>	Negatif	Negatif	Negatif	-
<i>Staph. Epidermidis</i>	Negatif	Negatif	Negatif	-
<i>Bacillus Sp</i>	Negatif	Negatif	Negatif	-
After 240th minute				
<i>Staph. Aureus</i>	Negatif	Negatif	Negatif	-
<i>Staph. Epidermidis</i>	Negatif	Negatif	Negatif	-
<i>Bacillus Sp</i>	Negatif	Negatif	Negatif	-

Table 4 presents the examination result of bacterial colonies before using Disinfectant B in Operating Room of Hospital X Kudus City using Split AC System. From the examinations that were conducted in three repetitions, the number of *Staphylococcus Aureus* is 6,33 CFU/cm² in average with standard deviation at 2,082, *Staphylococcus Epidermidis* 7,67 CFU/cm², and *Bacillus Sp* 2,33 CFU/cm² in average with standard deviation at 0,577.

A room is considered eligible for operating room if the number of germs is 0-5 CFU/cm². It means that the operating room examined is not eligible since the number of *Staphylococcus Aureus* and *Staphylococcus Epidermidis* in the operating room with Split AC system is higher than the requirement.

The examination conducted in the 20th and 240th minute shows negative results meaning that there were no bacterial growth of *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp* in the operation room.

Table 5: Examination Result of Bacterial Colonies before and after using Disinfectant B in Operating Room of Hospital X Kudus City using Central AC System

Type of Bacterial	Number of Bacterial Colonies in Repetition			Mean
	1	2	3	
Before				
Staph. Aureus	3	3	2	2,67
Staph. Epidermidis	3	3	4	3,33
Bacillus Sp	1	5	2	2,67
After 20th minute				
Staph. Aureus	Negatif	Negatif	Negatif	-
Staph. Epidermidis	Negatif	Negatif	Negatif	-
Bacillus Sp	Negatif	Negatif	Negatif	-

Table 5: Examination Result of Bacterial Colonies before and after using Disinfectant B in Operating Room of Hospital X Kudus City using Central AC System (Con't)

Type of Bacterial	Number of Bacterial Colonies in Repetition			Mean
	1	2	3	
After 240th minute				
Staph. Aureus	Negatif	Negatif	Negatif	-
Staph. Epidermidis	Negatif	Negatif	Negatif	-
Bacillus Sp	Negatif	Negatif	Negatif	-

The examination in operating room of Hospital X Kudus City using central AC system resulted in the number of *Staphylococcus Epidermidis* 2,67 CFU/cm² in average and *Staphylococcus Aureus* 3,33 CFU/cm² in average, while *Bacillus Sp* 2,67 CFU/cm² in average. The examination in the 20th and 240th minute resulted in negative results meaning that there was no bacterial growth for *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp* in operating room using central AC system.

C. Analysis of the Effectiveness of Disinfectant A and B in Operating Room using Central AC System

Table 6: Analysis of effectiveness of disinfectant A and B towards bacterial growth in operating room using central AC system

Type of Bacterial	Type of Disinfectant				Total		P value
	A		B		n	%	
	n	%	n	%			
Before							
Staph. Aureus	3	33,3	3	33,3	6	33,3	0,317
Staph. Epidermidis	3	33,3	3	33,3	6	33,3	0,157
Bacillus Sp	3	33,3	3	33,3	6	33,3	0,180
After 20th minute							
Staph. Aureus	3	33,3	3	33,3	6	33,3	1,000
Staph. Epidermidis	3	33,3	3	33,3	6	33,3	1,000
Bacillus Sp	3	33,3	3	33,3	6	33,3	1,000

Conted...

After 240 th minute							
<i>Staph. Aureus</i>	3	33,3	3	33,3	6	33,3	1,000
<i>Staph. Epidermidis</i>	3	33,3	3	33,3	6	33,3	1,000
<i>Bacillus Sp</i>	3	33,3	3	33,3	6	33,3	1,000

The Regulation of the Minister of Health of the Republic of Indonesia Number 1204/MENKES/SK/X/ 2004 established that a room is considered eligible for room floor and wall if the number of bacterial colonies in hospital is 0-5 CFU/cm². The number of bacteria before using disinfectant A in operating room with central AC system was, in average, *Staphylococcus Epidermidis* 2,67 CFU/cm², *Staphylococcus Aureus* 3,00 CFU/cm² and *Bacillus Sp* 1,33 CFU/cm². When using disinfectant B in operating room with central AC system, the number of bacteria was, in average, *Staphylococcus Epidermidis* 2,67 CFU/cm², *Staphylococcus Aureus* 3,33 CFU/cm² and *Bacillus Sp* 2,67 CFU/cm². It means that the number of bacteria in operating room with central AC system has met the criteria based on the regulation of the Minister of Health of the Republic of Indonesia for the floor of operating rooms.

The results of bacterial examination before using disinfectant A and B in operating room with central AC system obtained *p value* > 0,05 which means that there was no significant difference between using disinfectant A and B in operating room with central AC system since the operating room is equipped with filtered and controlled air ventilation. Air ventilation and circulation provide fresh air and prevent accumulation of anesthetic gases. Central AC system is equipped with *high efficiency particulate filter* (HEPA Filter) while common AC is only equipped with air filter which eliminates dust particles.¹ HEPA filter controls and isolates contaminants in such a way to minimize their circulation time in operating zone.

Bacteria can grow in standing water where water spray was located and air was condensed. The environment offers warm and humid temperature for bacteria to breed. Condensation or the use of water spray supports bacterial growth and provides a moist environment. The organism enters the room through the air carried by the AC system.¹³ Temperature affects the growth rate and the total amount of growth, changing certain metabolic processes and morphology (outer form)

of cells. The optimum growth temperature is the incubation temperature, which allows the fastest growth of bacteria in a short period of time, that is between 12 and 24 hours.¹¹

Hospital X has used disinfectant A to sterilize its operation rooms from microorganism growth. Disinfectant A has been used based on standard operating procedure for sanitizing the operating room. Based on the standard operating procedure, the operating room has been disinfected in three methods, i.e. daily, one day off and one time disinfecting. The examination for bacterial growth in the 20th and 240th minute after using disinfectant A and B in operating room with central AC system resulted in negative result. The *p value* after using disinfectant A and B in operating room with central AC system was 1,000 (*p value* > 0,05), which means that there was no significant difference in using disinfectant A and B n operating room with central AC system.

In the standard operating procedures (SPO), disinfecting the operating room of Hospital X has conducted to prevent the occurrence of nosocomial infections. One time disinfecting and daily cleaning are more noticed. Daily cleaning is carried out every day, every time and after the surgery is carried out. This cleaning includes cleaning floors, instrument tables, operating lamps and desks, and the surface of the operating tools used in the operating room using disinfectants. Daily cleaning is conducted at the beginning of morning shift and after performing operation. The examination shows that there was no bacterial growth of *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp* after the cleaning, and the disinfectant is able to eliminate any bacterial growth in a 4-hour observation.

The presence of bacteria in the operating room is affected by the level of air pollution. The level of air pollution is influenced by several factors such as the rate of ventilation, the density of people in operating room and the level of activities of people occupying the room. Bacteria are exhaled in the form of sparks from the nose and mouth during

sneezing, coughing and even talking. The drops of water from the respiratory tract have a size that varies from micrometers to millimeters. Small water drops in size of micrometer will survive in the air for some time, but large sizes will soon fall to the floor and / or the surface of other objects. Dust from this surface will occasionally be in the air during the activity in the room.¹⁴

Commonly, the cause of nosocomial infections is autoinfection (endogenous, self-infection) from a bacterium that already exists in the human body and moves elsewhere in our body. The second cause is exogenous factor (cross infection) which is caused by the hospital environment, such as air in operating room and ward, non-sterile equipment, and hospital officers who lack of aseptic and antiseptic behavior.¹⁵ Diseases caused by hospital environment are mostly caused by microorganism that commonly found in human and normally safe for normal people.¹⁶

Disinfectant A has sodium hypochlorite as its main ingredients. The ingredients is easy to use and eliminates gram-positive bacteria as well as gram-negative bacteria. Disinfectant A inhibits glucose oxidation in cells of microorganisms by inhibiting enzymes involved in carbohydrate metabolism³ so that it is effective to eliminate *Staphylococcus Aureus* and *Staphylococcus Epidermidis* for 20 to 240 minutes after exposure to disinfectant. Because it is made from chlorine, disinfectant A can cause corrosion and is easily being inactive if exposed to certain organic compounds.³

Different from disinfectant A, disinfectant B at its optimal level contains quaternary ammonium compounds that cause lysis in cells. At higher levels, the compound ignites denaturation of bacterial enzyme proteins. Cell membranes are useful as a selective barrier to solutes and hold

insoluble substances. Some substances are actively transported through the membrane, so that their concentration in the cell is high. Substances that are concentrated on the cell surface will change their physical properties so that they eliminate and inhibit cell growth. The changes in membrane permeability of cells result in leakage of essential cell constituents which results in the death of cell.¹⁷

A study conducted by Erlina (2013) on the Effectiveness of Quaternary Ammonium 1% and Phenol 1% Disinfectant to Reduce the Number of Floor Germs in Ward of RSU Kardinah Tegal City suggests that Quaternary Ammonium 1% disinfectant is more effective compared to Phenol 1% disinfectant. Quaternary Ammonium disinfectant deactivates cell parts that produce enzyme, unfolds important protein cells and interferes cell membrane.¹⁷ So, in this study, disinfectant B is not only effective to inhibit bacterial growth for *Staphylococcus Aureus*, and *Staphylococcus Epidermidis* for 20 – 240 minutes after exposure, but also destroys cell membranes, unfolds protein, and inhibit enzyme.

Quaternary ammonium is less toxic, highly soluble in water, stable in aqueous solution, colorless, and does not corrode metal tools. Quaternary ammonium derivatives such as benzalkonium chloride, benzetonium chloride, cetrimide, dequalinium chloride, and domifen bromide have bactericidal and bacteriostatic effects on gram-positive and gram-negative bacteria, fungi, and protozoa. However, this derivative is not active against spore-forming bacteria, such as *Mycobacterim tuberculosis* and viruses.² The disadvantage of disinfectant B are ineffective towards soap, anionic and non-ionic surfactant, Ca and Mg ions, blood serum, food, and complex organic substances.⁴

D. Analysis of Effectiveness of Disinfectant A and B in Operating Room using Split AC System

Table 7: Analysis of effectiveness of disinfectant A and B towards bacterial growth in operating room using split AC system

Type of Bacterial	Type of Disinfectant				Total		P value
	A		B		n	%	
	n	%	n	%			
Before							
<i>Staph. Aureus</i>	3	33,3	3	33,3	6	33,3	0,317
<i>Staph. Epidermidis</i>	3	33,3	3	33,3	6	33,3	0,157

Conted...

<i>Bacillus Sp</i>	3	33,3	3	33,3	6	33,3	0,180
After 20th minute							
<i>Staph. Aureus</i>	3	33,3	3	33,3	6	33,3	1,000
<i>Staph. Epidermidis</i>	3	33,3	3	33,3	6	33,3	1,000
<i>Bacillus Sp</i>	3	33,3	3	33,3	6	33,3	1,000
After 240th minute							
<i>Staph. Aureus</i>	3	33,3	3	33,3	6	33,3	1,000
<i>Staph. Epidermidis</i>	3	33,3	3	33,3	6	33,3	1,000
<i>Bacillus Sp</i>	3	33,3	3	33,3	6	33,3	1,000

Split air conditioner has indoor and outdoor parts. The compressor in Split AC system is located in the outdoor part and it has a fan to reduce the heat in the condenser pipe. The indoor part consists of evaporator pipe and electric motor to rotate the blower and then remove the condensed air to the designated room so that the room becomes cold.

The examination before using disinfectant A in operating room using split AC system shows the number of *Staphylococcus Epidermidis* 8,33 CFU/cm², *Staphylococcus Aureus* 7,33 CFU/cm² and *Bacillus Sp* 4 CFU/cm². While before using disinfectant B in operating room using split AC system, the number of *Staphylococcus Aureus* was 6,33 CFU/cm² in average, *Staphylococcus Epidermidis* 7,67 CFU/cm² and *Bacillus Sp* 2,33 CFU/cm². In both observed room, the number of bacteria before using disinfectant A and B exceeded the required number of bacteria in operating room, which was established at 0-5 CFU/cm².

The statistical test in operating room using split AC system before using disinfectant A and B resulted in *p value* > 0,05 meaning that there was no significant difference in bacterial examination before using disinfectant in operating room using split AC system. The condition was a result from insignificant temperature changes, which has no considerable changes to the number of germs. Russel stated that there are several physical and chemical factors contributing to the number of germs, namely temperature, acidity, and humidity.¹⁹

In addition, the number of bacteria in split AC bacteria is higher because the air filter filters only remove dust particles, while central AC is equipped with high efficiency particulate filter (HEPA Filter).¹

After the use of disinfectant A and B in operating room using split AC system, the bacterial examination resulted in negative. It means that after the exposure to disinfectant,

in the 20th and 240th minute, there was no bacterial growth in operating room. The *value of p* was 1,000 (*p value* > 0,05), meaning that there was no significant difference in the effectiveness of using disinfectant A and B in operating room using split AC system.

In the use of disinfectants, disinfectant B is more efficient than disinfectant A. Five liters of disinfectant B can be used for 200 times dilution at 25 ml in 5 liters of water. While 100 tablets of disinfectant A which can only be used for 25 times dilution every 4 tablets in 5 liters of water. If the average frequency of surgery in hospital X is 32, and the room cleansing performed during post-surgery in addition to routine cleaning, disinfectant B can be used for more than 2 months.

CONCLUSION

1. The result of inspection in operating room indicates that there are three kinds of bacteria, namely *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and *Bacillus Sp*.
2. The result of analysis on effectiveness of disinfectant A and B on bacterial growth in the 20th and 240th minutes in operating room using central AC system shows that no bacterial growth was observed.
3. The result of analysis on effectiveness of disinfectant A and B on bacterial growth in the 20th and 240th minutes in operating room using split AC system shows that no bacterial growth was observed.

ACKNOWLEDGMENT

I would like to extend my sincere gratitude to the advisor and examiners for the advice and encouragement and to my family, friends as well as the big family of the hospital for the support during the study.

Conflict of Interest: In this study data collection was carried out postoperatively without distinguishing the type of operation and sampling points taken at different quadrant points in each sample before disinfectant and after the exposure to disinfectant, in the 20th and 240th minute.

Ethical Clearance: Ethical clearance number 240/EC/FKM/ 2017 by the ethics committee on health research at Faculty Public Health, Diponegoro University.

Source of Funding: The source of research funding was obtained from the research personal funding.

REFERENCES

1. Minister of Health of the Republic of Indonesia. Technical Guidelines for Hospital Buildings Operating Room. 2012
2. Sudoyo AW, Setiyohadi B, Alwi I, Setiadi S. *5rd Edition of Internal Medicine*. Jakarta: 2009; p. 2907-8
3. Tjay, Rahardja. *Essential Medications Usefulness and Side Effects V Edition*. Jakarta: Gramedia. 2002
4. Fazlara, A., Ekhtelat, M. *The Disinfectant Effects of Benzalkonium Chloride on Some Important Foodborne Pathogens*. American-Eurasian Journal of Agricultural & Environment Scientifique. 12(1): 23-29. 2012
5. Notoatmojo S. *Health Research Methodology*. Jakarta: Rineka Cipta; 2012
6. Sugiyono. *Statistics for research*. Bandung. 2003
7. Dewi, D. A. P. R. *Effectiveness of Disinfectant Against Bacteria in Surgical Space for Central Surgical Installation (IBS) Sanglah Hospital Denpasar*. 2006
8. Waluyo, Lud. *Environmental Microbiology*. Muhammadiyah University Malang Press. 2009
9. Brooks, Geo F., Butel, Janet S, Morse, Stephen A. *Jawetz, Melnicks, Adelberg's. Medical Microbiology. Transfer of Language of the Microbiology Department of the Faculty of Medicine, Airlangga University, Salemba Medika, Jakarta*. 2005
10. Jawetz, Meinick, Adelberg's. *Medical Microbiology Twenty Second Ed.* USA: Mc Graw-Hill Companies; 2001
11. Hasyim. *Microbiology and Parasitology for Nursing Students*. Jakarta. CV Trans Info Media. 2010
12. Minister of Health of the Republic of Indonesia Number 1204/Menkes/SK/ X/2004 on the health of the hospital environment
13. Spengler,. *Indoor Air Quality Handbook*, Mc Graw-Hill Companies, Inc. United States Of America. 2000
14. Hart, Shears. *Color Atlas of Medical Microbiology*. USA: Departement of Medical Microbiology University of Liverpool; 1996
15. Soeparman. *3rd Edition of Internal Medicine, FKUI Publisher Center, Jakarta*. 2006
16. Ducel, G,. *Prevention of hospital acquired infection a practical guide (2nd ed)*. Ganeva : world health organization departement of communicable disease surveillance and response. 2002
17. Ghanem, K.M., Fassi, F.A., Hazmi, N.M. *Optimization of Chloroxyleneol Degradation by Aspergillus niger Using Plackett-Burman Design and Response Surface Methodology*. African Journal of Biotechnology. 11(84): 144-156. 2012
18. Erlina K. *Journal : The Effectiveness of 1% Quaternary Ammonium Disinfectant Effectiveness with 1% Phenol in Decreasing the Number of Treatment Room Floor Germs in Kardinah General Hospital, Tegal City*. Diponegoro University. Semarang. 2013
19. Russell AD, McDonnell G. *Concentration: a major factor in studying biocidal action*. J. Hosp. Infect 44:1-3. 2000

Household Food Security and Food Diversity as Risk Factor for Stunting in Toddlers at 24-59 Months of Age

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ABSTRACT

Background: The result of Riskesdas (2013) showed that the prevalence of stunting in Indonesia had increased from 35.6% to 37.2%. This high prevalence is not only related to health problems but also affected by others which indirectly affecting such as household food security. Low food security will result in a low quality of consumed food as reflected in a low food diversity which consumed by toddlers, leading to stunting. This study aims to analyze the risk factors for stunting in toddlers aged 24-59 months.

Method: This is an observational analytic study using a cross-sectional design. The study was carried out on Sub-district of Bayat, Klaten Regency, with a total of 100 toddlers aged 24-59 months as subjects using simple random sampling. The data then analyzed using bivariate analysis (Chi-Square, Fisher Exact test) and multivariate analysis (Logistic Regression test).

Result: Bivariate analysis showed that there was a relationship between birth length ($p=0,050$, $OR=2,533$, 95% CI: 1,084-5,919), household food security ($p = 0,00$, $OR = 6,160$, 95% CI: 2,497-15,197), food diversity ($p = 0.00$, $OR = 6.801$, 95% CI: 2,146-21,558) with the occurrences of stunting. The result of multivariate analysis showed that there was a relationship between household food security ($p = 0,00$, $OR = 8,328$, 95% CI: 2,860-24,251) and food diversity with the occurrences of *stunting* in toddlers ($p = 0,01$, $OR = 10,092$, 95% CI: 2,558-39,815).

Conclusion: The household food security and food diversity are the risk factors for stunting in toddlers aged 24-59 months.

Keywords: Food Security, Food Diversity, Stunting

INTRODUCTION

Stunting is a problem of nutrition in the world. There are 165 million toddlers worldwide who were short (stunting). Eighty percent of stunted children are spread across 14 countries in the world and Indonesia is ranked fifth in term of number.¹ In Southeast Asia, only Laos (44%), Cambodia (41%), and Timor-Leste (58%) have a higher stunting prevalence compared to

Indonesia.² The prevalence of stunting in Indonesia increased from 35.6% (in 2010) to 37.2% (in 2013). This demonstrates that approximately 8.9 million Indonesian children experience suboptimal growth or one in three children are stunted.³

The results of Nutrition Status Monitoring (PSG) Indonesia in 2017 showed that the prevalence of stunting among toddlers aged 24 - 59 months (29.6%) was higher than aged 0-23 months (20.1%).⁴ This high prevalence is not only related to health problems but also affected by others which indirectly affecting such as household food security.

According to FAO (2003), household food security is a condition in which the households have physical, social, and economic access to the safe and nutritious food sufficient enough to meet the nutritional needs so that an

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active, healthy life could occur.⁵ The risk for stunting is increased in infants with household food insecurity.^{6,7}

The results of the study conducted in Indonesia showed that the household food security may be used as a predictor of the occurrence of stunting in infants and obesity/overweight in mothers.⁸

The food intake in household food insecurity is not diverse in which affect the quality of food for toddlers. Non-diverse foods are associated with increased risk of stunting and other nutritional problems such as cardiovascular, dyslipidemia, metabolic syndrome⁹⁻¹¹. The results of the study in Kenya also showed that there was a significant relationship between food diversity and stunting, the less various food consumed by toddlers, the greater the risk of being stunted.¹²

Klaten regency is one of the regencies that included as 100 cities/regencies with stunting priority.¹³ Klaten Regency consists of 26 districts and Bayat is one of the sub-districts that have a high stunting prevalence of 21.07%. Based on this, the aim of this study is to analyze the risk factors for stunting in toddlers aged 24-59 months.

METHOD

This is an observational analytic study using a cross-sectional design. This study was carried out in Sub-district of Bayat, Klaten Regency in April 2018. The study site was purposively chosen by considering that Sub-district of Bayat had a high prevalence for stunting. Three villages with a high prevalence of stunting (Wiro, Banyuripan, and Jarum) were chosen. The population in this study were all toddlers aged 24 - 59 months. The sample size was calculated by using Slovin calculation formula. Total 100 children were obtained as the study subjects.

The sampling method used was simple random sampling. The toddlers who fulfill the inclusion criteria were selected and then randomized. The inclusion criteria were the child must not in medical care at the time of the study, living with its own parents, living in Sub-district of Bayat, toddlers aged between 24-59 months, and having books of KIA (*Kesehatan Ibu dan Anak/Maternal and Child Health*) and KMS (*Kartu Menuju Sehat/Health Improving Card*).

The primary and secondary data were collected. Primary data were obtained from interviews and direct measurements using questionnaires such as household income, mother education, household food security, food diversity, and height measurement data. Secondary data were collected from the literature study and data of toddlers in the primary health center and community clinic as well as birth weight and birth length data as seen from KIA and KMS book. Height measurement was performed using Microtoise with 0.1 cm of precision. The data were collected by the author and assisted by two people from DIII (associate degree) of nutrition and one bachelor of nutrition. Before the research is conducted, initial training was performed to reduce the level of measurement error.

Dependent variable in this study is nutritional status based on height for age. The nutritional status divided into two categories: normal if Height/Age z-score > -2.0 SD and stunting if Height/Age z-score < -2 SD.¹⁴ Independent variables were household income, mother education, gender, birth weight, birth length, household food security, and food diversity. Household income was obtained from the total expenditure for 1 month divided by the number of family members then classified as poor or not poor. The poverty line for Klaten Regency is Rp. 376.305/capita/month.¹⁵ Maternal education was divided into two: low (equal to or lower than middle-high school) and high (equal to or higher than high school). Birth weight was categorized into two: low birth weight if < 2500 grams and normal if ≥ 2.500 gram. Birth length was grouped into two: low birth weight if < 48 cm and normal if ≥ 48 cm.

Household food security was measured using the Household Adequacy Level of Energy. The adequacy level of energy has long been used as a gold standard to detect food insecurity. The energy consumption level of less than 70% implies the occurrence of food insecurity.¹⁶ The household adequacy of energy was measured using the household 24-hour recall method. The food diversity was measured using the recall method for 2 x 24 hours, after which the data were entered on the DDS/Dietary Diversity Score questionnaire.¹⁷ A score of 0-5 was categorized as non-diverse, and the score of 5 or more was considered as diverse.¹⁸

Descriptive analysis was performed through the categorization of data to describe the distribution of variables by percentage. Bivariate analysis was used to determine the relationship between dependent variable and independent variable. In this study, the bivariate

analysis used was the chi-square test and the Fisher Exact test with a confidence interval of 95%. The logistic regression test was used for the multivariate analysis. It was used to explore the direction of the relationship and the Odd Ratio (OR). The result of the chi-square test and Fisher Exact test between the dependent and independent variable with $p < 0.25$ were included in the logistic regression test.

RESULTS AND DISCUSSIONS

RESULTS

There were a total of 100 toddlers aged 24-59 months in this study. Based on table 1, it can be seen that fifty-seven percent of the subjects were male and 43% were female. Most subjects (86%) had birth weight ≥ 2500 grams and only 14% of subjects had birth weight < 2500 grams. As many as 66% of subjects have a birth length of ≥ 48 cm and 34% of < 48 cm. Regarding the household income, 70% of the subjects came from wealthy families and 30% of subjects from poor families. Based on mother education, 54% of subjects have mothers with low education level. Sixty-five percent of the subjects came from secure household food and 35% came from insecure household food. Dietary Diversity Score (DDS) showed that 71% of subjects have non-diverse food intake and only 29% are diverse. Forty-one percent of subjects developed stunting while 59% of them had normal nutritional status.

Bivariate Analysis: Bivariate analysis is used to test whether there is a relationship between the 2 variables; independent and dependent variable. The analysis used in this study was Chi-Square and Fisher Exact test. Based on table 2, it can be seen that the percentage of stunted male toddlers is higher compared to female toddlers. Chi-square test showed that there was no relationship between gender and stunting occurrences. Percentage of stunted toddlers with birth weight < 2500 g and birth length < 48 cm were 64.3% and 55.9%, respectively. The result of the chi-square test showed that there was a correlation between body length and stunting ($p = 0,05$). In this study, stunting was not associated with birth weight.

Table 1: Characteristics of Toddlers

Characteristic of Toddlers	Frequency	Percentage (%)
Gender		
Male	57	57
Female	43	43

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Birth Weight		
< 2500 gram	14	14
≥ 2500 gram	86	86
Birth Length		
< 48 cm	34	34
≥ 48 cm	66	66
Household Income		
Poor	30	30
Not Poor	70	70
Mother Education		
Low	54	54
High	46	46
Household Food Security		
Insecure	35	35
Secure	65	65
Food Diverse		
Non-diverse	71	71
Diverse	29	29
Nutritional status		
Normal	59	59
stunting	41	41

Regarding the household income, in this study, 50% of stunted toddlers came from poor households. Fifty percent of stunted toddlers have low educated mothers. The result of statistical test showed that there was no correlation between household income with stunting incidences in toddlers. Mother education was correlation with stunting ($p=0,075$).

Stunted toddlers in this study mostly came from insecure household food (68.6%) and 52.1% of them had a non-diverse intake. The results of the statistical tests showed that there was a relationship between household food security and food diversity with stunting occurrences in toddlers ($p = 0,00$).

Multivariate Analysis: From the results of chi-square and Fisher Exact test, the variables that can be included in logistic regression analysis ($p < 0.25$) were birth weight, birth length, maternal education, household food security, and food diversity, while other variables removed from the logistic regression test. The result of logistic regression analysis showed that household food security and food diversity were significantly associated with stunting development with each OR was 8,328 and 10,092 with the direction of the relationship were proportional and become the risk factor for the development of stunting (Table 3).

Table 2: The Relationship between the Characteristics of the Toddlers with Stunting

Characteristic of Toddlers	Stunting		Normal		p value	OR(CI95%)
	n	%	n	%		
Gender						
Male	24	42,1	33	57,9	0,957	1,112 (0,497-2,491)
Female	17	39,5	26	60,5		
Birth Weight						
< 2500 gram	9	64,3	5	35,7	0,106	3,038 (0,936-9,860)
≥ 2500 gram	32	37,2	54	62,8		
Birth Length						
< 48 cm	19	55,9	15	44,1	0,050*	2,533 (1,084-5,919)
≥ 48 cm	22	33,3	44	66,7		
Household Income						
Poor	15	50	15	50	0,329	1,692 (0,713-4,017)
Not poor	26	37,1	44	62,9		
Mother Education						
Low	27	50	27	50	0,075*	2,286 (1,003-5,211)
High	14	30,4	32	69,6		
Household Food Security						
Insecure	24	68,6	11	31,4	0,000**	6,160 (2,497-15,197)
Secure	17	26,2	48	73,8		
Food Diversity						
Non-diverse	37	52,1	34	47,9	0,000**	6,801 (2,146-21,558)
Diverse	4	13,8	25	86,2		

*p value = < 0,10 dan ** p value = < 0,05

Table 3: The Result of Logistic Regression Test of the Risk Factor in Toddlers Aged 24-59 Months

Variable	B	P	OR	Confidence Interval	
				Lower	Upper
Mother Education	0,868	0,089*	2,382	0,876	6,478
Household Food Security	2,120	0,000**	8,328	2,860	24,251
Food Diversity	2,312	0,001**	10,092	2,558	39,816
Constant	-1,858	0,001	0,156		

Note: Due to OR changes of more than 10%, the birth weight and the birth length were removed from the final model of logistic regression test using Backward Wald method

DISCUSSIONS

The Relationship between The Characteristic of the Toddlers and The Occurrences of Stunting: The results of this study indicate that the 41% of toddlers aged 24-59 months are stunted. According to WHO, a region is considered as suffering from malnutrition if

the prevalence of stunted toddlers is more than 20%.¹⁹ The high prevalence of stunting should be immediately addressed as it leads to decreased cognitive function, memory impairment, and poor academic performance, and would decrease their income and work productivity as an adult. All of this ultimately increase the poverty rate in Indonesia.²⁰

Percentage of stunted male toddler aged 24-59 months with the female toddler did not differ with 42.1% and 39.5%, respectively. The statistical results showed that there was no relationship between gender with stunting occurrences. The statistical results showed that there was no relationship between gender with stunting occurrences. Although there was no relationship between the gender and the occurrences of stunting, there was a greater tendency to male in term of the risk of stunting. The results of the study conducted in Maluku and Central Africa showed that male toddlers had a greater risk of stunting compared to female.^{21,22} Male toddlers had a 1.7 times greater risk for stunting when compared with female toddlers.²² Similar finding was also demonstrated by Aryastami et al., that male toddlers have 1.28 times greater risk for stunting, compared to female.²³

Eating behavior and maternal habit during pregnancy will affect the birth weight and birth length. Mothers who have a poor diet will give birth to babies with low birth weight and length. From this study, 64.3% of stunted children had birth weight < 2500 gram. This is greater when compared with the stunted subject who have birth weight \geq 2500 grams. The statistical results showed that there was no correlation between birth weight and stunting development in infants. Birth weight was not a risk factor for stunting in toddlers. This could be attributed to the effect of birth length occurred in the first 6 months of life, then gradually decreases until the age of 24 months. Thus if the baby could pursue their growth in the first 6-months of life, there is a high probability of achieving normal height.²⁴

Regarding the birth length, 55.9% of the stunted have a birth length < 48 cm and while 33.3% of them have a birth length of \geq 48 cm. The results of this study indicated that there was a relationship between the birth length with the development of stunting ($p \leq 0,05$). Toddlers born with < 48 cm body length have 2,533 times risk to develop stunting. Similar finding was also demonstrated by Trimukti et al., that toddlers born with < 48 cm body length have 1.28 times risk for stunting.²⁵

Socio-economic conditions such as household income and maternal education are indirect factors causing stunting in infants. The results of this study implicated that there was no relationship between household income with stunting development in infants. This could be explained due to national programs such

as PKH, BLT, raskin, and other similar programs that could increase the food security for the children's need. The results of prior studies demonstrated that children from poor households had 2.14 times greater risk of stunting, compared to children from wealthier families.²⁵ In poor households, the provision of food intake was less nutritious, so that the children were more prone to growth failure, infectious diseases, and lack of access to health services.^{26,27}

The level of maternal education is one important factor that closely related to the level of knowledge and awareness of health and nutrition of the toddlers. The higher the level of education, the better the knowledge of nutrition and mother who has good knowledge of nutrition will know how to process the food, how to arrange food menu, so that the nutrition will be more assured.²⁸ The result of this study indicated that there was relationship between maternal education level with the stunting development ($p=0,075$). A study conducted in Nairobi showed that there was a relationship between the level of maternal education with the occurrence of stunting. Short toddlers were 29% higher in mothers with a lower level of education.²⁸ According to Emamian et al., (2013) maternal education improvement is one effort among others to reduce the occurrence of stunting.²⁹

Stunting development in toddlers is not only influenced by health-related factors but also influenced by household food security. In this study, the percentage of toddlers who suffered stunting in insecure and secure household food differs significantly by 68.6% and 26.6%, respectively. The chi-square test showed that there was a relationship between household food security and stunting development in infants ($p=0,00$). The toddlers who come from insecure household foods have a greater risk of stunting if compared to secure household foods. In terms of diversity, the results of the chi-square test showed that there was a relationship between food diversity and the occurrence of stunting ($p = 0.0$). The more diverse the food intake, the smaller the risk for stunting. Toddlers in this study had a low intake of vegetables, fruit, meat, and fish. The previous study conducted by Mahmudiono et al., (2017) showed that stunted toddlers who had a low intake of animal protein sources had a greater chance of stunting due to the lack of iron and zinc from animal protein sources which prevent the stunting in toddlers.³⁰

The Risk Factor for The Development of Stunting:

Multivariate test results using logistic regression showed that household food security and food diversity were the most dominant risk factor of stunting development. Toddlers from insecure household food are at an 8.328 times greater risk of stunting compared to toddlers from secure household food ($p = 0.00$, OR = 8,328, 95% CI: 2,860-24,251). The results of this study are similar to which conducted by Mutisya et al., (2015) that the risk of stunting is increased by 12% in toddlers from household food insecurity.⁶ A household with food security has better quantity and quality of the food and this will affect the nutritional needs of the toddlers in which the optimal nutrition is achieved. Toddlers who come from households with food security have good adequacy level of energy, unlike toddlers from food insecurity who have growth retardation due to lackness of food access, so that food serving is reduced to share with other family members.³¹

Toddlers are considered to have less food access if the quality and quantity of the daily menu composition is incomplete as well as the dominant veggies as the side dish. The composition which is not nutritious, unbalanced, and not diverse in both quality and quantity could cause a delay in growth and malnutrition in toddlers.³² Food diversity is one of the most dominant risk factors for stunting. Toddlers with non-diverse food intake had 10.092 times to experience stunting when compared with toddlers with various dietary intake ($p = 0.01$, OR = 10.092, 95% CI: 2.558-39,815). The results of this study are similar to the study that the nutritional status of children aged 12-36 months was positively related to the diversity of dietary intake, and there is a difference of Z-score of 1.6 between the children who consumed one type of food compared to the children who consumed eight types of food for seven days.¹⁷

The results of this study are in accordance with the study conducted in Kenya which shown that the food diversity and food security may be used as proxy measures for stunting.¹² The study conducted in Bangladesh, Nepal, Pakistan, Tanzania, and Uganda showed that the household food security was related to the nutritional status of the child. The household food security and DDS (Dietary Diversity Score) may be used as the proxy measures for the underlying nutritional status of children.³³

CONCLUSIONS

From the above discussion, it could be concluded that household food security and food diversity are the most dominant risk factor of stunting development. Toddlers who come from insecure household food have an 8.328 times greater risk to develop stunting when compared with toddlers from secure household food. Regarding the food diversity, toddlers who have non-diverse food intake has 10.092 times to develop stunting when compared with a diverse dietary intake. Based on these, it could be seen that the incidence of stunting in toddlers is not only influenced by health-related factors but also influenced by other non-health-related such as household food security. Therefore, there is a need for inter-sectoral cooperation from the different government institution to prevent the occurrence of stunting.

ACKNOWLEDGMENTS

The author would like to thank the Ministry of Agriculture which has funded this research and all parties involved who participated in this study.

Conflict of Interest: The authors declare that there is no conflict of interest.

Ethical Clearance: This study has received an Ethical Clearance from the Health Research Ethics Commission of Dr. RSUD. Moewardi, University of Sebelas Maret with Number: 328 / III / HREC / 2018.

REFERENCES

1. UNICEF. *Improving Child Nutrition: The Achievable Imperative for Global Progress*. New York: United nations Plaza; 2013. doi:978-92-806-4686-3
2. GNP. Global Nutrition Report 2017: Nourishing the SDGs. *Glob Nutr Rep 2017*. 2017:115. https://www.globalnutritionreport.org/files/2017/11/Report_2017.pdf.
3. Ministry of Health. *Basic Health Research (RISKESDAS) 2013*. Ministry of Health Republic of Indonesia; 2013. doi:Desember 1, 2013
4. Ministry of Health. *Pocket Book for Monitoring Nutritional Status 2017*. Jakarta: Directorate General of Public Health, Ministry of Health; 2018.

5. FAO. *Trade Reforms and Food Security*. Roma (IT); 2003.
6. Mutisya M, Kandala N, Ngware MW, Kabiru CW. Household food (in)security and nutritional status of urban poor children aged 6 to 23 months in Kenya. *BMC Public Health*. 2015;15(1):1052. doi:10.1186/s12889-015-2403-0
7. Shinsugi C, Matsumura M, Karama M, Tanaka J, Changoma M, Kaneko S. Factors associated with stunting among children according to the level of food insecurity in the household: A cross-sectional study in a rural community of Southeastern Kenya Global health. *BMC Public Health*. 2015;15(1):1-10. doi:10.1186/s12889-015-1802-6
8. Mahmudiono T, Nindya TS, Andrias DR, Megatsari H, Rosenkranz RR. Household food insecurity as a predictor of stunted children and overweight/obese mothers (SCOWT) in Urban Indonesia. *Nutrients*. 2018;10(5). doi:10.3390/nu10050535
9. Labadarios D, Mchiza Z, Steyn NP, et al. Food security in South Africa: a review of national surveys. *Bull World Health Organ*. 2011;89:891-899. doi:10.2471/BLT.11.089243
10. Li Y, Lai J, He Y, et al. Lack of dietary diversity and dyslipidaemia among stunted overweight children: The 2002 China National Nutrition and Health Survey. *Public Health Nutr*. 2011;14(5):896-903. doi:10.1017/S1368980010002971
11. Azadbakht L, Mirmiran P, Esmailzadeh A, Azizi F. Dietary diversity score and cardiovascular risk factors in Tehranian adults. *Public Health Nutr*. 2006;9(6):728-736. doi:10.1079/PHN2005887
12. M’Kaibi FK, Steyn NP, Ochola SA, Du Plessis L. The relationship between agricultural biodiversity, dietary diversity, household food security, and stunting of children in rural Kenya. *Food Sci Nutr*. 2017;5(2):243-254. doi:10.1002/fsn3.387
13. National Team for Accelerating Poverty Reduction (TNP2K). *100 District/City Priority for Intervention of Stunted Children*. Jakarta: Secretariat of the Vice President Republic of Indonesia; 2017. www.tnp2k.go.id.
14. Ministry of Health. *Anthropometric Standards Assessment of Children Nutritional Status*. Jakarta: Directorate General of Nutrition and Health Development, Ministry of Health; 2011.
15. Central Bureau of Statistics. The Poverty Line according to Province, 2013-2017. <https://www.bps.go.id/linkTableDinamis/view/id/1120>. Published 2017.
16. D.Maxwell, J.Coates, B.Vaitla. *How Do Different Indicators of Household Food Security Compare? Empirical Evidence Fro Tigray*. USA: Feinstein International Center; 2013.
17. Ruel MT. *Is Dietary Diversity an Indicator of Food Security or Dietary Quality? A Review of Measurement Issues and Research Needs*. Washington, DC: International Food Policy Research Institute; 2002.
18. Kennedy G, Ballard T, Dop M. *Guidelines for Measuring Household and Individual Dietary Diversity*. Roma (IT): FAO; 2011. doi:613.2KEN
19. Ministry of Health Republic of Indonesia. *The Situation of Short Toddlers*. Jakarta: Data and Information Center, Ministry of Health Republic of Indonesia; 2016. doi:ISSN 2442-7659
20. Dewey KG, Begum K. Long-term consequences of stunting in early life. *Matern Child Nutr*. 2011;7(SUPPL. 3):5-18. doi:10.1111/j.1740-8709.2011.00349.x
21. Ramli, Agho KE, Inder KJ, Bowe SJ, Jacobs J, Dibley MJ. Prevalence and risk factors for stunting and severe stunting among under-fives in North Maluku province of Indonesia. *BMC Pediatr*. 2009;9:64. doi:10.1186/1471-2431-9-64
22. Vonaesch P, Tondeur L, Breurec S, et al. Factors associated with stunting in healthy children aged 5 years and less living in Bangui (RCA). *PLoS One*. 2017;12(8). doi:10.1371/journal.pone.0182363
23. Aryastami NK, Shankar A, Kusumawardani N, Besral B, Jahari AB, Achadi E. Low birth weight was the most dominant predictor associated with stunting among children aged 12–23 months in Indonesia. *BMC Nutr*. 2017;3(1):16. doi:10.1186/s40795-017-0130-x
24. Adair LS, Guilkey DK. Age-specific determinants of stunting in Filipino children. *J Nutr*. 1997;127(2):314-320.

25. Trimukti WY, Huang Y-W, Amini A. Affecting Factors of Stunting Incidences among Children Aged 12-59 Months in West Nusa Tenggara Province Indonesia. *J Healthc Commun.* 2017;2(4):45. doi:10.4172/2472-1654.100085
26. Akombi BJ, Agho KE, Hall JJ, Merom D, Astell-Burt T, Renzaho AMN. Stunting and severe stunting among children under-5 years in Nigeria: A multilevel analysis. *BMC Pediatr.* 2017;17(1):1-16. doi:10.1186/s12887-016-0770-z
27. Mark S, Lambert M, Loughlin JO, Gray-donald K. Household income, food insecurity and nutrition in Canadian youth. - Free Online Library. 2012;103(2). [http://www.thefreelibrary.com/Household + income, + food + insecurity + and + nutrition + in + Canadian + youth. -a0294507891](http://www.thefreelibrary.com/Household+income,+food+insecurity+and+nutrition+in+Canadian+youth.-a0294507891).
28. Abuya BA, Ciera J, Kimani-Murage E. Effect of mother's education on child's nutritional status in the slums of Nairobi. *BMC Pediatr.* 2012;12(1):1. doi:10.1186/1471-2431-12-80
29. Emamian MH, Fateh M, Gorgani N, Fotouhi A. Mother's education is the most important factor in socio-economic inequality of child stunting in Iran. *Public Health Nutr.* 2014;17(9):2010-2015. doi:10.1017/S1368980013002280
30. Mahmudiono T, Sumarmi S, Rosenkranz RR. Household dietary diversity and child stunting in East Java, Indonesia. *Asia Pac J Clin Nutr.* 2017;26(2):317-325. doi:10.6133/apjcn.012016.01
31. KO A, EO O, AA A, AO F, OT A. Influence of family size, household food security status, and child care practices on the nutritional status of underfive children in ile-ife, Nigeria. *Afr J Reprod Heal.* 2010;14(4):123-132.
32. Tessema, Belachew, Ersino. Feeding patterns and stunting during early childhood in rural communities of Sidama South Ethiopia. *Pan Afr Med J.* 2013;14:1-12.
33. Tiwari S, Skoufias E, Sherpa M. Shorter, cheaper, quicker, better. Linking measures of household food security to nutritional outcomes in Bangladesh, Nepal, Pakistan, Uganda, and Tanzania. 2013;(August):116. [http://search.proquest.com/docview/1438547905? accountid = 13042 % 5 Cnhttp://oxfordsfx.hosted.exlibrisgroup.com/ oxford? url_ver = Z39.88 - 2004 & rft_val_fmt = info: ofi /fmt: kev: mtx: journal & genre = preprint & sid = Pro Q:Pro Q:econlitshell & atitle = Shorter, + cheaper, + quicker, + bett.](http://search.proquest.com/docview/1438547905?accountid=13042%5Cnhttp://oxfordsfx.hosted.exlibrisgroup.com/oxford?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=preprint&sid=ProQ:ProQ:econlitshell&atitle=Shorter,+cheaper,+quicker,+bett)

The Influence of Giving Information and Its Factors Affecting the Knowledge Level of Antibiotics Use in Temanggung Regency

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ABSTRACT

The incidence of antibiotic resistance was allegedly due to low public knowledge. This study aims to determine the influence of giving information and its factors affecting the knowledge level of antibiotics use in Kertosari village Temanggung Regency. This Experimental research was carried out by the design One group pretest-posttest. The instruments for the research were questionnaire and leaflet adjusted to the guidance of pharmaceutical service for antibiotic therapy by the Indonesian Ministry of Health. Data analysis used was Paired T-Test with the level credibility of 95%. The results based on the analysis Paired T-Test showed that before getting an education, the respondents had moderate knowledge (66.20%) and after having up to 19.06%. Therefore, they had good knowledge (85.26%) with the sig value ($p < 0.05$) it means there was a significant achievement of important knowledge after education was carried out. Based on the Chi-Square analysis, respondent's characteristics that influenced the improvement of respondents' knowledge was only the age and job ($p < 0.05$). It means there was a significant relationship between age and job of respondents with the improvements of knowledge they had. The provision of drug information has an effect on the increasing knowledge of antibiotic use where age and job are the most influential factors.

Keywords: drug information, knowledge, drug use, antibiotic

INTRODUCTION

An antibiotic is a drug that helps to inhibit or kill the bacteria causes infection in humans. The use of antibiotics during the last decade also experienced a significant increase in all countries in the world, including Indonesia. The use of antibiotics for this felt very profitable when with the right and prescribing its precise because it can create an enormous effect conferring therapy^[1-4]. The use of the antibiotic began uncontrolled and became irrational from year to year^[5]. Consequences that will occur and the unavoidable use of

an antibiotic that is irrational is the incidence of resistant microorganisms^[6]. The problem occurs when the bacteria resistance to change into one or another of the things that cause a loss of effectiveness down or drugs, chemical compounds or other ingredients that are used to prevent or treat the infection.

In a study conducted by Togoobaatar et. Al (2010) shows that in the Americas, Asia and Europe there are 22% up to 70% of the community who misunderstand the use of the correct antibiotic and often taking antibiotics without a doctor's prescription^[7]. The results of the research of Antimicrobial Resistant in Indonesia (AMRIN-Study) in 2000-2005 at 2494 individuals in the community, shows that 43% of Escherichia coli resistant to many types of antibiotics, among others: ampicillin (34%), cotrimoxazole (29%) and chloramphenicol (25%)^[8]. The behavior of the improper use of antibiotics by most of the society Indonesia, i.e., as a rule, don't spend appropriate antibiotics, excessive use of antibiotics, the use of antibiotics that are not needed and buy antibiotics without the use of prescription from a doctor^[9-13].

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This research was conducted in Kertosari village, Temanggung, Central Java with the purpose to find out the knowledge society on the use of antibiotics. Also, to find out whether there are differences between the characteristics of the respondents against the increase in knowledge.

METHOD

This research was obtaining the certificate of Ethical Clearance of Provincial Hospital Dr. Moewardi – Faculty of Medicine Universitas Sebelas Market and get licenses to research in the region of Temanggung. The research design used one group pretest-posttest using questionnaires. Sampling nonprobability with the purposive sampling on society in Kertosari Village and had 104 respondents. This research uses a questionnaire that has been adapted to guide the use of the antibiotic therapy of Department of Health Republic of Indonesia 2011 and tested the validity and reliability. This questionnaire contains 20 numbers that are divided into several points of discussion that is the meaning of antibiotic, usage instructions, resistant factors, undesirable effects and the way to save drugs. The data obtained processed using Statistical Paired T-Test and Chi-Square analysis to know the characteristics of respondents that influence the increase of knowledge that is presented in the form of graphs and tables.

The questionnaire amounted to 20 items first tested the validity and the reliability. From the test results, it is known that the 20 items tested as valid and reliable. The questionnaire used was already adapted to guide the use of antibiotic therapy. Reliability test showed the value of *Cronbach alpha* of 0.931. These results indicate that the questions contained in the questionnaire assessed reliably as a tool to measure knowledge in the research.

RESULTS

Respondents used in this research as much as 104 respondents. The respondents represent some areas in the Temanggung Regency. Distribution of respondents

can be seen in table 1. Respondents were given the same treatment be given advance knowledge is measured with a given matter of pretest and then provided information about antibiotic, and after it was measured again with knowledge of given question posttest.

Table 1: Characteristics of Respondents

Variables	Characteristic	n	%
Age (years)	26-35	10	9.62
	36-45	27	25.96
	46-55	45	43.27
	56-65	22	21.15
Education	Primary	17	16.3
	Middle School	14	13.5
	High School	51	49
	Colege	22	21.2
Employment	Civil servant	18	17.3
	Self Employed	32	30.8
	Unemployed/ housewife	54	51.9

The first test was done using the Kolmogorov Smirnov normality to know the spread of the data obtained are normal or not, and the results of the normality of data obtained $p = 0.116$ on pretest and $p = 0.108$ on the posttest, then inconclusive data is normally distributed ($p > 0.05$).

The results of a pretest and posttest were tested with paired T-Test and the average value of the obtained answers of respondents who correctly before the extension was 66.20%, while the average value of the respondent's right after the extension was 85.26% with experience increased knowledge of 19.06%. The sign value obtained of $p = 0.00$ (< 0.005). This it can be concluded that there is a meaningful difference in knowledge about the correct use of antibiotics before and after illumination. This level of knowledge difference can be interpreted as the results of the through media outreach leaflets and continued the discussion as well as the faqs to get optimal results. The results of increased the knowledge of the respondents can be seen in table 2.

Table 2: Measurement of Increased the Knowledge of the Respondents

Question	Percentage of correct answers (%)		Percentage of The Increase in Knowledge (%)
	Pretest	Posttest	
Knowledge of antibiotics	15.07	15.99	0.93
Instructions for drug use	11.89	17.89	6.01

Conted...

Resistance Factors	13.32	15.73	2.41
Side effects	12.75	16.13	3.38
How to store medicines	13.17	19.50	6.34
Percent of total knowledge	66.2	85.26	19.06

The characteristics of the respondents are divided into several groups, age, education, and work. The results of the relationship between each of the characteristics of respondents and knowledge can be seen in table 3. The knowledge here is divided into three groups, well, enough and weak. The test used a Chi-Square test with IE results P Value below 0.05 it is said there is a meaningful difference between the characteristics of the respondents against his knowledge after the giving of the information.

Table 3: Correlation Between Knowledge and Characteristic Respondent

Variables		Percentage of the knowledge level						P Value
		Good		Moderate		Low		
		n	%	n	%	n	%	
Age (years)	26-35	3	2.88	7	6.73	0	0	0.00
	36-45	23	22.11	4	3.85	0	0	
	46-55	37	35.58	8	7.69	0	0	
	56-65	10	9.62	12	11.54	0	0	
Education	Primary	10	9.61	6	5.77	0	0	0.61
	Middle School	11	10.58	4	3.85	0	0	
	High School	32	30.77	19	18.27	0	0	
	Colege	20	19.23	2	1.92	0	0	
Employment	Civil servant	17	16.35	1	0.96	0	0	0.47
	Self Employed	21	20.19	11	10.58	0	0	
	Unemployed/housewife	35	33.65	19	18.27	0	0	

DISCUSSION

The results of this study reveal that some people misunderstand the use of antibiotics^[14-16]. This can be seen from the percentage of correct answers in filling out the questionnaire before being given information related to the correct use of antibiotics. After the given information can be seen increased knowledge of respondents by 19.06%.

Some of the people in our survey knew some important points regarding antibiotic use. Almost all of the people know what antibiotics are. The correct use of antibiotics is known only about one-third of the population, as well as the way to keep a good and proper medicine. Therefore, after being given the percentage information, the correct answer increased quite high around 6%. According to studies that once people have been wrong in using antibiotics because they use them

for some diseases that have the same symptoms as previous diseases^[17].

The characteristics of respondents are grouped into age, education, and occupation of respondents. Age is one of the factors that influence one's knowledge. Age can affect the thinking, capture, and memory of a person. In the age before 55 years, a person is assumed to have the ability to capture and remember higher information along with age. The age of more than 55 years has started organ degeneration so that the ability of memory and its catch is decreasing. The previously studied mentioned that the age of respondents significantly influences the increase of knowledge^[18].

Education is also a factor that affects one's knowledge. A person's mindset and understanding of information are influenced by his education. Higher education is expected to get more and more information,

and better understand and process information better. These results are in line with the theory, the average knowledge of respondents in the category of least enough of the college end-educated. These results were not statistically proven after being tested using chi-square and obtained p-value of 0.061 (> 0.05). Several studies that are in the line include the Djuang study which states that there is no correlation between the level of education with the use of antibiotics^[19]. Other studies are from Trepka et al. (1998) where low levels of education affect the concept of antibiotic use^[20].

A person's employment can also affect one's knowledge. The environment around a person's workplace can affect his or her social life. Environmental factors of work can affect the amount of exposure of information received by a person. Respondents who work generally interact with their colleagues. The process undertaken during work can affect a person's mindset. Therefore this is by the results obtained where their work affects their knowledge in using antibiotics.

CONCLUSION

The results showed that there was a difference in the level of knowledge after the giving of the information with an increase in the average value of pretest and posttest conducted of 19.06% ($p < 0.05$). Based on statistical analysis, respondent's characteristics that influenced the improvement of respondents' knowledge was only the age and job ($p < 0.05$). It means there was a significant relationship between age and job of respondents with the improvements of knowledge they had.

ACKNOWLEDGMENTS

The authors wish to thank to all people in Temanggung, Central Java and Sebelas Maret University which funded with PKLP PNB 2018 Grants Scheme.

Conflict of Interest: This paper has been approved by all author and there was no conflict of interest

Ethical Clearance: The study was approved by the ethics committee of Faculty Medicine of Sebelas Maret University with ethical certificate number: 501 / IV / HREC / 2018.

REFERENCES

1. F, Roger G., et al., *The Lancet Infectious Diseases*, **4.1**, 44--53 (2004)
2. Braithwaite, and Jean-Claude P., *J. of int mdc rsch* **24.3**, 229-238. (1996).
3. G. Larissa, et al. *Pharmacoepidemiology and drug safety* **16.11**, 1234-1243 (2007).
4. E. Margaret J., and Christine M. Bond, *The E. J of gnrl prctc* **9.3**, 84-90 (2003)
5. Dancer, S. J., *fe Lancet Infectious Diseases*, **4**, 611-619, (2004)
6. WHO, antimicrobial (2001)
7. Togoobaatar, G., et al., *Bulletin World Health Organisation. Issue*, **88**, (2010)
8. AMRIN study group, (2005)
9. Andre, M., Vernby, A., Berg, J., & Lundborg, C. S., **65**, 1292-1296, (2010)
10. Wise, Richard. "The relentless rise of resistance?" *Journal of Antimicrobial Chemotherapy* **54.2** (2004): 306-310.
11. Goossens, Herman, et al., *The Lancet* **365.9459**, 579-587, (2005)
12. Department of Health. Independent report. **2**, (2011)
13. Davey, P., Pagliari, C., and Hayes, A., *Clinical Microbiology and Infection* **8.s2**, 43-58 (2002)
14. Andre, M., Vernby, A., Berg, J., & Lundborg, C. S., *Journal of Antimicrobial Chemotherapy*, **65**, 1292-1296, (2010)
15. McNulty, C., Boyle, P., Nichols, T., Clappison, P., & Davey, P., *e-Journal of Antimicrobial Chemotherapy*, **59**, 727-738. (2007^a)
16. McNulty, C., Boyle, P., Nichols, T., Clappison, P., & Davey, P., *e-Journal of Antimicrobial Chemotherapy*, **60** (2007^b)
17. Van den Eng, J., Marcus, R., Hadler, J., Hadler, J. L., Imhoff, B., Vugia, D. J., et al., *Emerging Infectious Diseases*, **9**, 1128-1135. (2003)
18. Kim, So Sun¹., Moon, Seongmi., Kim, Eun Jung., *J Korean Acad Nurs* **Vol.41 No.6**, 742-749 (2011)
19. Djuang, Michelle Hendriani, *Skripsi Penggunaan Antibiotik*, (2009)
20. Trepka M. J., Belongia C. A., Davis J. P., dan Atlanta, G. A., *Antibiotic* (1998)

Persuasive Communication in Morning Dialogues Performed by Hospital Health Promotion Officers with Degenerative Diseases Prevention Knowledge (The Case Study at the Patient Checkup in Sultan Agung Islamic Hospital)

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ABSTRACT

Persuasive communication, performed by the Health Promotion Officers of Sultan Agung Islamic Hospital Semarang in morning dialogues, aims to change or influence one's beliefs, behavior, and knowledge; therefore, he or she acts according to the communicator's hopes. The morning dialogue materials; furthermore, are about degenerative diseases prevention. This research's purpose is to describe how persuasive communication in morning dialogues performed by the hospital health promotion officers can support changes in patients' knowledge of degenerative diseases prevention. This research is a descriptive-analytical research with cross sectional study design. The research samples, collected from random sampling, were 96 patients conducting checkup after hospitalized in Sultan Agung Islamic Hospital. The Chi-Square test with alpha 0.05 was employed, and the result showed variables correlated to the knowledge of degenerative diseases prevention such as sex ($P=0.005$), education ($P=0.025$), credibility of the hospitals health promotion officers (0.018), message packaging in persuasive communication (0.022), time spent for listening morning dialogues ($P=0.025$), and choosing morning time to conduct dialogues (0.018). Meanwhile, the uncorrelated variables are age ($P=0.629$) and occupation (0.778). The persuasive communication helps the hospital health promotion officers to educate patients who conduct checkup to have healthy life knowledge.

Keywords: *persuasive communication; hospital's health promotion; checkup patients; degenerative diseases.*

INTRODUCTION

Health promotion is one of important efforts in National Health System (abbreviated as SKN in Indonesian language). In the systems both established in 2004 and reestablished in 2009, it is mentioned that one of the subsystems is the Society Empowerment Subsystem.¹ This subsystem is an arrangement that collect all efforts in health issues done by individuals, groups, and societies cohesively and collectively in order to achieve the maximum degree of healthy life. The purpose of this subsystem is to ensure that service, advocacy, and social monitoring related to health issues can be implemented effectively and efficiently by individuals, groups, and societies for supporting health development.¹

Persuasive communication can be understood as a message conveying process from the communicator to the communicant for the purpose of ensuring

the communicant to do or behave according to the communicator's expectation. Persuasive communication as an effort to promote health is implemented in morning dialogues performed by the officers of Hospital Health Promotion (PKRS in Indonesian).² Hospital Health Promotion is activities closely related to all efforts to improve health. These activities aim to change the opinion of individuals or groups, so they can have healthier life²

The health promotion employed in Sultan Agung Islamic Hospital is in persuasive communication packaging, and the kinds of activities are direct counseling both inside hospital and outside hospital.⁵ Morning dialogue program is the message packaging, conducted by the hospital health promotion officers, who gives information about prevention of degenerative diseases. Therefore, this program is the mediator between the hospital and the society in order to give education and

counseling about the importance of preventive measures for a disease outbreak.

Therefore, the formulation of this research is: "How persuasive communication in morning dialogues, performed by hospital health promotion officers, can support changes in patients' knowledge of the degenerative diseases prevention."

RESEARCH METHODOLOGY

The type and design of the research: This research was a quantitative research with interview method and cross sectional approach.

The research subjects: The research subjects were the patients doing checkup in Sultan Agung Islamic Hospital. These subjects were collected using the random sampling technique in which 96 respondents were obtained.

RESULTS AND DISCUSSIONS

The result of the Chi-Square test with alpha 0.05 has described several variables in connection with the knowledge of degenerative diseases prevention. There are six variables that are correlated with the knowledge, and there are two variables which are not correlated.

Ages and Knowledge of Degenerative Diseases Prevention

Table 1: Cross table describing ages and knowledge of degenerative diseases prevention

Ages	Degenerative Disease Prevention Knowledge				Totals	
	Good		Bad			
	F	%	F	%	F	%
Adults (26-35 years old)	37	74	13	26	50	100
Elders (46-70 years)	32	69.6	14	30.4	46	100

From the table 1, it can be seen that the knowledge of adult respondents is better (74%). From the hypothesis testing using Chi Square test, p-value $0.0629 \geq 0.05$, shows that H_0 is accepted and it can be concluded that there is no correlation between ages and the knowledge of degenerative diseases prevention.

Sex and Knowledge of Degenerative Diseases Prevention

Table 2: The cross table describing sex and knowledge of degenerative diseases prevention

Sex	Degenerative Diseases Prevention Knowledge				Totals	
	Good		Bad			
	F	%	F	%	F	%
Males	12	70.6	5	29.4	17	100
Females	57	72.2	22	27.8	79	100

Table 2 shows there are more female respondents who have knowledge of degenerative diseases prevention (72.2%). Hypothesis testing with Chi Square test, p-value $0.005 < 0.05$, shows that H_a is accepted and H_0 is rejected. Thus, the conclusion is that there is a correlation between respondents' sex and respondents' knowledge.

Education and Knowledge of Generative Diseases Prevention

Table 3: The cross table describing education level and knowledge of degenerative diseases prevention

Education Level	Knowledge of Degenerative Diseases Prevention				Totals	
	Good		Bad			
	F	%	F	%	F	%
Uneducated-Elementary School	38	82.6	8	17.4	46	100
Junior High School-Higher Education	31	62	19	38	50	100

From table 3, it can be seen that uneducated and elementary school graduated respondents have more knowledge of degenerative diseases prevention (82.6%).

Chi Square shows p-value = $0.025 < 0.05$, so H_0 is rejected, hence there is a correlation between respondents' education level and knowledge of degenerative diseases prevention

Occupation and Knowledge of Generative Diseases Prevention

Table 4: The cross table describing occupation types and knowledge of degenerative diseases prevention

Occupation	Degenerative Diseases Prevention Knowledge				Totals	
	Good		Bad			
	F	%	F	%	F	%
Non formal	53	72.6	20	27.4	73	100
Formal	16	69.6	7	30.4	23	100

Table 4 shows that respondents who have more knowledge of degenerative diseases prevention are the ones who work in informal sector (72.6%) compared to the ones who work in formal sectors (69.6%). The result of Chi Square hypothesis testing shows that $p\text{-value } 0.778 \geq 0.05$ (H_a is rejected and H_o is accepted), and the conclusion is there is no correlation between respondent's jobs and generative diseases prevention knowledge.

Credibility of Hospital Health Promotion Officers in Morning Dialogues and Knowledge of Degenerative Diseases Prevention

Table 5: The cross table between credibility of hospital health promotion officers in morning dialogues and knowledge of degenerative diseases prevention

Officers' Credibility	degenerative diseases prevention Knowledge				Totals	
	Good		Bad			
	F	%	F	%	F	%
Credible	57	72.2	22	27.8	79	100
Not Credible	12	70.6	5	29.4	17	100

The officers' credibility in morning dialogues gives respondents the positive knowledge about degenerative disease prevention (72.2%). The hypothesis testing which used Chi Square test between the officers' credibility variable and the knowledge of degenerative diseases prevention variable shows $p\text{-value } 0.018 < 0.05$ (H_a is accepted and H_o is rejected). Thus there is correlation between the officers' credibility and the respondent's knowledge of degenerative diseases prevention.

The communicator credibility of hospital health promotion officers through morning dialogues in imparting knowledge of degenerative diseases prevention³ mentions at least there are two source credibility components namely expertness and trustworthiness⁴.

Expertness: Expertness is the impression formed by communicants about the ability of the persuasion communication source related to topic discussed⁴.

The hospital health promotion officers have enough skills to be a good campaign communicator because before doing campaign, they have received hospital health promotion training. Basically this training discusses strategies in hospital health promotion, persuasive communication, and public speaking.

Trustworthiness: Trustworthiness is the communicants' impression about persuasive communication sources related to characters like honesty, sincerity, moral compass, fairness, courtesy, ethical knowledge, and credibility⁴. The process of conveying persuasive messages is done through morning dialogues done by hospital health promotion officers.

The message packaging of persuasive communication in morning dialogues with knowledge of degenerative diseases prevention

Table 6: The cross table describing message packaging of persuasive communication in morning dialogues and knowledge of degenerative diseases prevention

Message packaging of persuasive communication in morning dialogues	Knowledge of degenerative diseases prevention				Totals	
	Yes		No			
	F	%	F	%	F	%
Clear	55	72.4	21	27.6	76	100
Unclear	14	70	6	30	20	100

The message packaging of persuasive communication in morning dialogues makes respondents clearly understand the messages conveyed for knowledge of degenerative diseases prevention (72.4%).

Based on hypothesis testing result with Chi Square test on the two variables, it shows $p\text{-value } 0.022 < 0.05$ which means H_a is accepted and H_o is rejected. Therefore, it can be concluded that there is correlation between the message packaging of persuasive communication and the knowledge of degenerative diseases prevention.

Verbal messages are all kinds of symbols that use one word or more. Language, in this context, is categorized as verbal communication. The verbal language is the main medium to express our thoughts, feelings, and intentions. Verbal communication uses words representing various individual reality aspects⁵. In persuasive communication, to give style to the messages is an important aspect because it can give more interesting "package" to the messages to be "consumed" An effective language has three elements namely clarity, simplicity, and accuracy. A clear, simple, and accurate language can help persuaders to create impressions and to influence behaviors and knowledge of target markets⁶.

a. Eisenberg Clarity (1984) explains that clarity emerges from the combination of source factors, messages, and communicants. To be clearly understood, common and concrete words are chosen, and language style is explained by giving clues ⁴. The process of delivering messages performed by the hospital health promotion officers focuses on language use when communicating with checkup patients, from different ages and characters, during morning dialogues at the waiting room. Firstly, information about the origin of degenerative diseases and how to implement the healthy life knowledge in order to prevent degenerative diseases are given; such as having breakfast in the morning, consuming food containing balanced nutrition, consuming water daily, doing exercise, having enough time to get rest, cutting down fatty food consumption, and avoiding stress.

b. Straightforwardness refers to feeling, and it creates unforgettable moments. A straightforward language can help communicants to see, hear, touch, feel, and smell impressions and ideas ⁶. A straightforward language pattern can be improved by using metaphorical words and syntactical devices ⁴ Words that are easily remembered by communicants are chosen to create either positive or negative emotion effects. Persuasive messages are then “packed” with invitation or persuasion, so they do not appear as coercive messages. The examples of these messages are “*Ayoo, cegah penakit jantung dengan berolahraga dan hindari makanan berlemak*” (“Let’s prevent cardiac arrest by doing exercise and avoiding fatty foods”), “*saya rutin chek up untuk cegah penyakit degeneratif*” (“I do routine checkup to prevent generative diseases”), “*Ini Aksiku!!! Mana Aksimu?*” (“It’s my action!!! Where’s your action?”). In addition, there are also statements containing persuasive messages that are delivered implicitly to discover facts related to the danger of degenerative diseases.

c. The language accuracy can create direct personal connection between individuals and target markets. Thus, to use language accurately, we must (1) avoid “bad-tasted words”, (2) use words according to their contexts, and (3) use straightforward words ⁴. In morning dialogues,

the chosen words are not the patronizing ones, and the message delivery uses more polite and simple language like “*Sebelum kesekolah, kekampus dan ke kantor, yuuuk Sarapan*” (“Want to go to school, campus, or office? Let’s have breakfast first”) Using common language makes the patients doing checkup feel more comfortable in the atmosphere of togetherness which eventually lead them to understand the knowledge of degenerative diseases prevention well.

Time Spent in Listening Morning Dialogues and Knowledge of Degenerative Diseases Prevention

Table 7: The cross table describing time spent in listening morning and knowledge of degenerative diseases prevention

Time Spent in Listening Morning Dialogues	Knowledge of Degenerative Diseases Prevention				Totals	
	Good		Bad			
	F	%	F	%	F	%
Good	57	72.2	22	27.8	79	100
Bad	12	70.6	5	29.4	17	100

The respondents have good knowledge about degenerative diseases prevention (72.2%). From hypothesis testing result using Chi Square test on both variables, it shows that $p\text{-value } 0.025 < 0.05$ which means that H_a is accepted and H_o is rejected. Therefore, it can be concluded that there is correlation between time spent in listening morning dialogues and knowledge of degenerative diseases prevention.

Choosing Morning Time to Conduct Dialogues and Knowledge of Degenerative Diseases Prevention: The successful communication between patients and hospital health promotion officers in morning dialogues gives comfort and satisfaction for both sides. The ability of the officers to communicate persuasively makes patients feel comfortable and choose time to listen carefully the message; and furthermore, this following condition is due to the way the officers deliver the messages, the way these officers behave politely, the way they give their attention, the way they listen the patients carefully, and the way they show empathy. For the purpose of giving accurate and well-structured information, a hospital health promotion officer needs to master persuasive communication skill to be able to communicate with patients.

Table 8: The cross table describing choosing morning time to conduct dialogues and knowledge of degenerative diseases prevention

Choosing Morning Time to Conduct Dialogues	Knowledge of Degenerative Diseases Prevention				Totals	
	Yes		No			
	F	%	F	%	F	%
Proper	56	73.7	20	26.3	76	100
Improper	13	65	7	35	20	100

The choosing morning time to conduct dialogues is considered appropriate by respondents (73.7%). The result of hypothesis testing that employed Chi Square test on the two variables shows p-value $0.018 \geq 0.05$. It means that H_a is accepted and H_o is rejected showing that there is correlation between choosing morning time to conduct dialogues and knowledge of degenerative diseases prevention

Choosing morning time to perform dialogues creates pleasant and conducive atmosphere that can give positive effect to persuasive communication process and knowledge of degenerative diseases prevention.

CONCLUSION

Persuasive communication in morning dialogues is useful for the Hospital Health Promotion Officers in Sultan Agung Islamic Hospital, Semarang to educate patients doing checkup, so these patients can have knowledge about preventing degenerative diseases.

ACKNOWLEDGMENT

The author would like to express his gratitude to the Sultan Agung Islamic Hospital for allowing him to make the hospital as the locus of the research. This self-funded research was conducted in January until September 2017, and it was done by the author, the lecturer of the

Faculty of Public Health, UNDIP; as the implementation of Three Higher Education Principles. The author hereby declares that there is no conflict of interests with other parties in connection with this research.

Ethical Clearance: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

REFERENCES

1. Health Department of Republic of Indonesia, Minister of Health Decree of Republic of Indonesia No.131/Menkes/SK/II/2004 concerning National Health System, 2004.
2. Hartono B. Health Promotion in Public Health Centers and Hospitals. 1st.ed. Jakarta. Rineka Cipta. 2010.
3. Hovland CI, Janis IL, Kelley HH. Communication and persuasion; psychological studies of opinion change. 1st.ed. New Haven. Yale University. 1953.
4. Wood JT. Communication in Our Lives. 6th.ed. Boston, MA. Wadsworth Publishing Company. 2011.
5. Mulyana D. An Introduction to Communication Studies. Bandung. PT Remaja Rosdakarya. 2005..
6. Kemm JR, Close A. Health Promotion: Theory and Practice. 1st.ed. London. Palgrave Macmillan. 1995.
7. Soemirat S, Satiri, Suryana A. Persuasive Communication. Jakarta. Universitas Terbuka. 2008.
8. Curtis DB, Floyd JJ, Winsor JL. Business and Professional Communication. New York. HarperCollins. 1992.

Oral Health Program for School Children: Dependent or Independent UKGS Program

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ABSTRACT

Oral Health Program for School Children (UKGS Program) has been implemented by Community Health Center since 1951 but the result isn't satisfied yet. National research on Health 2013 has found that the dental caries prevalence among children in Indonesia has increased by 13,7%. Due to this condition, Dental Nurse Department (JKG) Poltekkes Semarang had tried to implement independent UKGS Program in a school.

This study was quantitative descriptive with a cross-sectional approach. The population was from SD Padangsari 01 handled by Padangsari Community Health Center and - for further- called as Dependent UKGS Program and SD Antonius 02 handled by JKG and called as Independent UKGS Program. The samples were 46 students which were 8-12 years old. Each school was observed about their facilities and UKGS services and the samples were reviewed about their caries status, oral hygiene, and saliva condition. The data would be analyzed statistically and presented in the tabulation.

There was a significant difference between the facilities and services of dependent and independent UKGS Program (p-value: 0.000). In the independent group, there was no poor oral hygiene and the caries status was low to moderate (91.30%-100%). But in the dependent group, there was no good oral hygiene and the caries status was low to high (34.78%-43.48%). The saliva condition of the independent group was better than on the dependent group.

The effect of implementation of independent UKGS Program handled by JKG was more satisfied than dependent one handled by Padangsari Community Health Service.

Keywords: *Oral Health Program for School, UKGS*

INTRODUCTION

UKGS Program has been implemented in Indonesia since 1951. This Program is handled by the Community Health Centers (Puskesmas) in Indonesia to reduce the caries prevalence among school children. The programme consists of promotive, preventive, curative and referral activities. Unfortunately, the result of this UKGS program is not satisfied yet. According to National Resesearch (2013), there are 24.8% of children

suffered dental health problems and there are only 1.8 % who brush their teeth correctly¹. The caries prevalence among school children has increased by 13.7%. Besides, there is also a decline in dental health manpower in Community Health Centers and Hospitals².

Due to this condition, independent UKGS or UKGS on School-Based could become the solution. It was designed to improve access to dental care by reducing barriers for all children. Simple dental clinic handled by a dentist and a dental nurse from JKG has been built in UKS room of SD Antonius 02. Every semester, there was a report of this Program to JKG and Padangsari Community Health Center. The costs were covered by students' contributions. This independent UKGS Program had some services including Dental education, Oral screening, Fluoride application, Fissure sealant, milk dentition extraction and Referral for follow up dental treatment. This program might eliminate the

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barriers to take dental treatments. School becomes a non-threatening environment for children so moving “dental clinic” to school could influence the children in fending of dental health services.

This study wanted to know the differences between the UKGS Program of Community Health Center (dependent UKGS) and UKGS Program on School-Based (independent UKGS). SD Padangsari 01 (control group/dependent UKGS) and SD Antonius 02 (intervention group/independent UKGS) are schools under Padangsari Community Health Center’s Jurisdiction. This independent UKGS might improve the goals of UKGS program on decreasing dental caries prevalences among children.

METHOD

This study was descriptive research with cross-sectional approach. The population was 46 students of SD Santo Antonius 02 (intervention group/independent UKGS) and SD Padangsari 01 (control group/dependent UKGS). These two groups were observed about their UKGS facilities, services and the results of UKGS services.

Their facilities were observed by using checking list observation including manpower, dental instruments and material, environment, schedules of implementation of UKGS Program, trained teachers, and MoU between school and Padangsari Community Health Center

The services were observed by using checking list observation including training for UKS teachers and “little doctor”, Dental education, oral screening, preventive activities, emergency curative, dental treatments, and surface protection.

The result of services was observed by examining children’s dental health clinically including³:

- a. DMF-T, DMF-S index: the index to express the caries problems of permanent teeth
- b. def-index: the index to express the caries problems of milk dentition
- c. OHI-S index: the index to express the oral hygiene
- d. Plaque index: the index to express the thin layer covered teeth surfaces
- e. Saliva condition: expressed by quantity and viscosity of saliva

RESULTS AND DISCUSSIONS

Facilities of UKGS: The facilities of UKGS in SD Padangsari 01 – the control group – were not adequate to support the UKGS Program. There were no clinical equipments at a school to facilitate dental treatment. Students who needed emergency or simple dental treatment should go to the Padangsari Community Health Center. Besides, there were no routine schedules for implementing the UKGS Program.

Table 1: Frequent Distribution of Facilities and Services of UKGS in Intervention and Control Group

UKGS Program	Mean ± SD	Min	Max	Criteria	P value
UKGS Facilities					
Independent	2,7 ± 0,5	1	3	Adequate	0.000
Dependent	1,5 ± 0,6	1	3	Not Adequate	
UKGS Services					
Independent	2,6 ± 0,5	1	3	Good	0.000
Dependent	1,6 ± 0,5	1	2	Poor	

Services of UKGS: The services of UKGS in SD Padangsari (control group) were only implemented 8.3 – 66.7% in a year but 60.6–100% in SD Antonius 02 (intervention group)

Table 2: Frequent Distribution of UKGS Services in Intervention and Control Group

	Services	Independent UKGS		Dependent UKGS	
		N (times/year)	%	N (times/year)	%
1.	Training of teacher and little doctor	2	100	1	50
2.	Dental education	12	100	2	16.7
3.	Mass tooth-brushing	12	100	1	8.3

Conted...

4.	Oral screening	3	100	2	66.7
5.	Preventive activities	12	100	--	--
6.	Emergency curative	35 of 35 cases	100	--	--
7.	Dental treatments	40 of 66 cases	60.6	--	--
8.	Referral activities	26 of 26 cases	100	--	--

Clinical Result

Oral Hygiene: The condition of oral hygiene and Plaque on SD Antonius 02 (intervention group) is good to moderate and there was no poor oral hygiene. On contrary, there was no good oral hygiene and plaque condition on SD Padangsari 01 (control group). The oral hygiene was in line with dental plaque. The existence of dental plaque could influence the Oral Hygiene index (OHI-S). There was also a significant difference between two groups on OHI-S and Dental Plaque (*p value* 0.000).

Table 3: Frequent Distribution of Oral Hygiene Index and Plaque Index in Intervention and Control Group

UKGS Program	N	Criteria			Min	Max	P value
		Good	Moderate	Poor			
		Mean ± SD	Mean ± SD	Mean ± SD			
OHI-S							
Independent	23	0,9 ± 0,3	1,8 ± 0,4	0	0,3	2,8	0.000
		34.78%	65.22%				
Dependent	23	0	2,4 ± 0,4	3,8 ± 0,3	1,5	4,1	
			52.17%	47.83%			
Plaque Indeks							
Independent	23	1,1 ± 0,5	2,1 ± 0,3	0	0,3	2,5	0.000
		52.17%	47.83%				
Dependent	23	0	2,0 ± 0,5	3,9 ± 0,4	1,8	4,5	
			65.22%	34.78%			

Caries Status: There was no high caries of permanent and milk dentition on SD Antonius 02 but there was 13.04%-34.78% high caries on SD Padangsari 01

Table 4: Frequent distribution of Caries Status in Intervention and Control Group

UKGS PROGRAM	N	CRITERIA			P value
		Low	Moderate	High	
		Mean ± SD	Mean ± SD	Mean ± SD	
DMF-T					
Independent	23	1,0 ± 0,8	0	0	0.000
		100%			
Dependent	23	1,2 ± 0,6	3,8 ± 0,4	7,2 ± 1,7	
		43.48%	17.39%	34.78%	
def-t					
Independent	23	0,4 ± 0,7	3,5 ± 0,7	0	0.044
		8.70%	91.30%		
Dependent	23	0,5 ± 0,6	3,2 ± 0,4	5,3 ± 0,6	
		56.52%	21.74%	13.04%	

Conted...

DMF-S					
Independent	23	0,9 ± 1,0	0	0	0.000
		100%			
Dependent	23	3,4 ± 2,4	13,0 ± 2,8	0	
		39.13%	26.09%		

Saliva Condition: Quantity saliva in normal criteria is higher in SD Antonius 02 (21.74%) than SD Padangsari 01 (17.39%). The salivary viscosity in SD Antonius 02 was low to moderate but was moderate to high in SD Padangsari 01

Table 5: Frequent Distribution of Saliva Condition on Intervention and Control Group

UKGS PROGRAM	N	SALIVARY QUANTITY			Min	Max	P value
		Very low Mean ± SD	Low Mean ± SD	Normal Mean ± SD			
Independent	23	3,2 ± 0,3 34.78%	4,1 ± 0,2 43.48%	5,3 ± 0,5 21.74%	3	6,5	0.005
Dependent	23	2,5 ± 0,8 47.83%	4,0 ± 0,0 34.78%	5,0 ± 0,0 17.39%	1	5	
		SALIVARY VISCOSITY					
		Low Mean ± SD	Moderate Mean ± SD	High Mean ± SD			
Independent	23	1.5 ± 0.5 47.83%	1.4 ± 0.5 52.17%	0	3	6,5	0.005
Dependent	23	0	2.0 ± 0.0 82.61%	3.0 ± 0.0 17.39%	1	5	

Independent UKGS or UKGS on School-based could give some advantages for students and parents. Parents would keep informed about their children’s dental problems or treatments and they didn’t have to provide their time to fulfill their children’s dental appointments. In addition, children were not afraid of getting dental treatments in school due to the familiar and non-threatening environment³. For schools, this program offered the benefit of reducing time out of the classroom for each child who might otherwise take time during the day for a trip to the dentist. For Community Health Center, this program provided reports every semester so the data could be monitored and evaluated.

There was a significant difference between these two groups on facilities and services. The inadequacy of facilities could influence the given services and give a bad impact on the customers’ satisfaction⁴. Padangsari Community Health Center only have 1 dentist and 1 dental nurse to cover the UKGS Program in 11 schools under their jurisdiction. The lack of manpower had a significant influence on the quality of service⁵. This independent UKGS Program could help Community Health Center to reach the goals of UKGS. Independent

UKGS could solve the problem or inadequacy of facilities by bringing the program to a school and focusing on it so it could give a better result at the end.

Children with poor oral health and dental problems may be unable to concentrate and learn, complete school work and score well on tests⁶. Poor oral health has been related to decreased school performance, poor social relationships and less success later in life⁷. There was significant difference between these two groups on caries status (*p value* 0.000 and 0.044). The caries status of children in the intervention group was better than the control group. Oral screening three times a year or every four months for all students could find out and follow up new problems of their dental health. In addition, dental education and mass tooth-brushing activities could influence children’s mindset and behavior in maintaining their oral condition rightly. Fluoride, a naturally occurring element, plays a critical role in the prevention of tooth decay. Topical fluorides, such as toothpaste, rinses and professionally applied fluoride treatments provide a complimentary benefit for the prevention of tooth decay⁸.

There were significant differences on salivary quantity and viscosity. (*p value* 0.005). The condition of saliva (quantity and viscosity) could influence the existence of Dental Plaque which has an important role in caries formation. Dental Plaque is a bacteria thin layer formed within minutes on the clean tooth surface⁹⁻¹⁰. In this study, the viscosity and quantity of saliva were in line with the growth of dental plaque. Salivary Viscosity and plaque index in the intervention group (low to moderate) was better than control one (moderate to high). When salivary viscosity increased, the water content would be decreased with an increased salivary thickness¹¹. As a result, the cleansing effect of the saliva to remove plaque and bacteria became low. This condition could increase the susceptibility to dental caries¹².

CONCLUSION

Independent UKGS or UKGS on School-based could become a broad spectrum of programs, policies, activities, and services that take place in schools and their surrounding communities. This concept not only modified individual behavior but also enabled one to modify his/her environment. Besides, the result of this concept could decrease the caries status, maintain the oral hygiene and salivary viscosity. At last but not least, it could reach the UKGS goal to decrease children's caries prevalences.

Conflict of Interest: The authors declare that there is no conflict of interests. No funding was received for this study or it was nil.

Ethical Clearance: The Ethical clearance was taken from the Ethic Committee of Health Polytechnic of Semarang- Indonesia.

REFERENCES

1. Indonesia Ministry of Health, *Indonesia Basic Health Report (Risksdas) 2013*. Jakarta: Ministry of Health RI, 2014
2. Ministry of Health Republic of Indonesia, *Indonesia Health profile 2014*, Jakarta: Ministry of Health RI 2015; p.115-116
3. Massachusetts Coalition for Oral Health, *Reaching New Heights in Health with School-Based Oral Health Programs*, 2011)
4. Jorge MA, Herga P, Ahmed A. Client satisfaction and quality of health care in rural Bangladesh. *Bulletin of the WHO*. 2001;79:512–517. [PMC free article] [PubMed]
5. Tjiptono, Fandy dan G. Chandra. *Service, Quality, & Satisfaction*. Penerbit Andi. Yogyakarta, 2005
6. Holt K, Kraft K. Oral health and learning: When Children's Oral Health Suffers, So Does Their Ability To Learn (2nd ed.). Washington, DC: National Maternal and Child Oral Health Resource Center; Available from: <http://www.mchoralhealth.org/pdfs/learningfactsheet.pdf>, 2003
7. Blumenshine SL, Vann Jr WF, Gizlice Z, Lee JY. Children's school performance: impact of general and oral health. *J Pub Health Dent*. Spring, 2008; 68(2):82-7
8. Association of State and Territorial Dental (Asttd), *Best Practice Approach Report :Improving Children's Oral Health through Coordinated School Health Programs*. Available from: <http://www.astdd.org/docs/BAPSschoolCSHP.pdf>, 2011
9. Wilson M, Devine D. *Medical implications of bio-films*. Cambridge University Press., 2003 **Vol. 1**, p. 173
10. Jass J, Surman S, Walker J. *Medical Biofilms, Detection, Prevention and Control*. Wiley, 2003 **Vol. 2**, pp. 173-192
11. Gopinath VK, Arzreanne AR. Saliva as a diagnostic tool for assessment of dental caries. *Arch Orofacial Sciences*, 2006; 1:57-59. [IVSL].
12. Zussman E, Yarin AL, Nagler RM. Age- and flow-dependency of salivary viscoelasticity. *JDR*; 2007; **86 (3)**:281-285

Assessing Noise-Exposure and Daily Habits Can Cause Hearing Loss among Ladies Club at Nightclub

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ABSTRACT

The majority problem in the workplace is about occupational noise-exposure. Health problem caused by noise becomes one of the important issues that must be observed. Nightclub owners often forgot about the health of their workers, especially hearing problem. The workers who works at nightclub are exposed to noise every time will putting their hearing at risk. The study aims to classify into levels of noise exposure, classify into levels of hearing loss, and assessing daily habits that can cause hearing loss. This research was cross-sectional study, where 62 ladies club were participated. As for the measurement in this study was used two methods such as: the tools (sound level meter for measuring intensity of noise exposure, audiometer for hearing problem), and questionnaires were assessed for daily habits. The mean of noise at nightclub was 107.22 dBA. A total of 51 workers (82.3%) had hearing loss (mostly at the level of mild 45 workers, and 6 workers in the level of moderate), while 11 respondents (17.7%) did not experience any hearing loss (normal). The statistical test found that hobby and smoke were strongest predictor may affect to hearing loss (p value < 0.05). Intensity noise all of nightclub exceeds the threshold value where the workers are works more than 4 hours a day. There are no management at nightclub doing regularly inspections the worker's ear. Doing the job rotation system it was a good solution to prevent from hearing loss.

Keywords *Nightclub, Noise-exposure, Hearing loss*

INTRODUCTION

A major environmental problem in many countries is about noise. The loud sound may damage hearing instantly. Prolonged exposure to loud noise can lead to a gradual, but permanent of hearing loss¹. A study conducted by World Health Organization (WHO) found that approximately 16% of the world's population endures hearing loss caused by occupational exposure to noise². High noise intensity and prolonged exposure can cause hearing loss. Hearing loss is a disease that damages and occurs in both ears can be divided into three types of

levels such as mild, moderate, or severe³. The impact of hearing loss may be profound, with consequences for the social, functional, and psychological well-being of the person such as insecurity, guilt and anger, concentration problems, less confident, and also feelings of humiliation⁴.

Genesis hearing loss causes DALY (Disability-Adjusted Life Year) more than four million, received disability related to hearing loss. DALY number found that males larger than females. Regulations controlling noise exist but are rarely enforced. For an example, countries in Southeast Asia have regulations regarding to prevention from hearing loss, but unfortunately it lacks of implementation⁵.

Along with the development and modernization in the industrial sector, health problem caused by noise becomes one of the important issues that must be observed. The workers who works at the entertainment sector are also could harm to the both ears. Many overseas research indicates that musicians and discotheques workers were exposed to loud music constantly throughout the work shift and putting their hearing at risk. ⁶.

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According to Hendarmin (1990) who conducted an investigation on the level of danger caused by loud disco music (between 100-110 dBA) shows that loud music can damage one's hearing⁶. Duration of action permitted by the Indonesian government by the labor minister decision No. 51/Men/1999 of the maximum noise limit in the workplace mentioned that if the noise level more than 100 dBA, then the worker should only work less than 15 minutes. But in reality they worked more than 4 hours a day.

Exposure to high levels of music in the entertainment industry has long been an important concern to those interested in hearing conservation. Due to much longer exposures to loud music, it is reasonable to believe that the hearing of employees working in the music entertainment industry is at much greater risk. Therefore, hearing loss among employees working in the music entertainment industry is a more important concern that needs to be studied⁷. The study aims to classify into levels of noise exposure, classify into levels of hearing loss, and assessing daily habits that can cause hearing loss.

METHOD

A cross-sectional research was conducted among 5 nightclub in Tarakan, North Borneo, Indonesia. This research used total sampling as a sampling technique. A total of 62 ladies club volunteered to take part in this research as study samples. This research mainly consists of two methods such as: the tools (sound level meter for measuring intensity of noise exposure, audiometer for hearing problem), and questionnaires were assessed for daily habits.

Sound Level Meter: This research used Sound Level Meter (SLM) type 2 840029. The SLM has been calibrated by Universitas Muhammadiyah Kalimantan Timur. The SLM recorded the noise exposure to establish a noise intensity each nightclub. L_n (noise in the night) = $10 \times \log \frac{1}{8} (T5 (2 \text{ hours the first time range}) \times 10^{0.1 \times L5}$

(Noise taken on 23:00 as a represent on 22.00-24.00) + T6 (3 hours the second time range,) $\times 10^{0.1 \times L6}$ (Noise taken on 01:00 as a represent on 24.00-03.00) + T7 (3 hours the third time range) $\times 10^{0.1 \times L7}$ (Noise taken at 03:00 as a represent at 03.00-06.00) dBA¹³.

Audiometer: For determine level the hearing of workers, the researcher used Audiometer type Oscilla SM930, and the result of hearing loss was classified into: normal (<24 dB) mild (> 25 to 40 dB), moderate (> 40 to 55 dB) and severe (> 55 dB). The audiometric test was done after 14 hours of the last noise exposure to recovery from temporary threshold shift.

Questionnaire: The core question questionnaires were consisted by two parts as follow: socio-demographic (the first of questionnaire identified personal information of respondents including age the workers, educational background) and health habits (the behavior of health workers every day. In this case if they do exercise or no, smoking habit, alcohol consumption, and hobbies).

Data Analysis: Descriptive statistics was presented with frequency, percentage, mean, standard deviation for measure each variable. For inferential statistics, Chi-square test was done to find out the significant association between daily habits may cause hearing loss.

RESULTS AND DISCUSSIONS

Results

Demographic Characteristics: Socio-demographic characteristics of the respondents are shown in Table 1. The mean age of the respondents was 22.6 years old, with a minimum age of 19 years and maximum age of 28 years. Table 1 also showed that total of 45 respondents (72.6%) from 62 respondents had hobbies related to high sound. Smoking characteristics of the respondents can be seen from Table 1 as well. The mean (SD) number of family members who smoked was 12.4 bars per day (7.51). Table 1 explained that 52 respondents (83.8%) consumed alcohol every day.

Table 1: Frequency Each Variable

Characteristics	Level	n = 62	Percentage (100%)
Age	Later Adolescence (17-25 years)	57	91.9
	Early Adulthood (26-35 years)	5	8.1
Mean: 22.6	SD: 2.18	Min: 19	Max: 28
Education	Secondary school	15	24.2
	High school	47	75.8

Conted...

Hobbies	Not related to loud sound	17	27.4
	May cause hearing loss	45	72.6
Hobbies	Not related to loud sound	17	27.4
	Attend live music concert	7	11.3
	Diving	7	11.3
	Listening to music through headphones or earphones	20	32.3
	Play music at studio	11	17.7
Smoke	Non smoker	21	33.9
	Smoker	41	66.1
Cigarette Consumption	Non smoker	21	33.9
	10-19 bars per day	8	12.9
	20 bars per day or more	33	53.2
<i>Mean: 12.4</i>	<i>SD: 7.51</i>		
Drinking Alcohol	Non drinker	5	8.1
	Drinker	57	91.9
Alcohol Consumption	Non drinker	5	8.1
	Frequent drinker	5	8.1
	Regular Drinker	52	83.8
Exercise Activities	Physically Active	8	12.9
	Physically Inactive	54	87.1
Time to do exercise	Regular Exercise	4	6.5
	Occasional Exercise	4	6.5
	No Exercise	54	87.0

Noise Exposure Each Nightclub: After measurement and calculate of noise exposure (L_n = noise in the night) by using formulas, the researcher found that nightclub 1 had the highest noise exposure (117.5 dBA), while the nightclub 5 had the lowest noise exposure (101.5 dBA).

Table 2: Noise Exposure Among 5 Nightclubs

Nightclub	Exposure level			Total noise exposure level
	T1 (23.00)	T2 (01.00)	T3 (03.00)	
Nightclub 1	106.4 dBA	117.9 dBA	119.3 dBA	117.5 dBA
Nightclub 2	98.7 dBA	103.4 dBA	111.5 dBA	107.9 dBA
Nightclub 3	98.7 dBA	101.7 dBA	110.3 dBA	106.8 dBA
Nightclub 4	96.9 dBA	99.3 dBA	105.4 dBA	102.4 dBA
Nightclub 5	96.2 dBA	98.1 dBA	104.5 dBA	101.5 dBA

Hearing Loss: By using audiometer for calculation of hearing loss among 62 respondents, the researcher found that a total of 51 respondents (82.3%) had hearing loss, while 11 respondents (17.7%) did not experience any hearing loss (normal). Total 51 respondents who indicated experiencing hearing loss, mostly at the level of mild (45 respondents), while 6 respondents at the level of moderate.

Table 3: Level of Hearing Loss Among Ladies Club

Category	n = 62	Percentage (100%)
Normal	11	17.7
Mild	45	72.6
Moderate	6	9.7

Association between Daily Habits and Hearing Loss: After using statistical analysis daily habit variables, found only 2 variables (hobbies related to high noise, and daily smoking habits) are very influential on the occurrence of hearing loss (p value <0.05). The result of analysis shows that respondents who have hobbies related to high noise can have 91.1% hearing loss, while respondents who have hobbies unrelated to high noise have a chance of hearing loss of 58.8%. Respondents who have a hobby can cause hearing loss 7.175 times greater than respondents who have a hobby unrelated to noise. For variable smoking habit, the respondents as a smoker had 90.2% chance of experiencing hearing loss compared with respondents who do not smoke (the chance of hearing loss is only 66.7%).

Table 4: Association between daily habits and hearing loss

Independent variables	Hearing Loss		Total	OR	p-value
	No	Yes			
Hobbies					
No related to loud sound	7 (41.2%)	10 (58.8%)	17 (100%)	7.175 CI = 1.752 – 29.377	0.009*
May cause hearing loss	4 (8.9%)	41 (91.1%)	45 (100%)		
Smoke					
Non smoker	7 (33.3%)	14 (66.7%)	21 (100%)	4.625 CI = 1.171 – 18.270	0.021*
Smoker	4 (7.3%)	37 (90.2%)	41 (100%)		
Alcohol					
Non drinker	1 (20%)	4 (80%)	5 (100%)	1.175 CI = 0.118 – 11.663	0.890
Drinker	10 (17.5%)	47 (82.5%)	57 (100%)		
Exercise					
Physically active	2 (25%)	6 (75%)	8 (100%)	1.667 CI = 0.289 – 9.620	0.936
Physically inactive	9 (16.7%)	45 (83.3%)	54 (100%)		

*= $p < 0.05$

DISCUSSION

The results showed that the intensity of noise among nightclub in Tarakan exceeds the threshold value determined by the Ministry of the Republic of Indonesia at 85 dB for 8 hours per day. The average noise at nightclub was 107 dBA. Hearing loss can be experienced by workers who are complaints related to noise exposure levels and frequencies based on the results of audiometric examination, found that as many as 51 workers have a hearing loss, while 11 workers did not experience hearing loss (normal). Hearing loss can be temporary or permanent. Temporary hearing loss results from short-term exposures to noise, with normal hearing returning after period of rest. Generally, prolonged exposure to high noise levels over a period of time gradually causes permanent damage⁸. An initial hearing loss may be temporary first and develop to the permanent hearing loss.

The intensity of the noise affecting the hearing loss as research conducted by Gunderson in workers obtained

music club workers working at nightclub, that has the highest noise sound have more symptoms of tinnitus after work and were more likely to perceive a hearing deficit after work¹⁰. The duration of noise exposure in a single day and duration work at nightclub may affects the occurrence of hearing loss. Ladies club are works more than 4 hours a day and work every day. Nancy (2008) on their research found that long-term may have become desensitized to the perception of hearing loss or tinnitus after work or they may have experienced a permanent threshold shift in hearing⁹.

Hobbies were contributed to the hearing status of workers. Related noisy hobbies that noise exposure to workers certainly increase hearing loss. Meanwhile, a hobby related to the environment of high pressure such as diving, hobbies associated with exposure to high noisy e.g. shooting with firearms, racing bike/car, listening to loud music and others can cause hearing loss⁶. The results showed that 45 (72.6%) respondents had a hobby may cause hearing loss. Listening to music through earphone/

headphone is a hobby type most favored by respondents (20 respondents), as many as 7 respondents liked the hobby of diving, 11 respondents liked the hobby of playing music in the studio, and only 7 respondent who liked like watching a concert event. If all this noise at nightclub reached an average of 107 dBA, then the favored hobbies workers are used earphones to listen the music, the ear for hearing-impaired workers will be higher. Frequency of listening to music has a close relation to the risky behaviors that can lead to hearing loss trigger.

Smoking is one of the common habits in all social levels including workers. Mizoue et al. (2002) studied on 4624 workers in metal factory in Japan. Exposure to noise was proved by recorded data of the factory. A logical review was performed to determine the relation between smoking dose and hearing response. The results showed smoking can be an important factor in hearing loss in high frequencies¹¹. The other research has been conducted by Mohammadi et al. in Yazd Sadooqi University (2010), studied on 622 workers of wagon factory. Periodical audiometry was performed in an acoustic room for all of them after at least 14 hours passed from exposure to noise. Results have shown that risk of cochlea damage in smokers were 5 to 6 times more than in non-smokers¹². Influxion blood circulation system in cochlear organ caused by smoking is the cause of hearing loss in high frequency progressive and most often occurs in old age. A total of 41 respondents from 62 workers at a nightclub were smoked. The study says that the average worker spends as much as smoking 12.4 cigarettes a day.

CONCLUSIONS

Noise is unwanted sound produced by a wide variety such as DJ music through the loudspeaker. Measurement of noise intensity at nightclub was carried out by using the Sound Level Meter for 3 times and starts from 23:00 PM to 03:00 AM. The calculation results show average noise at nightclubs were 107 dBA, where the ladies club works from 22.00 PM to 04.00 AM. Significant hobbies such as diving, coming to live music concerts, play music at studio, diving, and listening to music using headphones/earphones can cause hearing loss. In addition, smoking is also another factor that can cause hearing loss.

Special attention is required for the owner of the nightclub owner to pay more attention to the health of

the workers' ears. The calculation of hearing power before starting work at nightclubs and thereafter needs to be done to find out more if noise can cause hearing loss. Work rotation also needs to be done in order to restore the hearing of workers after exposure to noise. For the government, also need to socialize and campaign about workers health especially ear health. Besides using SLM as a noise measurement, personal noise dosimeter is also needed to measure noise exposure level received by each workers when they are working.

ACKNOWLEDGEMENTS

The author would like to thank to the owner, all the ladies club at nightclub and also the government of Tarakan City, Indonesia for their encouragement and good cooperation during this study.

Conflict of Interest: The authors declare that there are no conflict of interests from this study.

Ethical Clearance: The ethical clearance was obtained from Lembaga Penelitian dan Pengabdian Masyarakat, Universitas Katolik Indonesia Atma Jaya, Jakarta No: 532/III/LPPM-PM.10.05.06/2016.

Source of Funding: Source of funding this research was used by cost self.

REFERENCES

1. **Salvendy, Gabriel.** *Handbook of Human Factors and Ergonomics*. New York City : John Wiley & Sons, Inc, 1997.
2. *The global burden of occupational noise-induced hearing loss.* **Nelson, Deborah Imel, et al.** 2005, American Journal of Industrial Medicine.
3. *Hearing Impairment.* **Shah, Rahul K. and Isaacson, G. C.** 2011, Medscape Reference.
4. *The Effect of Noise-Induced Hearing Loss on Children and Young Adults.* **Levey, Sandra, et al.** 2012, Contemporary Issues in Communication Science and Disorders.
5. *Validation of Noise Induced Hearing Loss Questionnaire Among Malay Sawmill Workers in Kelantan Malaysia.* **Razman, M. R., et al.** 2010, International Medical Journal Malaysia.
6. *The Relationship Between Noise Exposure and Hearing Loss (Case Study at Discotheque A,*

- B, C in Medan*). **Silitonga, Naek, et al.** 2014, Departemen Ilmu Kesehatan Telinga Hidung dan Tenggorok Bedah Kepala Leher, Fakultas Kedokteran Universitas Sumatera Utara.
7. *Entertainment Noise in Western Australia*. **Guo, J. and Gunn , P.** 2005, Australian Acoustical Society.
8. **Labor, United States Department of.** Occupational Safety and Health Administration. [Online] 2002. [Cited: June 29, 2018.] <https://www.osha.gov/Publications/OSHA3074/osha3074.html>.
9. *Examination of Noise Hazards for Employees in Bar Environments*. **Lawrence, Nancy and Turrentine, Andrew.** 2008, The American Society of Safety Engineers.
10. *Risks of Developing Noise-Induced Hearing Loss in Employees of Urban Music Clubs*. **Gunderson, Erik, Moline, Jackqueline and Catalano, Peter.** 1997, American Journal of Industrial Medicine.
11. *Combined Effect of Smoking and Occupational Exposure to Noise on Hearing Loss in Steel Factory Workers*. **Mizoue, T., Miyamoto, T. and Shimizu, T.** 2003, Occupational Environmental Medicine.
12. *Effect of Simultaneous Exposure to Occupational Noise and Cigarette Smoke on Binaural Hearing Impairment*. **Mohammadi , S., et al.** 2010, Noise Health.
13. *Analisis Intensitas Kebisingan Lingkungan Kerja pada Area Utilities Unit PLTD dan Boiler di PT. Pertamina RU II Dumai*. **Fithri, Prima and Annisa, Indah Qisty.** Riau : Jurnal Sains, Teknologi dan Industri, 2015.

Associated Factors of Latent Tuberculosis among Diabetics in Urban Health Clinics

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ABSTRACT

Mycobacterium tuberculosis infection causes significant morbidity and mortality worldwide. Among the risks for tuberculosis is diabetes, which triples the risk of tuberculosis compared to non-diabetics. One of the effective strategy to reduce the transmission, morbidity, and mortality of active disease among diabetic patients is the identification of latent tuberculosis infection (LTBI). This study aimed to determine the prevalence of LTBI and its associated risk factors among diabetic patients in urban health clinics. This cross-sectional study was conducted at three randomly selected urban health clinics in Terengganu. Participants (n=362) were administered with Tuberculin Skin Test (TST) and interviewed to obtain the socio demographic and clinical data. Simple and multivariate logistic regression were applied to test for the significant associated factors of LTBI. The prevalence of LTBI among diabetic patients was 5.8%. This study revealed that the associated factors for LTBI were having higher glycated haemoglobin (HbA1c) (p=0.016, OR=14.23), smoking (p=0.046, OR=3.78), asthma (p=0.049, OR=5.79) and history of TB contact (p= <0.001, OR=6.92). Active screening, infection control measures and glucose controls are recommended in reducing the risk of LTBI and reactivation of LTBI.

Keywords: Latent Tuberculosis Infection (LTBI); Tuberculin Skin Test (TST); Diabetes

INTRODUCTION

Tuberculosis (TB) in adult is an important public health problem with over 8.6 million people suffering TB infection and as many as 1.3 million deaths from TB annually^[1]. Despite this tremendous global burden, case detection rate in Malaysia continues to be low; from 93 TB cases per 100 000 people in year 2014 reduce to 89 TB cases per 100 000 in year 2016^[2].

Exposure to mycobacterium tuberculosis (MTB) complex causes significant morbidity and mortality worldwide. Latent tuberculosis infection (LTBI) is a condition when MTB complex unreactive state; MTB may alive in body but no symptoms of TB with normal

chest radiograph^[3, 4]. MTB will adherence to a distinct cell wall as a bacteria's survival and these cell wall consist of mycolic acid (a fatty acid) that give a strong lipid barrier to the MTB^[5]. Nevertheless, some studies revealed only 5-10% people who are infected with LTBI will develop into active TB^[4, 6, 7].

At the same time, diabetes mellitus (DM) prevalence is soaring globally, fuelled by obesity, changing patterns of diet, physical activity and aging population and thus DM was dramatically increase. Worldwide, about 422 million person suffering DM^[8] and this immunocompromised state triples the risk of TB; and conversion rate to active TB is higher and faster^[7, 9, 10]. Therefore, early screening and intervention of LTBI among diabetic patients can early recognize LTBI and thus may help control the progression of LTBI into active TB and improve the outcome.

A study on influence of diabetes mellitus and risk factors in activating latent TB infection in Malaysia

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concluded that there is a need to improve the screening of latent TB amongst patients with risk factor by early intervention through tuberculin skin test (TST) or interferon gamma releasing assay (IGRA) amongst high risk patients such as diabetes mellitus [11]. This would help to cultivate positive attitude, formulate a more economical screening strategies and better preventive practices among diabetes patients to reduce latent tuberculosis infection in the country.

The objective of this study is to determine the prevalence of LTBI among diabetic patients at a community level and to evaluate the association between associated factors and LTBI status. The outcome of this study could provide an insight on the prevalence and its risk factor of latent tuberculosis infection among diabetes patient in Terengganu.

METHOD

This cross-sectional study was conducted from July 2017 to March 2018. The target population for this study was diabetic patients attending urban health clinics. Urban clinics were defined as clinic in area that are located 35 km from the main city. Simple random sampling was applied to choose the health clinics where three out of five health clinics in urban area of Terengganu were chosen. Sample size was calculated using PS software where minimum of 315 samples were needed. Systematic random sampling with 1:1 ratio was then applied to choose samples among diabetic patients who attended the clinics during the study period.

All diabetic patients participated in this study on a voluntary basis and fulfilled the inclusion criteria. The inclusion criteria were: age ≥ 18 years, having diabetes mellitus diagnosed at least 12 months and with no mental health problems (Fig. 1).

DATA COLLECTION

After signing the consent form, participants completed an interviewer-administered questionnaires covering socio-demographic characteristic, includes of history contact with TB patients, smoking status, occupational, environmental and others comorbidities such as hypertension, hyperlipidaemia, asthma, chronic obstructive pulmonary disease, systematic lupus erythematosus, and rheumatoid arthritis. Clinical data was obtained by looking up the medical records.

Diagnosis of LTBI: To diagnose LTBI, diabetic patients were tested with tuberculin by trained nurses. The standard tuberculin test (TST) consists of an intracutaneous injection of 0.1 ml (5 tuberculin units) of purified protein derivative (PPD) into the volar forearm. The reaction was read 48 to 72 hours after injection. The size of the reaction was determined by measuring the diameter of induration in millimetres (mm). The indurated area refers to the raised region, not the surrounding erythema. The “pen technique” was used to distinguish the indurated area from the surrounding erythema. To employ this technique, a line was lightly drawn with a pen in the horizontal and vertical planes until the edge of the induration was reached. To determine the size of the reaction, the induration was measured transversely to the long axis of the long axis of the forearm from the most medial point [12]. The raised or indurated area (center) was measured and not the area of the erythema (indicated by the perpendicular lines). A TST reaction ≥ 10 mm of the induration was considered positive [13]. All participants underwent a chest radiograph, which was independently read by expert respiratory physician and family medicine specialist in each clinic to exclude active TB.

Statistical Analysis: Data was entered and analysed using computerized software statistical package SPSS version 22, with p values <0.05 regarded as statistically significant. Descriptive statistic such as percentage, mean and standard deviation for each variable was calculated to describe frequencies and percentage for categorical variables while mean and standard deviation was presented for numerical variables. To determine associated factors of TST positivity, a multivariable logistic regression model was then constructed to adjust for occupation, monthly income, smoking status, history of TB contact, and any other variable that reached a p -value of less than 0.25 in the univariable analysis.

RESULTS AND DISCUSSIONS

Socio-demographic participants: Figure 1 described the sampling for the study. A total of 362 diabetic patients were tested. Mean age of the participants was 59, majority (86%) were ≥ 50 years (Table 1). Majority were female (64.1%), and married (86.2%), 42.9% were secondary level of education, and majority (54.7%) were unemployed. Self-report of smoking (6.9%) and history of TB contact (12.2%) was relatively low. Majority of the participants (76.2%) were obese, 76.2% had hypertension, 85.7% had hyperlipidaemia while only 4.5% had asthma and 2.2% had rheumatoid arthritis.

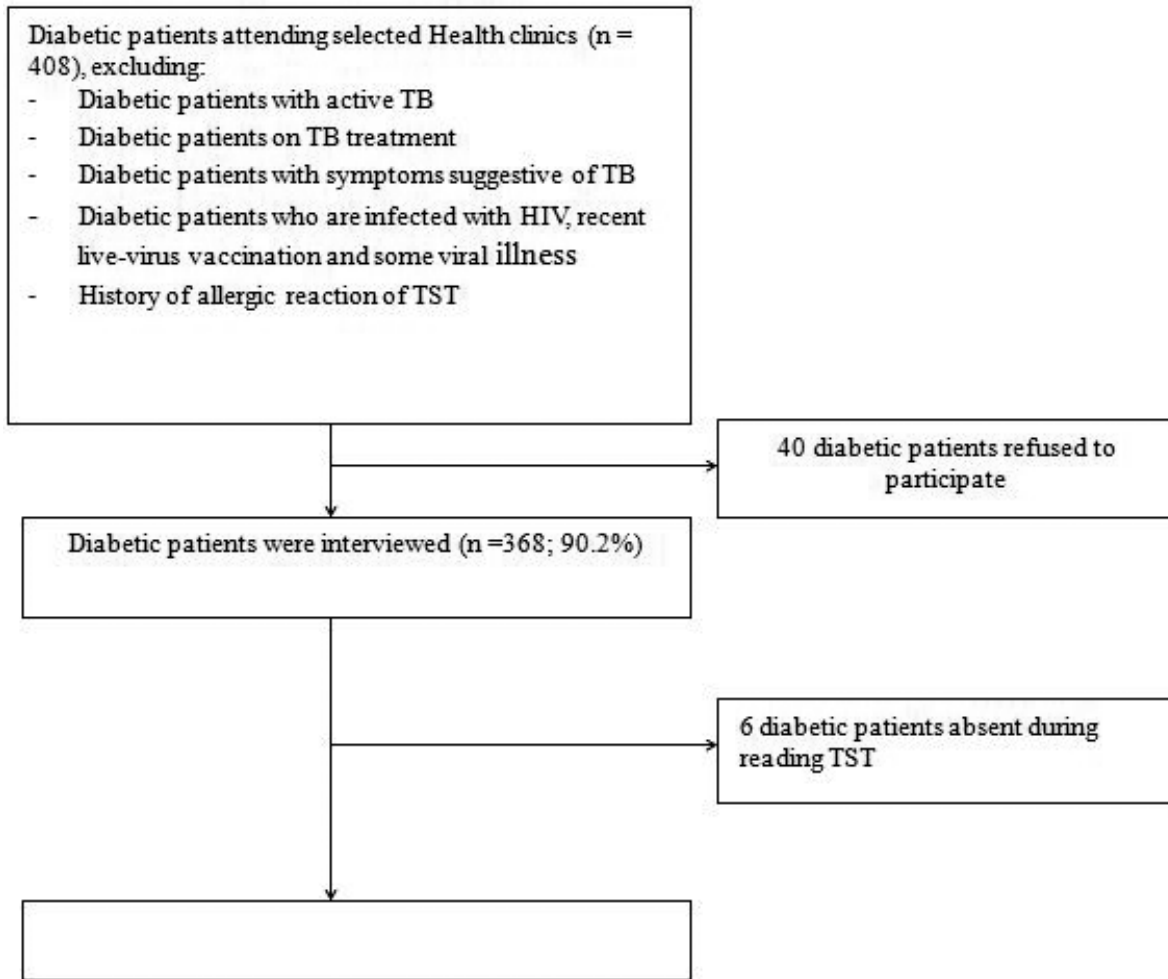


Fig. 1: The enrolment process of diabetic patients in the study

Table 1: Characteristic of Non-diabetic related factors with positive and negative TST results (n = 362)

Variables	TST Negative n (row %)	TST Positive n (row %)	Total n (column %)	Mean (SD)
Age				
< 50 Years Old	49 (14.4)	3 (14.3)	52 (14.4)	59.21 (9.01)
≥ 50 Years Old	292 (85.6)	18 (85.7)	310 (85.6)	
Gender				
Male	121 (35.5)	9 (42.9)	130 (35.9)	
Female	220 (64.5)	12 (57.1)	232 (64.1)	
Ethnicity				
Malay	340 (99.7)	21 (100.0)	361 (99.7)	
Chinese	1 (0.3)	-	1 (0.3)	
Marital Status				
Single	8 (2.3)	-	8 (2.2)	
Married	294 (86.2)	18 (85.7)	312 (86.2)	
Divorced	8 (2.3)	2 (9.5)	10 (2.8)	
Widowed	31 (9.1)	1 (4.8)	32 (8.8)	

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Highest educational level				
No Formal Education	28 (8.2)	1 (4.8)	29 (8)	
Primary	133 (39.0)	5 (23.8)	138 (38.1)	
Secondary	145 (42.5)	9 (42.9)	154 (42.5)	
Diploma Degree	32 (9.4)	6 (28.6)	38 (10.5)	
Master PhD	3 (0.9)	-	3 (0.8)	
Household Monthly Income (RM)				
<3000	275 (80.6)	17 (81.0)	292 (80.7)	1976.27 (3179.4)
≥3000	66 (19.4)	4 (19.0)	70 (19.3)	
Occupation				
Not Working	192 (56.3)	6 (28.6)	198 (54.7)	
Healthcare Worker	29 (8.5)	7 (33.3)	36 (9.9)	
Non-Healthcare Worker	120 (35.2)	8 (38.1)	128 (35.4)	
Smoking Status				
No	320 (93.8)	17 (81.0)	337 (93.1)	
Yes	21 (6.2)	4 (19.0)	25 (6.9)	
History Contact with TB patient				
No	306 (89.7)	12 (57.1)	318 (87.8)	
Yes	35 (10.3)	9 (42.9)	44 (12.2)	
Obesity				
No	98 (28.7)	25 (23.8)	103 (28.5)	
Yes	243 (71.3)	16 (76.2)	259 (71.5)	
Hypertension				
No	81 (23.8)	4 (19.0)	85 (23.5)	
Yes	260 (76.2)	17 (81.0)	277 (76.5)	
Hyperlipidemia				
No	80 (23.5)	3 (14.3)	83 (22.9)	
Yes	261 (76.5)	18 (85.7)	279 (77.1)	
Bronchial Asthma				
No	334 (97.9)	19 (90.5)	353 (97.5)	
Yes	7 (2.1)	2 (9.5)	9 (2.5)	
Rheumatoid Arthritis				
No	333 (97.7)	21 (100.0)	354 (97.8)	
Yes	8 (2.3)	-	8 (2.2)	

Abbreviations: TST, Tuberculin Skin Test

Table 2: Characteristic of Diabetic related factors with positive and negative TST results (n = 362)

Variables	TST Negative n (row %)	TST Positive n (row %)	Total n (column %)	Mean (SD)
Duration of Diabetes in Years				
<10 years	250 (73.3)	14 (66.7)	264 (72.9)	7.26 (5.28)
≥10 Years	91 (26.7)	7 (33.3)	98 (27.1)	

Conted...

Types of Medication				
Diabetic Oral Medication	203 (59.5)	15 (71.4)	218 (60.2)	
Insulin Therapy	22 (6.5)	-	22 (6.1)	
Both	116 (34.0)	6 (28.6)	122 (33.7)	
HbA1c Levels for the last 1 year				
< 6.5%	94 (27.6)	1 (4.8)	95 (26.2)	8.28 (2.20)
≥ 6.5%	247 (72.4)	20 (95.2)	267 (73.8)	
Microvascular complications:				
Retinopathy				
No	243 (71.3)	17 (81.0)	260 (71.8)	
Yes	98 (28.7)	4 (19.0)	102 (28.2)	
Neuropathy				
No	224 (65.7)	11 (52.4)	235 (64.9)	
Yes	117 (34.3)	10 (47.6)	127 (35.1)	
Nephropathy				
No	207 (60.7)	18 (85.7)	225 (62.2)	
Yes	134 (39.3)	3 (14.3)	137 (37.8)	
Macrovascular complications:				
Coronary Heart Disease				
No	324 (95.0)	19 (90.5)	343 (94.8)	
Yes	17 (5.0)	2 (9.5)	19 (5.2)	
Stroke				
No	332 (97.4)	20 (95.2)	352 (97.2)	
Yes	9 (2.6)	1 (4.8)	10 (2.8)	
Peripheral Vascular Disease				
No	329 (96.5)	21 (100.0)	350 (96.7)	
Yes	12 (3.5)	-	12 (3.3)	

Abbreviations: TST, Tuberculin Skin Test; HbA1c. Glycated Hemoglobin

Table 3: Associated factors of Latent Tuberculosis Infection (LTBI) by simple and multiple logistic regression models

Variable	Simple Logistic Regression			Multiple Logistic Regression		
	b	Crude OR (95% CI)	p	b	Adjusted OR (95% CI)	p
HbA1C	2.03	7.61 (1.01, 57.51)	0.049	2.66	14.03 (1.63, 213.99)	0.016
Smoking Status	1.27	3.59 (2.31, 74.54)	0.033	1.33	3.78 (1.02, 13.98)	0.046
History of TB Contact	1.88	6.56 (3.07, 69.60)	<0.001	1.94	6.92 (2.56, 18.78)	<0.001
Asthma	1.61	5.02 (0.05, 1.18)	0.053	1.76	5.79 (0.02, 1.39)	0.049

^a Forward LR Multiple Logistic Regression model was applied

Multicollinearity and interaction term were checked and not found

Classification table (overall correctly classified percentage= 94.2%, which is >70%) and area under ROC curve (98.6%) were applied to check the model fitness.

Diabetes Profile: Overall, 72.9% of the 362 participants with TST result were ≥ 10 years of having diabetes and 60.2% were taking diabetic oral medication. For microvascular complications, only 28.2 % were retinopathy, 35.1 % were neuropathy and 14.3 % were nephropathy. Then, for macrovascular complications, only 5.2% were coronary heart disease, 2.8% were stroke and 3.3 % were peripheral vascular disease (Table 2).

Prevalence of LTBI: The prevalence of LTBI in diabetic patients was only 5.8% (Fig. 2).

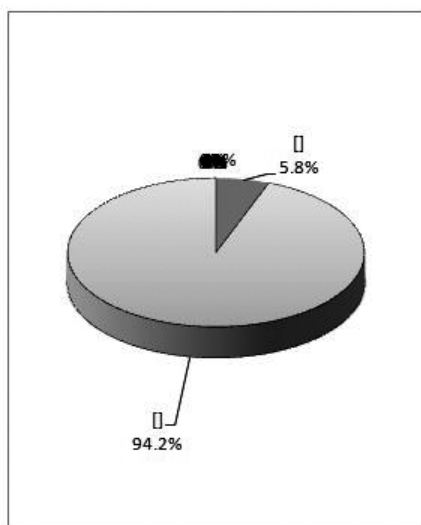


Fig. 2: Prevalence of LTBI among Diabetic Patients (n = 133)

Factors associated with LTBI: In univariable analysis, smoking status, history of TB contact and HbA1C level had significant association with TST positivity.

Multivariable logistic regression showed the smoking status, history of TB contact, HbA1C level and presence of asthma were independently associated with a diagnosis of LTBI (Table 3). Those actively smoking had a 3.78 higher odds for LTBI, while those with history of TB contact had 6.92 higher odds for LTBI and asthma patients had 5.79 times higher odds. The highest odds to have LTBI were the patients with HbA1C $\geq 6.5\%$ where they were at 14.23 times higher odds to have LTBI.

In this study, the prevalence of LTBI among diabetic patients was only 5.8% (21/362). The result indicated that the tendency for diabetic patients in urban health clinics to have LTBI is low. This is in contrast to the higher prevalence in the study by Swarna Nantha *et al.* [14] which found 28.5% diabetic patients to have positive TST.

It is found in this study that diabetic patients who were active smokers, asthmatics and those with history of

TB contact had high risk to get LTBI than other diabetic patients. In our study, being an active smoker was significantly associated with LTBI ($p=0.046$) where they were 3.78 times at higher odds to have LTBI compared to non-smokers. This is in agreement with the results of previous studies which stated that smoking cause disturbed cilia function thus increased susceptibility to LTBI [10]. Many studies have proved that smokers were at increased risk of developing LTBI and increasing the reactivation of LTBI into active TB [15]. The new finding of association of LTBI with asthmatics need to further evaluation as it is yet clear of its cause.

Usually, healthcare workers especially those who handle a diagnostic test of active TB patients have higher risk to have LTBI as compared to non-healthcare workers (HCWs) [20, 21]. A study of Nasehi *et al* in Iran found 24.38% (95% CI, 21.31 to 27.74) the prevalence of LTBI among HCWs act as TB laboratory staff, higher than other HCWs such as administrative staff, financial staff and service personnel (14.82%, 95% CI, 11.31 to 19.20) [22]. It was also found that longer length of employment as HCWs also increase the risk of LTBI [23]. In our study, a higher proportion of healthcare workers developed LTBI compared to those who were not healthcare workers (Table 2). However, this was statistically insignificant ($p=0.148$). This unexpected but welcoming finding may be the fruit of careful application of personal protective equipment such as proper facemask while handling specimens or during interaction with patients.

Household TB contact increased the risk of TST positivity in previous studies [16, 17]. Likewise, the result of current study showed that household contact significantly associated risk factor of LTBI ($p<0.001$). These are factors other their diabetes profile that need to be taken into account when considering infection with tuberculosis.

Several previous studies showed that men had more tendencies to have LTBI than women [15, 16, 18, 19]. However in our study, there was no significant association between gender and LTBI.

The factor which had the highest increase in odds to have LTBI was having HbA1C $\geq 6.5\%$. This finding was not commonly found in previous studies but simply highlights that the importance of blood glucose control could never be overemphasized in preventing complications in diabetes, specifically infections such as tuberculosis.

Strength and limitations: The strength of this study is that it provides a current prevalence of LTBI among diabetic patients attending urban health clinics in Terengganu. Another unique feature of this study is that it had adequate sample to demonstrate that the diabetic patients with higher HbA1C and other factors such as smoker, asthma and had history of TB contact has higher tendency to have LTBI than other diabetic patients.

The major limitation of our study is related to the cross-sectional nature of the study which can only find associated factors rather than actual risk factors. Therefore, further prospective studies are needed to gain more insight into the risk factors of incidence of latent tuberculosis and development of active tuberculosis in diabetics.

CONCLUSIONS

In conclusion, this study revealed that the associated factors for LTBI were having higher glycated haemoglobin (HbA1c), smoking, asthma and history of TB contact. Active screening, infection control measures and glucose controls are recommended in reducing the risk of LTBI and reactivation of LTBI. It also provided updated estimates of LTBI among diabetic patient in Terengganu to help guide control programs. Further study regarding development LTBI into active TB among diabetic patient should be conducted.

ACKNOWLEDGEMENTS

The authors are thankful to all participants who took part in this study. This study was supported by the Special Research Grant (UNISZA/1/2015/SRGS/4). We wish to thank all family medicine specialist, medical officer and nurses of the health clinics involved who assisted in data collection in this study.

Conflict of Interest: There was no conflict of interest in the authors.

Ethical Clearance: The study was approved by the human research ethics committee of the faculty of medicine at the Universiti Sultan Zainal Abidin and Medical Research and Ethic Committee (NMRR-16-1937-30162). Participation in the study was entirely voluntary and written informed consent was obtained before data collection and administered TST test.

REFERENCES

1. World Health Organization *Global Tuberculosis report*. 2013
2. The World Bank *Incidence of Tuberculosis (per 100,000 people)*. 2016.
3. Rohan, S. and S. Indra Devi, *Clinical Manifestation and Risk Factors of Tuberculosis Infection in Malaysia: Case Study of a Community Clinic*. Global Journal of Health Science, 2015. 7(4): p. 110-120.
4. Sanduzzi, A., et al., *Latent tuberculosis infection (LTBI): a real host defence or a permanent threat?* Le Infezioni in Medicina, 2016. 3: p. 179-182.
5. Cantrell, S.A., et al., *Free mycolic acid accumulation in the cell wall of the mce 1 operon mutant strain of Mycobacterium tuberculosis*. Journal of Microbiology, 2013. 51: p. 619-626.
6. Abdul Rahaman, J.A., et al., *Tuberculosis In Adult*. Malaysian Family Physician, 2014. 9(3): p. 34-37.
7. Riza, A.L., et al., *Clinical management of concurrent diabetes and tuberculosis and the implications for patient services*. Lancet Diabetes Endocrinol, 2014. 2: p. 740-53.
8. World Health Organization *The Dual Epidemic of TB and Diabetes*. 2014.
9. Bhattacharya, P.K. and A. Roy, *Tuberculosis and Diabetes Mellitus: A Double Whammy for the Developing Nations*. J Med Diagn Meth, 2015. 4(3): p. 1-4.
10. El-Sokkary, R.H., et al., *Assessing The Prevalence of Latent Tuberculosis among Health Care Providers in Zagaziq City, Egypt using Tuberculin Skin Test and Quantiferon-TB Gold In-Tube Test*. Cent Eur J Public Health, 2015. 23(4): p. 324-330.
11. Swarna Nantha, Y., *Influence of Diabetes Mellitus and Risk Factors in Activating Latent Tuberculosis Infection: A Case for Targeted Screening in Malaysia*. Med J Malaysia, 2012. 67: p. 467-472.
12. Asad, A., et al., *Testing for Latent Tuberculosis*. Clinical Medicine and Research, 2004. 2(3): p. 191-194.

13. Adams, S., et al., *Incidence of occupational latent tuberculosis infection in South African healthcare workers*. The European respiratory journal, 2015. **45**(5): p. 1364-1373.
14. Swarna Nantha, Y., et al., *Epidemiology of latent tuberculosis infection among patients with and without diabetes mellitus*. Family Practice, 2017. **00**(00): p. 1-7.
15. Cheng, C., et al., *High Latent TB Infection Rate and Associated Risk Factors in the Eastern China of Low TB Incidence*. PLOS ONE, 2015. **10**(10): p. 1-9.
16. Lee, S.J., et al., *Risk factors for latent tuberculosis infection in close contacts of active tuberculosis patients in South Korea: a prospective cohort study*. BMC Infectious Diseases, 2014. **14**(1): p. 566.
17. Mancuso, J.D., et al., *The Prevalence of Latent Tuberculosis Infection in the United States*. Am J Respir Crit Care Med, 2016. **194**(4): p. pp 501-509.
18. Ncayiyana, J.R., et al., *Prevalence of latent tuberculosis infection and predictive factors in an urban informal settlement in Johannesburg, South Africa: a cross-sectional study*. BMC Infectious Disease, 2016. **16**(661): p. 1-10.
19. Wen-Ying, T., et al., *Gender Disparities in Latent Tuberculosis Infection in High-Risk Individuals: A Cross-Sectional Study*. PLOS ONE, 2014. **9**(11): p. e110104.
20. Chu, H., et al., *Risk of tuberculosis among healthcare workers in an intermediate-burden country: a nationwide population study*. J Infect, 2014. **69**(6): p. 525-532.
21. Herna'ndez, M., et al., *Latent tuberculosis infection screening in healthcare workers in four large hospitals in Santiago, Chile*. Rev Chilena Infectol, 2014. **31**: p. 254-260.
22. Nasehi, M., et al., *Prevalence of latent tuberculosis infection among tuberculosis laboratory workers in Iran*. Epidemiol Health, 2016. **39**(0): p. e2017002-0.
23. Belo, C. and S. Naidoo, *Prevalence and risk factors for latent tuberculosis infection among healthcare workers in Nampula Central Hospital, Mozambique*. BMC Infectious Diseases, 2017. **17**: p. 408.

Santri Perception on the Lesbian Gay Biseksual and Transgender Phenomenon a Study in Pondok Pesantren Nurul Mursyd Semarang

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ABSTRACT

Introduction: LGBT should be banned by the Indonesian government for harming health as well as incompatible with Islamic perspective. The Country must protect its citizens from this perverse behavior that contributes to the greatest number of HIV/AIDS cases. Pondok Pesantren is like a dormitory, which also prone to LGBT behavior. The purpose of this study was to analyze the characteristics and perceptions of students about the phenomenon of LGBT with their sexual experience.

Method: The study design was observational with cross sectional approach. The population was 35 students and the sample were 25 people. The inclusion criteria of santri is baligh. Quantitative data were collected through self-administered tool. The analysis were univariate and bivariate. The research has received ethical clearance approval No.270/EC/FKM/2016 dated December 20, 2016.

Results: The majority of students aged 15-19 years old (68%), with female santri (58%) more than male (42%). Most were in high school (52%). Perceived Susceptibility, perceived seriousness and perceived of benefits and barriers in high category with the percentage of 60%, 56% and 80%, while Cues to action in low category (72%). There were 28% of santri who have sexual experience. There was no relationship to all perceptual independent variables on sexual experience of santri.

Conclusion: All santri were categorized as teenagers and most of them have high school education. Few santri have had sexual experience. Perceptions of Susceptibility, seriousness and Perceptions of benefits and barriers had high categories, but cues to action had low categories.

Keywords: *santri, perception, LGBT*

INTRODUCTION

LGBT should be banned by the Indonesian government because it leads to health problems and are not in accordance with Islamic teachings. LGBT contribute the most cases of HIV/AIDS.

Pondok Pesantren is an educational place where the students are all moslem (called santri), they live together in a dormitory and study together under the guidance of Kyai (moslem teacher). Pondok Pesantren is also vulnerable to LGBT behavior because santri live with same sex and are not allowed to be with different sex.¹³

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LGBT invaded Indonesia through academic, political and social aspects. Academically, the spread of LGBT ideas took cover behind academic studies. Many LGBT organizations are practicing on campuses and calling for LGBT ideas through writing. They politically engage in political movements such as action, trying to influence various political policies and cooperate with various institutions, especially those who engaged in advocacy and human rights. Socially, LGBT propaganda is called in various ways and means. Through organizations that concerned about AIDS, they carried out advocacy and consultation, making film, action on the ground, culture, mass media and so on. The spread of LGBT ideas and behaviors under the pretext of freedom and human rights. LGBT is justified by the idea of truth and moral relativity.

LGBT behavior can be imitated by others. If the propaganda and LGBT movements are allowed then the deviant behavior can spread to the community. It should be stated that LGBT is a behavioral aberration.^{1,2}

Based on midline 2013, conducted by Puska Gender and UI Sexuality in Jombang, Banyuwangi and Lamongan city, it is known that there are teenage problems about sexual and reproductive health, one of them is about coercion or sexual violence. As much as 21.1% of respondents claimed to have been touched in certain parts without desired. It was 61.5% done by a friend of theirs, and the remaining 38.5% done by boyfriend/girlfriend. This was experienced by male and female students.

Pondok Pesantren also has some various reproductive and sexual health problems, such as cases of sexual intercourse with same-sex santri. There is an activity called '*nyuluh*' which means rubbing the penis between the thighs of a male santri while sleeping.³

Santri is disciplined with time table activity and tight studying environment. Factors that are considered underlying sexual behavior '*dalaq*' in pesantren is the homogeneity of interaction, the new santri, and the prohibition and punishment for santri who interact between sex. And also power which are scattered in relations and regulations.⁴

Mairil is described as a woman while the perpetrator is called *warok*. *Nyempet* is a sexual activity conducted by *santri* (same-sex) to vent their sexual desire. This activity is done with or no coercion. Santri begin this activity at the age of 13-17 years, due to a homogeneous

environment (all male). *Nyempet* activity performed at night, in the room, and they assume there will be no harm from the health side, if they perform sex only by rubbing the penis between the thighs, without putting it into the anus.⁵

In the study of Reproductive Health Survey in Semarang city in 2014, from 475 respondents santri obtained results as follows:

Most of the samples were 15-19 years old (65.9%), coming from rural (73.1%), consist of 40.6% male and 59.4% female. The education of santri's parents, both father and mother is secondary education (SMP, SMA) working as non civil servant (90%), with low average income (Rp 1,209,000/month). Family, school, community and media have not contributed enough for santri in the aspect of giving reproductive health information. Mother (57.1%), father (29.9%) and siblings (31.8%) talked about reproduction in the family. In school, some friends (51.6%) and teachers (37.5%) discussed it, whereas in the community, some health workers (30.5%) and religious leaders (25.3%) talked about it. Santri who claimed to have a girlfriend (50.5%), perform activities such as holding hands (58.3%), kissing lips (25%) and feeling/stimulating partner (16.7%). The reason of a small group of santri who agree to premarital sex (9%) were sexual intercourse just happen, being forced by a partner or they were curious to try. This group does not consider that female and male virginity are important when they are married. Santri who claimed to have sex (10.74%), admitted to perform for the first time in the age range <15 years to 17 years (50.99%). All of them stated that they used condoms during the first sexual intercourse, but 21.57% admitted to not using condoms during the last sex.⁶

Adolescence is an important stage because it is a transitional period from children to adult. Various problems and changes in physical, biological, psychological and social, could be faced by adolescents in the course of their lives toward adulthood. Within those days, they are still the responsibility of parents and other adults in the community until they are mature and independent.⁷

Human behavior is influenced by one's own perception of something. Perception is always unique in each individual. Perception of a health problem, can be the same, can also be different depends on internal and external factors. Perception is not the passive reception

of gestures, but is shaped by learning process, memory, hope, and attention.⁸ Similarly, santri in response to social phenomena such as LGBT rampant. They respond actively to the social background of the demographics they have and experienced during their journey of life, through sight, smell, hearing, touch, and selective tasting. The santri response about LGBT was approached with the theory of health beliefs models, which include the variables such as perceived susceptibility, perceived seriousness, benefit and barrier, and cues to action. The purpose of this study was to analyze the characteristics and perceptions of santri about LGBT phenomena related to their sexual experiences.

METHOD

This research was held in Pondok Pesantren Nurul Mursyd which located in Mangunharjo Village, Tembalang District, Semarang. The research design was observational with cross sectional approach.⁹ The population was 35 santri with 25 samples. The inclusion criteria of santri are *baligh*. Quantitative data were collected through self-administered questionnaires, and analyzed the univariate and bivariate ^{18,11}.

RESULTS AND DISCUSSION

The majority of santri are aged 15-19 years (68%), with female santri (58%) more than male (42%). Most are in high school (52%). Perceived susceptibility, perceived seriousness and perception of benefits and barriers in high category were 60%, 56% and 80%, while cues to action on low category was 72%. There are 28% of santri who have sexual experience. There is no relationship to all perceptual independent variables on sexual experience of santri.

All santri were categorized as teenagers (young people) with equal numbers of men and women and most of them were in high school education.

Table 1: Sexual Experience

No.	Sexual Experience	F	%
1.	Never	18	72.0
2.	Ever	7	28.0
Total		25	100.0

Table 1 showed that there were santri who have sexual experience, although they do not disclose the type of sexual experience that has ever been conducted. Eventhough the percentage of those who had sexual experience is small (28%), it should be interpreted as iceberg phenomenon. It is small on the surface, but the bottom is very large. This finding indicates that the boarding school should begin to provide reproductive health education to the santri. The reproductive health education will aimed to give knowledge and build positive attitude toward sexual and reproductive health. Therefore it could also prevent same-sex sexual activity, or even premarital sex. Aritonang in 2015 found that knowledge and attitude are predisposing factors that will motivate someone to act positively or negatively. It was also found that good knowledge and attitude will affect the behavior of premarital sex.¹²

Table 2: Perceived Susceptibility of Santri

No.	Perceived Susceptibility	F	(%)
1.	Low	10	40.0
2.	High	15	60.0
Total		25	100.0

Perceived susceptibility and seriousness in the high category, as well as perceived on the benefits and barriers, while the cues to action on the low category.

The expected behavior in this study is that students can prevent themselves from the act of LGBT which could be the trigger of the emergence of HIV/AIDS. Behavior will be achieved or can not be observed through the theory of Health Belief Model.¹²

Their perceived of susceptibility is high because they feel prone to imitate the acts leading to LGBT behavior. Although they have the notion that LGBT behavior is not allowed by religion, they believe that LGBT does not bring harm to the perpetrators and is a phenomenon that will disappear by itself. They also assume that if they or their families are in LGBT nuanced environment they can also imitate the act of LGBT. The surprising thing is that orphanages or boarding schools are also vulnerable to LGBT behaviors.

Table 3: Perceived Seriousness of Santri on LGBT Behavior

No.	Perceived Seriousness	F	(%)
1.	Low	11	44.0
2.	High	14	56.0
Total		25	100.0

The perceived seriousness that is in the high category. Most santri expressed that they believed LGBT behavior would suffer tremendous torture in the hereafter, and the culprit would be excommunicated by the community in addition to triggering HIV/AIDS causing future loss and even death. The LGBT will also find it difficult to get a job. But what needs to be underlined is that they believe in the boarding school environment, there are santri who behave like LGBT, one of them is *dalaq* phenomenon in pesantren.^{4,5,6}

Table 4: Perceived of Benefits and Barriers of Santri to LGBT Behavior

No.	Benefits and Barriers	F	(%)
1.	Low	5	20.0
2.	High	20	80.0
	Total	25	100.0

About the perceived benefits, santri thought that some will have LGBT behavior when they feel peace if the environment is supporting such as giving examples of LGBT behavior and as a means to vent the lust that is difficult to be expressed in their environment. Since Pondok Pesantren teaches Islamic norms, which one of them is forbid premarital sexual activity. But the perceived barrier to LGBT behavior is from family and peer group of santri. This result is supported by the research result from Sidqin in 2017. Sidqin found that the external factors that affect the tendency of becoming LGBT are lack of support from family especially parents, mislead parenting, homogeny environment, and life style. Other research also found that family support on sexual and reproductive health education could prevent children on turning into doing LGBT-related behavior.^{14, 15, 16}

However, other research found that peer group among teenagers forms the feeling of sympathy and empathy to their peers. Teenagers tend to develop the feeling of fondness whether to different sex or to same sex. It shows the affection aspect of teenagers is developing very well. However, if teenagers exposed to LGBT-related behavior it will change their perception from the feeling of empathy to feeling of affection or love.¹⁷

Table 5: Cues to Action to LGBT Behavior

No.	Cues to Action	F	(%)
1.	Low	18	72.0
2.	High	7	28.0
	Total	25	100.0

The Cues to Action, santri perceived that they tend not to engage in LGBT behavior because of the prohibition from the religion, family, community leaders, friends, doctors and media who reports.

Table 6: Recapitulation of bivariate Test Results

No.	Independent Variable	Dependent Variable	P
1.	Perceived Susceptibility	Sexual experience	0,378 Not related
2.	Perceived Seriousness		0,090 Not related
3.	Perceived benefits and barriers		0,113 Not related
4.	Cues to Action		1,000 Not related

There is no relationship between perceptual independent variables of susceptibility and seriousness as well as from the side of benefits and barriers as well as cues to action with the sexual experience of santri ($H_0 =$ acceptable). The perception of a person depends on the social background of each individual’s culture, including santri in Pondok Pesantren. The perceptual variable is not the only variable that becomes the determinant of sexual behavior. There are many other determinants of behavior that must be explored to link it to sexual behavior.

CONCLUSION

All santri are categorized as teenager with the majority is in high school. Few santri have had sexual experience. Perceived susceptibility, perceived seriousness, and perceived benefits and barriers to LGBT behavior were in high categories, whereas cues to action were in low categories.

It is suggested to give education about adolescent reproductive health to santri in Pondok Pesantren so that they are empowered in reproductive health continually in curriculum of Pondok Pesantren. It is also suggested to improve the facilities and personal facilities of students such as santri rooms and also make regulation of reproductive health related behaviors in order to anticipate LGBT behavior.

ACKNOWLEDGMENT

The researchers would like to thank Muslims, Ahmad Ramdan, Sri Wahyuningsih, Ajeng and Yayuk Musayyidah for their assistance in collecting data in the

field and Dean of the Faculty of Public Health Diponegoro University for the financial support provided.

Ethical Clearance: The research has received ethical clearance approval No.270/EC/FKM/2016 dated December 20, 2016 from Ethics committee Faculty of Public Health University of Diponegoro Semarang

Competing Interest: The authors declare that they have no competing interest

REFERENCES

1. Bulletin of Dakwah Hizbut Tahrir Indonesia AL Islam. Beware of LGBT Virus Threatening Law (Internet) .2016. (Edition No. 792, Friday 5 February 2016 M/25 Rabi'ulAkhir 1437 H. Retrieved 21 June 2016 at 14.35). Available at <http://hizbut-tahrir.or.id/2016/02/03/awas-virus-lgbt-mengancam-umat/>.
2. Hizbut Tahrir Indonesia Islamic Missionary Bulletin. LGBT: Part of the Attack on Western Culture. (Internet) .2016. (Edition No.794, 10 Jumadulwal 1437 H - 19 February 2016 M. accessed on 21 June 2016). Available at <http://hizbut-tahrir.or.id/2016/02/19/lgbt-bagian-dari-serangan-budaya-barat/>
3. Kartikawati R. Reproductive Health and Sexuality Issues at Pondok Pesantren. (Accessed June 23, 2016). Available at <https://seperlima.com/2014/11/11/prosedur-kesehatan-reproduction-dan-seksualitas-di-pondok-pesantren/>
4. Zuhri S. Dalaq in Pesantren [Magister thesis]. Yogyakarta: UGM, 2006.
5. Kamiasari Y, Prabamurti PN, Musthofa SB. Mairil's behavior and affection related to homosexual activities in Islamic boarding schools. Indonesian Health Promotion Journal. 2014. January. Vol.9, No.1. ISSN: 1907-2937
6. Prabamurti PN. Santri Reproductive Health Survey, Study at Several Islamic Boarding Schools in Semarang City. Research Report. Semarang: FKM UNDIP, 2014.
7. Narendra MB. Child Growth and Learning (Textbook I). Jakarta: Sagung Seto Publisher; 2002.
8. Ros HS, Mico PR. Theory and Practice in Health Education California: Mayfield Publishing Company ; 1980.
9. Sastroasmoro S. Basic foundation of the Clinical Research Methodology. Jakarta: CV. Sagung Seto; 2014
10. Babbie E. The Practice of Social Research. California: Wadsworth Publishing Co.; 1986
11. Glanz K. Health Behaviour and Health Education, Theory, Research and Practice. San Fransisco: Jossey-Bass Publisher; 1994.
12. Aritonang TR. Relationship between Knowledge and Attitudes about Reproductive Health with Behavior of Premarital Sex in Aged Ages (15-17 Years) at Yadika 13 Tambun Vocational School, Bekasi. Widya Scientific Journal. Vol. 3 No. 2. September 2015. ISSN 2337-6686.
13. Ministry of Education and Culture. Learning House. Islamic boarding school. (Internet). (accessed on August 13, 2018). Available at <https://belajar.kemdikbud.go.id/PetaBudaya/Repositorys/pesantren/>
14. Sidqin AM. Islamic Counseling and Psychotherapy Studies in Dealing with Santri Tending to LGBT (SSA = Same Sex Attraction) in Boarding Schools. 2017. (accessed on August 14, 2018). Available at <http://repository.umy.ac.id/handle/123456789/12299>
15. Ermayani T. LGBT in the Islamic Perspective. Humanika Journal, Th. XVII, No. 1. September 2017
16. Rianawati. Child Sex Education in Anticipating LGBT Behavior. Raheema: Journal of Gender and Child Studies. Vol 3, No.1. 2016
17. Aryanti Z. Risk Factors for the Occurrence of LGBT in Children and Adolescents. Nizham, Vol. 5 No. January 1, 2016.
18. Dahlan MS. Statistics for Medicine and Health. Jakarta: Salemba Medical; 2008

Factors that Affect the Success of Tuberculosis Therapy in Primary Care: Type of Tb Preliminary Studies

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ABSTRACT

The incidence of tuberculosis disease is a public health problem, although there are standards of therapy and clinical pathway for TB patients. Complications of TB disease will lead to increase mortality and to decrease quality of life of patients. The effectiveness of drug therapy should be enhanced by developing an educational or counseling model as non-pharmacological treatment of primary care. Preparation of that model start with knowing factors that influence the success of tuberculosis therapy in primary care. This step is needed to make the model effective and in accordance with the service condition. The purpose of this research is to know the factors influencing the success of tuberculosis therapy in primary care as the first step to formulate the intervention model of behavior change of Tuberculosis patients. The study design was a cohort for 4 months with a total of 40 early tuberculosis patients. Data collection was done in primary by interviewing with questionnaire guidance. Secondary data retrieval was conducted to obtain therapeutic data, clinical outcomes, laboratory and radiology. The results showed family support factors, medication adherence, companion to take medication from family and good nutrition intake have an effect on the success of tuberculosis therapy. Tuberculosis pharmacologic therapy should be supplemented with family support, medication adherence, companion taking of family-derived medication and good nutritional intake. The conclusion showed the most patient has pulmo tuberculosis (61.9%), age <50th (81%), and woman (52,4%). Mineral (Fosfor) from nutrition intake factors have relationships in tuberculosis therapy ($p = 0.014$; $p < 0,05$).

Keywords: Success of therapy, factor, model, primary service

INTRODUCTION

Tuberculosis is a contagious disease caused by *Mycobacterium Tuberculosis*. Tuberculosis is a disease of global concern. With various control efforts being carried out, the incidence and death due to tuberculosis have decreased, but Tuberculosis is estimated to still attack 9.6 million people and cause 1.2 million deaths in 2014.¹ India, Indonesia and China are countries with the most Tuberculosis sufferers, namely 23%, 10% and 10% of all sufferers in the world.² Complications of tuberculosis will lead to increased mortality and decrease the quality of life of patients. The effectiveness of therapy should be enhanced by developing knowledge of the factors that influence the success of tuberculosis therapy. Treatment attendance, family carrying capacity, the role

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of drug guidance, depression and nutritional intake in tuberculosis patients are thought to be associated with successful tuberculosis therapy.

OBJECTIVE

Assess the relation of adherence to treatment, family supporting capability, role of drug-taking guides, depression and nutrition with successful tuberculosis therapy

METHOD

The study design was a cohort for 4 months with a total of 40 early tuberculosis patients. Data collection was done in primary by interviewing with questionnaire guidance. Secondary data retrieval was conducted to obtain therapeutic data, clinical outcomes, laboratory and radiology. Place of study in polyclinic and clinic treatment center.

RESULTS AND DISCUSSIONS

Patient characteristics with the number of frequency and percentage are presented in table 1. Patients without depression and patients with mild depression category had the highest number of all respondents. Almost all patients have good treatment, except for one patient. 19 out of 21 patients who have good family support. Then there were 13 people from 21 people who did not get good medication reminders. For nutritional intake, most patients are still lacking in protein, fat, carbohydrates, vitamin A, and vitamin c. Whereas energy intake in tuberculosis patients is less and normal than 9 people. Mineral phosphorus is dominated by patients with over 8 people.

Based on table 2, description of the condition of tuberculosis patients for HDRS very severe on extrapulmonary tuberculosis of 4.8%. Description of the condition of tuberculosis patients less disobedient category in taking tuberculosis drug in pulmonary tuberculosis of 28.6% and in extrapulmonary tuberculosis of 14.3%. The carrying capacity of less family in pulmonary tuberculosis is 9.5%.

Table 1: TB Patient characteristics of depression scale, taking medicine, carrying capacity and nutritional intake

Patient characteristics	Frequency	Percentage
Hamilton Depression Rating Scale		
Normal	9	42.9
Mild	9	42.9

Conted...

Moderate	1	4.8
Severe	1	4.8
Very Severe	1	4.8
Treatment Compliance		
Obedient	20	95,2
Disobedient	1	4,8
The carrying capacity of the family		
Positive support	19	90,5
Negative support	2	9,5
Role of supervisor taking medicine		
Good	4	19,0
Bad	13	61,9
None	4	4,8
Nutritional intake		
PROTEIN		
Less	16	76.2
Normal	4	19.0
More	1	4.8
ENERGY		
Less	9	42.9
Normal	9	42.9
More	3	14.3
FAT		
Less	15	71.4
Normal	5	23.8
More	1	4.8
CARBOHYDRATE		
Less	18	85.7
Normal	3	14.3
VITAMIN A		
Less	14	66.7
Normal	3	14.3
More	4	19.0
MINERAL (FOSFOR)		
Less	6	28.6
Normal	7	33.3
More	8	38.1
VITAMIN C		
Less	18	85,7
Normal	3	14,3

Table 2: The relation of factors that affect the success of TB therapy with the type of TB

Variable	Type of TB		Σ TB Patient	P	OR
	Pulmonary TB	Extra pulmonary TB			
Hamilton Depression Rating Scale					
Normal	7 (33,3%)	2 (9,5%)	9 (42,8%)	6.010	0.289
Mild	2 (23,8%)	4 (19,0%)	6 (28,6%)		
Moderate		1 (4,8%)	1 (4,8%)		
Severe	1 (4,8%)		1 (4,8%)		
Very Severe		1 (4,8%)	1 (4,8%)		
Treatment Compliance					
Obedient	12 (57.1%)	8 (38.1%)	20 (95,2%)	0.600	0.289
Disobedient	1 (4.8%)		1 (4,8%)		
The carrying capacity of the family					
Positive support	11 (52.4%)	8 (38.1%)	19 (90,5%)	0.579	0.505
Negative support	2 (9.5%)		2 (9,5%)		
Role of supervisor taking medicine					
None	4 (19.0%)		4 (19,0%)	5.467	0.127
Good	6 (28.6%)	7 (33.3%)	13 (61,9%)		
Bad	3 (14.3%)	1 (4.8%)	4 (19,1%)		
Nutritional intake					
PROTEIN					
Less	8 (38.1%)	8 (38.1%)	16 (76,2%)	5.729	0.133
Normal	4 (19%)		4 (19,0%)		
More	1 (4.8%)		1 (4,8%)		
ENERGY					
Less	3 (14.3%)	6 (28.6%)	9 (42,8%)	6.918	0.052
Normal	7 (33.3%)	2 (9.6%)	9 (42,8%)		
More	3 (14.3%)		3 (14,4%)		
FAT					
Less	7 (33.3%)	8 (38.1%)	15 (71,4%)	7.182	0.075
Normal	5 (23.8%)		5 (23,8%)		
More	1 (4.8%)		1 (4,8%)		
CARBOHYDRATE					
Less	10 (47.6%)		18 (85,7%)	0.556	0.257
Normal	3 (14.3%)	8 (38.1%)	3 (14,3%)		
VITAMIN A					
Less	8 (38.1%)	6 (28.6%)	14 (66,7%)	0.471	0.797
Normal	2 (9.5%)	1 (4.8%)	3 (14,3%)		
More	3 (14.3%)	1 (4.8%)	4 (19,0%)		
MINERAL (FOSFOR)					
Less	3 (14.3%)		6 (28,6%)	11.217	0.014
Normal	2 (9.5%)	3 (14.3%)	7 (33,3%)		
More	8 (38.1%)	5 (23.8%)	8 (38,1%)		
VITAMIN C					
Less	10 (47.6%)	8 (38.1%)	18 (85,7%)	0.556	0,257
Normal	3 (14.3%)		3 (14,3%)		

Our study provides evidence that patient with mild depression can be found out in both type of TB, 2 patient for Pulmonary TB, and 4 patient for Extrapulmonary TB. While moderate and very severe depression only found in Extrapulmonary TB (4,8%), and severe depression is only found in Pulmonary TB (4,8%). All of them has odds ratio 0,289, which means depression factors can be affect the type of tuberculosis patient 0,289x more than tuberculosis patient with no depression. Previous studies said TB patients have a high risk of significant depression when compared to the general population.³ And previous studies have also reported that stigma is often attached to health problems, including tuberculosis. The stigma attached to TB sufferers is like rejection, exclusion, fear of infection or transmission, changes from people with TB.⁴ The stigma in tuberculosis can lead into depression and can cause treatment delay and have a negative impact on the continuity of treatment. Negative impacts in treatment continuity may lead to discontinuation of treatment in patients with tuberculosis that may lead to unresolved treatment.⁵

Compliance is an individual's behavior (for example: taking medication, adhering to a diet, or making lifestyle changes) as recommended by therapy and health. The level of compliance can be started from the act of paying attention to every aspect of the recommendation to obeying the plan.⁶ Based on table 2, most of patient (95,2%) was obey. Adherence to treatment is behavior that shows the extent to which individuals follow recommendations related to health or disease. Based on the explanation above, it can be concluded that the behavior of adherence to treatment is the extent to which the efforts and behavior of an individual shows conformity with the rules or recommendations provided by health professionals to support his recovery. There are 4 factors that influence patient compliance in undergoing treatment, namely treatment-related factors, patient-related factors, factors related to medical personnel and factors related to health care provider systems. If these four factors synergistically support, the patient's compliance in carrying out the treatment, the therapeutic target of healing can be achieved.⁷

Family support capacity has a role in the success of tuberculosis therapy. The family has a great role in controlling tuberculosis treatment, because the duration of TB treatment is long and must be organized and the patient also needs support in other things such as daily activities, nutritional support, from emotional to

instrumental aspects such as financial support.⁸ Long-term treatment and the effects of medication make the patient uncomfortable so that they do not continue treatment, so family support is also needed as a means of treatment compliance.⁹

Families can contribute to contributing to patients in two ways: supporting and caring for patients. Previous research suggests that patients feel support and care should be given directly by the family. The intended support is in the form of assistance in daily routine activities, financial assistance, emotional and moral support, and motivation to complete treatment. Another thing that patients need to be supported is to accompany during treatment, to take and take medication, provide food, and give them time to rest.¹⁰ Family support has a positive effect on nutritional status and adherence to treatment and high family support can increase the likelihood of making the patient's nutritional status better and more obedient in treatment.¹¹

The results of the study indicate that work and health services are not a risk factor for treatment behavior for pulmonary TB patients. While the role of PMO, family support and discrimination is a risk factor for treatment behavior for pulmonary TB patients. This means that if the PMO does not carry out its role properly, it can affect the patient's treatment behavior which then has an impact on therapeutic success. Direct treatment supervision is important at least during the intensive treatment phase (first 2 months) to ensure that the drug is eaten with the right combination and the right time period. With direct supervision of treatment, patients do not assume responsibility for compliance with drug use alone.¹² Health care workers, community health workers, the government and the public must all share responsibilities and provide a lot of support to patients to continue and complete their treatment. Treatment supervisors can be anyone who wants, is trained, is responsible, can be accepted by the patient and is responsible for the supervision of tuberculosis treatment.¹³

According to Dorland (2015) nutrition is taking food and burning from food substances that contain nutrients by an organism for survival. Nutritional intake is the amount of food that a person eats in order to obtain energy. As for these foods like carbohydrates, protein, fat. Other names of these nutrients are macro nutrients.¹¹ The problem of nutrition intake is important because the improvement of nutrition is one of the efforts to

break the transmission and eradication of tuberculosis in Indonesia.¹⁴ Besides that, the lack of macro nutrients will have an effect on Zinc, Vitamin A, Vitamin C, Vitamin D and Mineral deficiency. This lack of micronutrients will result in damage to critical cell immunity to fight tuberculosis.¹

CONCLUSION

Adherence to treatment, Family carrying capacity, Role of drug taking guides (PMO), Depression and Nutritional intake related to the success of tuberculosis therapy.

Conflict of Interest: The authors declare that they have no conflicts of interest.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the contribution of Universitas Muhammadiyah Yogyakarta . The trial was financially supported by the research institution, publications and community service, No: 151.S/SK-LP3M/III/2018.

Ethical Clearance: The study was approved by Institutional ethics committee

REFERENCES

1. Ministry of Health RI.. *National Tuberculosis Control Guidelines..* Jakarta : Directorate General of Disease Control and Environmental Health.2014
2. World Health Organization. Global tuberculosis report. Geneva :World Health Organization, 2016.
3. Dos Santos, A.P.C., Lazzari, T.K., Silva, D.R., *Health-Related Quality of Life, Depression and Anxiety in Hospitalized Patients with Tuberculosis.* Tuberc. Respir. Dis. 2017 :80, 69–76. (2017).
4. Chinouya, M.J., Adeyanju, O. *A disease called stigma: the experience of stigma among African men with TB diagnosis in London.* Public Health 145, 45–50. (2017).
5. Courtwright, A., Turner, A.N., *Tuberculosis and stigmatization: pathways and interventions.*

- Washington DC :Public Health Rep. Wash. DC 1974 125 Suppl 4, 34–42. (2010).
6. Koziar, B., n.d. *Fundamentals of Nursing.* 9th edition. London :Pearson, 2013.
 7. Case Management Adherence Guidelines (CMAG), 2006. *Case Management Adherence Guidelines*, 2.0 Case Management Society of America. ed.
 8. Kaulagekar-Nagarkar, A., Dhake, D., Jha, P., *Perspective of tuberculosis patients on family support and care in rural Maharashtra.* Indian J. Tuberc. 2012; 59: 224–230.
 9. Samuel, B., Volkmann, T., Cornelius, S., Mukhopadhyay, S., MejoJose, Mitra, K., Kumar, A.M.V., Oeltmann, J.E., Parija, S., Prabhakaran, A.O., Moonan, P.K., Chadha, V.K.. *Relationship between Nutritional Support and Tuberculosis Treatment Outcomes in West Bengal, India.* J. Tuberc. Res. 2016; 4: 213–219. <https://doi.org/10.4236/jtr.2016.44023>
 10. Samal. *Family perspectives in the care and support of tuberculosis patients: An Indian context.* JACP.2017;5:67 [WWW Document]. URL <http://www.jacpjournal.org/article.asp?issn=2320-8775;year=2017;volume=5;issue=2;spage=67;epage=69;aualast=Samal> (accessed 8.4.18)
 11. Gupta, Krishna Bihari, Rajesh Gupta, Atulya Atreja, Manish Verma, Suman Vishvkarma, and others. 2009. “Tuberculosis and Nutrition.” *Lung India.* 2009;26 (1): 9.
 12. Lisu Pare, A., Amiruddin, R., Leida, I., *Relationship between work, PMO, health services, family support and discrimination with medical treatment for pulmonary TB patients.* Makasar: Public Health Faculty, Unhas, 2013, URI: <http://repository.unhas.ac.id/handle/123456789/3282>
 13. WHO, *Tuberculosis. Geneva :WHO. 2017* [WWW Document]. WHO. URL <http://www.who.int/mediacentre/factsheets/fs104/en/> (accessed 5.26.17).
 14. Suharyo. *Jurnal kesehatan masyarakat determinasi penyakit tuberculosis di daerah pedesaan.* Jurnal Kesehatan Masyarakat. 2013; vol. 9 (1): 85-91.

Mapping of Tuberculosis (TB) Prevalence in Padang City

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ABSTRACT

Transmitted TB disease is still a concern of the World because it can attack anyone and anywhere. The prevalence of pulmonary tuberculosis in Padang City increased by 0.18% in 2016. This study aims to obtain a picture and to know whether or not there is a relationship between socio-demographic and environmental variables on the prevalence of Pulmonary TB per sub-district in Padang City. A descriptive analytic study with an ecological study design on secondary data in Padang City Health Office. Data were analyzed by univariate and bivariate using correlation test and linear regression. The result of bivariate analysis showed that the percentage of healthy house and phosphate households was related to the prevalence of Pulmonary TB ($r = -0.854$) and ($r = -0.607$). While the percentage of sex ($r = 0,103$), population density ($r = 0,185$), ratio of health service facility ($r = -0,061$) also have no correlation with prevalence of Pulmonary TB per sub-district in Padang City. Healthy homes and phylogenic households have an influence on the association of socio-demographic and environmental factors with the prevalence of pulmonary tuberculosis. It is expected that the Health Office, Public Health Center and related health agencies can improve the prevention and control of pulmonary TB disease. Approach to the community especially family in the household is one of the right way to reduce the risk of pulmonary tuberculosis in increasing the percentage of healthy house and households behave healthily especially Nanggalo and Bungus sub district in Padang City.

Keywords: Ecology, environment, prevalence, socio-demography, Pulmonary TB

INTRODUCTION

Lung Tuberculosis is an infectious disease caused by Mycobacterium tuberculosis and the second leading cause of death after HIV.¹ TB disease is also the leading cause of death number 5 after cardiovascular disease and airway disease in all age groups and number 1 of the infectious disease class.² Data (WHO) 2013 shows an increase in the number of TB infected TB cases by 0.6% in 2014.³

Indonesia is ranked fifth with the highest TB burden in the world.¹ TB prevalence rate in Indonesia in 2013 is 0.4% of the population.⁴ The prevalence of pulmonary TB in West Sumatra in 2013 is 0.2%. In 2014

the prevalence of TB in West Sumatera is 0.11% and in 2016 the prevalence of Pulmonary TB in West Sumatra has increased to 0.15%. The city of Padang accounts for a high rate of pulmonary TB incidence in West Sumatera Province. The prevalence of pulmonary tuberculosis in Padang City in 2014 is 0.11%. While in 2016 increased to 0.18%. This figure exceeds the prevalence rate of Pulmonary TB in West Sumatera (0.15%)⁵⁻⁷

The high prevalence of Pulmonary TB is caused by various risk factors. Some of the risk factors for pulmonary tuberculosis are socioeconomic factors, demography, environmental health and behavioral factors. Research conducted by Rukmini,

That there are several risk factors for pulmonary tuberculosis, such as age, sex, job status, nutritional status, physical condition of the house. This is supported by research conducted by Jendra in Wori Sub district which states that age, sex, and occupancy density are risk factors for pulmonary tuberculosis. The Sylva Lestari study in Lampung also showed that the population density and Health Behavior related to the occurrence of Lung TB⁶⁻¹⁰

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Study of Chandra Wibowo found that in men get pulmonary TB In case of contact 0, 36 times in women. This study also confirmed that the density of the population is related to the incidence of tuberculosis in Lampung Province and in line with Deska Adi's research which says that there is a relationship of clean and healthy life behavior with the incidence of Pulmonary Tuberculosis (0.002)¹¹⁻¹³

Padang City is the capital of Sumatera Province West. Padang City has the largest population of 914,968 people. Population density in Padang City is 11316 people / km². Padang City consists of 11 districts and 104 sub-districts. The total number of houses in Padang City is 176,745 units, while the number of households recorded is 199,704. The number of health service facilities in Padang City is 29 units of hospital, 22 units of health center, and 62 Health Center auxiliary⁷

Research on pulmonary tuberculosis has been done by previous researcher. But the research of Pulmonary TB using ecology is still little done especially in Padang City. Ecological studies are epidemiological studies with populations as units of analysis, aimed at describing the correlative relationship between the disease and the factors of interest of the researcher can determine whether or not the relationship and where the relationship is (positive / negative). So that the researcher can directly find the existence of relationships and the level of relationship variables that are reflected in correlation coefficient¹⁴⁻¹⁵

Previous research on Pulmonary TB has been done in the city of Padang. As research conducted by Shabrina about the risk of TB in the work area of Andalas Health Center in Padang City using case control design¹⁶ While research of Pulmonary TB with cross sectional design also done by Ivan Putra in the same place¹⁷. Some studies that have been done in Padang City generally discuss at the individual level, for the population level is still rarely done. Research with ecological approach needs to be done in Padang City because, suspected that demographic condition and environmental condition of Padang city at risk for the happening of Pulmonary TB. Through the ecological approach is expected. This study can be a broader policy input in the process of preventing and promoting the incidence of Pulmonary TB in the city of Padang.

METHOD

This study uses an ecological study design. Ecological studies were used to examine the relationship between socio-demographic and environmental factors on the prevalence of pulmonary tuberculosis in Padang City. The population in this study is all sub-districts contained in Padang Municipality

Secondary data on the incidence of TB disease per sub-district was measured by document review. Reports and recapitulation data of Lung TB prevalence in Padang City Health Office is used as a measuring tool. Secondary data on socio-demographic and environmental factors on lung tuberculosis prevalence consisting of age, sex, population density, and healthy house, Health Behavior and health facilities were obtained from data recording of Health Office of Padang. The results of recording and recapitulation of the data used as a measuring tool.

RESULTS AND DISCUSSIONS

Table Bivariate Analysis

Variabel	r	R ²	p value
% Sex	0,103	0,011	0,763
% population density	0,185	0,034	0,587
% healthy home	-0,635	0,404	0,036
% Households behave healthily	-0,607	0,368	0,048
Ration of Health Facilities	-0,061	0,004	0,859

Based on the analysis of the correlation between relationship socio-demographic and environmental factors on the prevalence of pulmonary tuberculosis revealed that there was no significant relationship between male sex percentage and TB prevalence ($p = 0.763$), had weak strength ($r = 0.103$) with positive direction. There was no significant association between population density and lung TB prevalence ($p = 0.587$), had weak strength ($r = 0.185$). There is a significant correlation between percentage of healthy house with prevalence of Pulmonary TB ($p = 0.036$), has strong strength ($r = -0.635$) with negative direction. There was a significant correlation between percentage of Households behave healthily with prevalence of Pulmonary TB ($p = 0.048$), had strong strength ($r = -0.607$) with negative direction. There is no significant relationship between the ratio of health care facilities and the prevalence of pulmonary tuberculosis ($p = -0.859$).

CONCLUSIONS

Percentage of male gender: The study is in line with Demsa stating that there is no relationship between sex and Tuberculosis occurrence (p value = 0.115)¹⁸. The study conducted by Merryani also states there is no relationship between sex with Tuberculosis incidence (p value = 0.201).¹⁹

Sex is one of the risk factors for pulmonary TB. In the world of TB Lung a lot of men. Pulmonary tuberculosis is more prevalent in males than in females as males mostly have smoking habits making it easier to contract pulmonary TB²⁰

According to the researchers' assumptions, there is no significant relationship between the percentage of male sex and the prevalence of pulmonary TB due to males men generally work outdoors to meet the needs of their families, whereas most women live in homes as housewives. That way more women spend time at home and that causes the risk to contract TB more. In the house contact with people with Pulmonary TB directly and often. This is what causes the risk of women suffering from Lung TB greater than men. In addition, because of the close contact relationship that plays a role because the longer the contacts, the more risky to catch TB germs.

Population density: This study is in line with research conducted by Dyah research which states that there is no relationship between population density and lung TB prevalence (p value = 0.97).²¹

Basically, population density has an effect on the occurrence of Pulmonary TB people susceptible to exposure to infectious pulmonary TB patients are higher in densely populated areas. The greater the community, the greater the range of health problems and the greater the number of health resources. And these resources are often needed because infectious diseases can spread more rapidly and environmental problems are often more severe in densely populated areas.²²

These results indicate that there is no significant relationship between population density and lung TB prevalence because the population density is not always more frequent contact occurs more often. Residential density at home is more risky because at home contacts occur directly and often. Pulmonary TB transmission

will be easy to occur even from parent to child or from one family member to another. The increased time associated with the patient is likely to be infected by the growing contact. The level of contact relationships is very important because the longer the contacts, the more risky to catch TB germs. The closeness of contacts is seen from household contacts and contacts outside the home. From the results of the study found significant differences in risk between population densities with contacts outside the home.

Percentage of healthy house: The study is in line with research conducted by Demsa's research which states that there is a relationship between room occupancy density and incidence of Pulmonary TB ($p = 0,005$)¹⁸ and there is also a relationship between ventilation area and pulmonary TB incidence ($p = 0,008$). In research Ryana also stated that there is correlation between lighting with Tuberculosis incidence ($p = 0,025$), and there is relationship between ventilation area with Tuberculosis event ($p = 0,005$)²³

In theory from some of the indicators one of the important healthy house requirement is density dwelling. The density of the inhabitants of the house can affect health, because if a dwelling house is densely populated it may allow the transmission of the disease from one human being to another. The excessive density of occupants in the room will have an effect on the development of the seeds of the disease in the room. Householder density is one factor that can increase the incidence of pulmonary tuberculosis and other infectious diseases.⁹

Ventilation and lighting in the home are also factors related to the occurrence of pulmonary tuberculosis. Eligible room ventilation allows for a change of air in the room, thereby reducing the likelihood of transmission to others as the germ concentration decreases.

A room with an inadequate ventilation area causes germs always in high concentration, thus increasing the likelihood of transmission to others. Inadequate ventilation causes inadequate airflow so that indoor air humidity rises and this condition becomes a good medium for the development of pathogens. The entry of sunlight into the house is expected to kill the TB germs released by the patient at the time of cough, so the number of germs in the house can be reduced and transmission is also reduced.

Percentage of households with Health Behavior: The study is in line with research conducted by Deska who said that there is a relationship of clean and healthy life behavior with the incidence of Pulmonary Tuberculosis (0.002)¹³

In theory, some indicators in Health behavior affect the occurrence of Pulmonary TB, such as clean water, fruit and vegetables and not smoking in the house. The behavior of people who still do not use clean water will cause disease. The existence of the disease will reduce the body's immunity so that other disease will also be easy to attack, one of which is Pulmonary TB. Likewise for consumption of fruits and vegetables which are indicators in Health Behavior to improve nutritional status in the household. With the fulfillment of nutrient status then it will increase the body immunity which then can reduce the risk of lung tuberculosis. No smoking in the home is the most important indicator in reducing the risk of TB infection. Those who smoked 3 to 4 times more positive test, which means 3 to 4 times more infected with pulmonary tuberculosis than non-smokers¹⁸

Ratio of health care facilities: This research is in line with research conducted by Herri in Malang stating that there is no relation between health service facilities and the incidence of Pulmonary TB (p value = 0,11)²⁴

Availability of health service facility is one of important factor in Lung TB prevention. However, according to the researcher's assumption, there is no relationship between the ratio of health facilities and the prevalence of pulmonary tuberculosis because in addition to the amount, other factors such as access to health service facilities and public knowledge about the existence of health service facilities can also affect the prevalence of pulmonary TB.

Rural areas are high the incidence of TB is high due to the distance factor to the health service facilities, also because of the lack of knowledge for the utilization of health service facilities and also economic problems so prefer not to seek medical facilities and prefer the traditional way. In the city of Padang for health care facilities such as health centers and hospitals are already available well, maybe only the spread is not evenly distributed. But it does not matter because the distance traveled to the health facilities means not too far away. Therefore, in this study, the ratio of health center and hospital ratios have no correlation with the prevalence of pulmonary tuberculosis.

CONCLUSIONS

Nanggalo Sub-district is the highest prevalence of pulmonary TB in 2016. The percentage of male sex, population density and ratio of health service facilities have no correlation to the prevalence of pulmonary tuberculosis in Padang City. While the percentage of healthy homes and households with health behavior has a strong power relationship with a negative direction toward the prevalence of pulmonary tuberculosis.

The Padang health office is expected to conduct cross-sectoral cooperation with the Central Bureau of Statistics of the city of Padang and the department of public works and public housing related to the distribution of healthy homes and households with healthy and clean behaviors in an effort to reduce the risk of tuberculosis.

The Public Health Center is expected to improve tuberculosis prevention and control, by approaching households to improve knowledge and understanding of the importance of healthy living behaviors.

The health office along with the public health center can provide counseling to the community to reduce the increase of lung TB in Padang city, especially to the community in the area with high lung TB prevalence and risky environmental conditions.

The health department can also disseminate information media such as leaflets, posters, etc., so that all walks of life can be touched with information about pulmonary TB.

Conflict of Interest: There is no conflict of interest in this research

Sourcing of Funding: The costs incurred in this study come from personal costs

ACKNOWLEDGEMENTS

Thank you to the city health office in Padang for giving permission and supporting the process of the results of this study.

Ethical Clearance: This study uses secondary data obtained from monthly report on disease control and prevention section in the Padang City Health Office in 2016. So the ethical clearance for this research is excluded from the research requirements.

Research permission is obtained from Health Office.

REFERENCES

1. P2PL, National Tuberculosis Control Strategy in Indonesia 2010-2014. Jakarta: Director General of Disease Control and Environmental Health. 2011.
2. Widoyono, Tropical Diseases, Epidemiology, Transmission, Prevention and Eradication. Jakarta: Erland. 2008.
3. Rafiglione, Tuberculosis Prevention, Care and Control 2010-2015 Global Farming and WHO Strategic Priorities. WHO: Geneva. 2009.
4. RI, DK, National Health Research of the Republic of Indonesia. Ministry of Health of the Republic of Indonesia. 2013.
5. West, DKS, Data Pulmonary TB West Sumatra. 2014 - 2016, West Sumatra Provincial Health Office: Padang. 2017.
6. Padang, DKK, Health Profile of Padang City. City Health Office of Padang Padang. 2014.
7. Padang, DKK, Health Profile of Padang City. Padang City Health Office: Padang. 2016.
8. Rukmini, Influential Factors Against Adult Lung TB Incidence in Indonesia (Basic Health Research Data Analysis Year 2010). Research Bulletin of Health System. 2011. 14.
9. Dotulong, JFJ, MR Sapulete, And GD Kandou, Relationship Of Risk Factor Age, Sex And Density Of Occupancy With Lung TB Disease In Wori Village Wori Subdistrict. Journal of Kedoteran Komunitas Dan Tropik. 2015.
10. Sylva, L., Effect of Land Use Change on Incidence of Pulmonary Tuberculosis: Study In Lampung Province (Effect Of Land Use Toward Pulmonary Tuberculosis Incidence: Study In Lampung Province). Faculty of Medicine, University of Lampung. 2017. 5.
11. Chandra Wibowo, MCW, H Mewengkang,, Contact Case of Pulmonary Tuberculosis at Lung Clinic Manado General Hospital ,. Indonesian Medical Magazine. 2004.
12. Woro, D, Increasing Social Determinants In Lowering Pulmonary Tuberculosis Incidence In Bandar Lampung City, U. Lampung, Editor. Department of Public Health Faculty of Health, University of Lampung: Lampung. 2012.
13. Kurniawan, DA, Relationship of Clean and Healthy Behavior (Phbs) With Pulmonary Tuberculosis Incidence In Residents In Kelurahan Distance, Wonosobo, Central Java, STIK 'Aisyiyah, Yogyakarta. 2010.
14. Emzir, Quantitative And Qualitative Research Methodology. Jakarta: PT Raja Grafindo Pergoda. 2009.
15. Abidin And M. Zainal, Correlational Research. 2010.
16. Izzati, S., Risk Factors Associated With Pulmonary Tuberculosis Incidence In Andalas Puskesmas Working Area 2013. 2015.
17. Siswanto, IP, Relationship Knowledge And Family Support With Drug Compliance Anti Tuberculosis At Andalas Puskesmas Padang. Journal of Health Andalas. 2015.
18. Simbolon, D., Risk Factors of Pulmonary Tuberculosis in Rejang Lebong District Journal of National Public Health. 2007. 2.
19. Girsang, M., Demographic Characteristics and Its Relation to Tuberculosis Disease in Central Java Province (Advanced Analysis Riskesdas 2007). 2010.
20. Bambang, R., Spatial Analysis of Spread of Pulmonary Tuberculosis Cases Viewed From Environmental Factors In And Outdoors In Pekalongan Regency, In Postgraduate Program Environmental Health, Diponegoro University Semarang. 2010.
21. Sumekar, DW, Spatial Relation of Population Density and Proportion of Pre-prosperous Families Against Lung Tuberculosis Prevalence in Bandar Lampung. Faculty of Medicine, University of Lampung.
22. JF, M., Public Health An Introduction, Jakarta: EGC Medical Book Publishers. 2007.
23. Ryana Ayu Setia Kurniasari, Suhartono, And K. Cahyo, Risk Factors Of Pulmonary Tuberculosis In Sub District Baturetno Wonogiri Regency. Media Health Society of Indonesia. 2012. 11.
24. „Mulyanto, H., Relationship Five Indicators of Clean and Healthy Behavior With Tuberculosis Multidrug Resistant Relationship Five Behavioral Indicators And Healthy Living With Multidrug-Resistant Tuberculosis. Journal of Epidemiological Public Health. 2014.

Analysis of Media Information about Elimination of Breeding Place

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ABSTRACT

Background: Elimination of Breeding Place (EBP) is the most effective effort in preventing the occurrence of Dengue Hemorrhagic Fever (DHF). This effort has been socialized to the grassroot in order to be willing and able to conduct EBP routinely. Information on how to conduct EBP has often been exposed by using media communication. The use of media is expected to improve the understanding of the community so that the practice of EBP can be routinely implemented.

Purpose: This study aimed to determine the effect of media information on EBP toward the practice of EBP.

Method: This research used cross sectional approach. The sample in this study was 95 women obtained by simple random sampling technique.

Results: Most of the respondents were late adult (41.1%), graduated from primary school (30.5%), and housewives (68.4%). Respondents who practice EBP had supportive availability of media information (58.6%) than those with less information availability (32%). There is a relationship between information availability with the practice of EBP ($p = 0.022$). Women with less supportive media availability had a risk of 3.00 times not practicing EBP compared to women with supportive availability to media information (95% CI = 1,144-7,890). More respondents who practice EBP were in the group that had supportive availability of information (56%) than the less availability of information media (46.7%). Besides, this study indicated that there is no relationship between the accessibility of media information with the practice of EBP ($p = 0.363$).

Conclusions: Availability of information media affects the practice of EBP. Women with less supportive information media availability had 3.00 times greater risk of not doing EBP. Meanwhile, the accessibility of media information about EBP has no effect on the practice of EBP in the community.

Keywords: *media information, elimination of breeding place, dengue fever*

INTRODUCTION

Each year, Indonesia has an average number of dengue cases reaching 100,000 cases. This makes Indonesia as one of the countries that have the most cases of DHF. DHF cases that have been recorded in the period 2010-2015 averaged 50,000 to 150,000 cases per year. Even incidents that occur reach 40-60 cases found in every 100,000 people. The trend of population deaths

due to dengue since 2012 until 2015 was increasing. This mortality has reached up to more than 0.75% annual death rate. The number is high so that more prevention efforts need to be maximized.¹

Based on data from the Ministry of Health of Indonesia, the number of dengue fever patients has reached 129,179 people by 2015. Throughout January 2016, the Directorate of Vector and Zoonosis Disease Control recorded 3,298 dengue cases with 50 deaths. While in the outbreak area recorded 492 cases, 25 cases of them died. Outbreaks occurred in 11 districts/cities in 7 provinces in Indonesia, one of which is Central Java.¹

DHF is a priority health problem in the province of Central Java. From 2008 to 2013, Semarang City was ranked 1 with the highest incidence rate (IR) DHF in

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Central Java. Semarang city is one of dengue endemic areas. In 2010, Semarang City ranks first in DHF endemic areas in Central Java. In 2008 there were 5,429 cases with IR 36.08/10.000 population and CFR 0.3%. In 2009 it decreased to 3,883 cases with IR 26.21/10.000 population and CFR 1.1% but in 2010 it increased again to 5,538 cases with IR 36.75/10.000 population and CFR 0.8%.²

The seriousness in controlling DHF is seen with the issuance of Local Regulation of City of Semarang Number 5 Year 2010 About Control of Dengue Hemorrhagic Fever. This regulation contains sanctions against violations of the implementation of DHF control in Semarang City. MOH decree no.581 in 1992 has been stated the efforts to control DHF to avoid the Dengue Outbreak by Elimination of Breeding Place (EBP). In the minister's decree stated that the EBP has done periodically by community coordinated by Head of village in the form of EBP with 3M plus as a core message. The success of EBP activities, among others, can be measured by the Free Larvae Rate (ABJ). ABJ is said to reduce or prevent transmission of DHF if the figure reaches 95%.^{3,4}

EBP itself is now experiencing progress and changes since the minister's decree. It is marked in 2004 has begun to introduce a method of communication in delivering information/messages that impact on behavior change in the implementation of EBP through local social cultural approach.⁴ One of the efforts to make EBP run well in the future is routinely EBP activity and socialization of community mobilization in order to realize EBP must be continuously improved. Efforts to convey information on the importance of doing EBP by every household have been intensified through several programs such as Sicientik (kids supervising the free larvae program), SRSJ (One House One Supervisor), PJR (Monitoring larvae density) routine, Jumat Bersih (Cleaning the environment together every Friday), routine counseling and other supportive activities. In every activity, the use of information media is very helpful in delivering health messages. The media used include flipcharts, posters, leaflets and videos that are displayed at local health centers. Use of good media will facilitate the public in understanding the information submitted by health workers. Along with the better understanding of the community regarding EBP, it is expected that EBP practices are also conducted according to the rules so that the incidence of Dengue Fever can continue to be suppressed.

The activities mentioned above have also been routinely conducted by Pudukpayung Health Center which is located in Banyumanik, Semarang City. Pudukpayung has vary characteristics because most of them are not the original residents. Pudukpayung Residents as many as 21,802 people, with details of 10,895 women and 10,907 men. Number of household is as many as 6.070 families. The proportion of the poor is as much as 7.04% or as many as 1,534 households. This area is far from the central government of Semarang City, which is on the border of Semarang City with Semarang Regency so it causing high migration of people from and out of town. In the year 2006 has been found 20 people with DHF in Pudukpayung.

This study aims to determine the effect of media information about the practice of EBP in the community in the Pudukpayung Semarang from the availability and accessibility perspective.

METHOD

This research used Cross sectional approach method. Cross sectional study is a research on the object of research that is measured and collected simultaneously, one time or one time at a time (the same time), and in this study there is no follow up or intervention. This research is quantitative survey research. The sample in this research is the women in Pudukpayung, Banyumanik, Semarang City. While for sample size calculated using Lemeshow formula with population proportion 0.5, 95% confidence level and precision 0,1 so the sample found as much 95 person. The sampling technique in this research used Simple Random Sampling technique. Respondents were taken only in Pudukpayung area to meet the data collection in the field according to the sample criteria.

Primary data were obtained from interviews of respondents with the help of structured questionnaires. While the secondary data obtained from the Ministry of Health data, on-line data, reference books and scientific journals.

Data obtained from respondents' answers will be analyzed quantitatively. Quantitative analysis will be done by the method that has been determined and done gradually. Data analysis used in this research is univariate analysis which is done to each variable from research result. Generally in the analysis only produce the distribution of each variable. In addition, the relationship

test is performed to determine the relationship between independent variables and dependent variables. To test the hypothesis, Chi Square (X²) test was done on significance level of 95% ($\rho < 0,05$) so that there is a statistically significant relationship between SPSS for windows very 16.00. Through the calculation of Chi Square (X²) the next test drawn the conclusion when ρ smaller than alpha ($\rho < 0.05$), then Ho is rejected and Ha accepted, which indicates a meaningful relation between dependent and independent variables and if ρ greater than alpha $\rho > 0.05$ then Ho accepted and Ha rejected which shows there is no significant relation between dependent and independent variables. While, multivariate analysis is a method in doing research on more than two variables simultaneously. By using this analytical technique can be analyzed the influence of several variables against other variables at the same time. In the multivariate analysis will be known which independent variables has the greatest effect on the dependent variable.

RESULTS AND DISCUSSIONS

Respondent's Characteristic: Kelurahan Pudukpayung is one of the villages in Banyumanik Sub-district, Semarang City. This village has an area of 392,932 km² with 23,080 residents.

The majority of women in this study was housewives (68,4%). What people do for occupation can affect one's level of knowledge through experience or knowledge directly or indirectly. In addition to affecting the level of knowledge, the work environment also affects behavior. As well as environment, behavior can be affected by environment either. People who do not have a job, although more leisure time but there are several factors that can influence the behavior of the correct prevention of DHF.⁵

Although many people have heard of DHF, some unaware of local transmission, its symptoms and of methods to reduce risk of infection. A lack of knowledge regarding prevention of mosquito breeding is evident that information about DHF and its prevention is needed for community especially who lived in dengue risk area. The enhancement of knowledge through different educational programs is needed to increase awareness of dengue fever. Some research found that female's knowledge about DHF is better than men's.^{6,7}

Table 1: Distribution of respondents characteristic (n = 95)

	Respondent characteristic	f	%
1.	Age		
	Late adolescent 17-25 yo	2	2,1
	Early adult 26-35 yo	17	17,9
	Late adult 36-45 yo	39	41,1
	Early elderly 46-55 yo	25	26,3
	Late elderly 56-65 yo	12	12,6
2.	Education		
	No education	4	4,2
	Graduated from elementary school	29	30,5
	Graduated from junior school	16	16,8
	Graduated from high school	32	33,7
	Graduated from college	14	14,7
3.	Occupation		
	Housewives	65	68,4
	Private employee	15	15,8
	Civil servant	4	4,2
	Labourer	11	11,6

EBP Practice

The Elimination of Breeding Place activity (EBP) includes:⁸

1. Drain water reservoirs at least once a week.
2. Closely sealed the water reservoirs such as water barrels, jars, and so on.
3. Removing or recycling used items that can hold water such as plastic bottles, cans, scrap tires, and other intercepts.

In addition, coupled with other ways are:⁹

1. Empty vases, bird drinks place and other places once a week.
2. Fix drains and gutters that are damaged.
3. Close the holes on pieces of bamboo, trees, and so on with soil.
4. Clean/dry places that can hold water such as banana peepah or other plants.
5. Drying other places that can accommodate rainwater in yards, gardens, cemeteries, empty houses, and so forth.
6. Keep mosquito larvae fish.

7. Use of mosquito screen/mesh on window.
8. Not hanging clothes in-house.
9. Sleep under net.
10. Adjust adequate lighting and ventilation.
11. Use anti-mosquito repellent to prevent mosquito bites.
12. Perform larvasidation ie put larvacides such as temephos in places that are difficult to drain or in areas that are difficult to water.

Other studies found that people in smaller households have a relatively greater likelihood of keeping their homes and surroundings clean and of taking preventive and protective measures to control vectors and vector bites compared with larger households.⁹

Table 2 shows most respondents (93%) have depleted the water reservoir regularly, at least 1 time per week. Only 65% of respondents closed the shelter and only 31% recycled used goods so that they could not be used for mosquito breeding. For places that are difficult to reach to be cleaned or drained it is advisable to use a larvalid powder.

Table 2: Distribution of EBP Practice (n = 95)

EBP Practice		f	%
1.	Drain the water reservoir once a week	88	93
2.	Closely sealed the water reservoir	62	65
3.	Recycle used goods	29	31
4.	Empty water vase, drinking water etc	27	28
5.	Sprinkle the larvicide powder	34	36
6.	Keep fish who eat larvae	25	26
7.	Install the wire net in the ventilation	36	38
8.	Not hanging the clothes	52	55
9.	Strive for lighting and ventilation	50	53
10.	Use mosquito net	8	8
11.	Use anti mosquito repellent/lotion	43	45
12.	Planting mosquito repellent plants	15	16

Larvacidation is the control of larvae of mosquitoes by giving a rainy insecticide to kill the larvae. This larvicidal administration can suppress the population density for a period of 2 months. There are various types of larvacides, including temephos, piriprosifen, metoprene, and bacillus thuringensis.⁸

While, adult mosquitoes can indeed be eradicated by fumigation (fogging) using insecticides (insect poison) but fumigation is not enough because the fumigation is killing only adult mosquitoes. The mosquito larva does not die with fogging. As long as the larva is not

eradicated, every day, new mosquitoes will emerge from the breeding grounds. This still needs to be socialized to the community because there are still many people who want to do fogging without doing EBP on a regular basis.⁸

Availability of Media Information: The delivery of health information can be done through media, both print media, electronic media, billboards and entertainment media. The availability of information media in this study includes information in various media and extension. Information will increase a person’s knowledge level so that with good knowledge will encourage a good attitude followed by doing EBP for DHF. By media, information can be disseminated to the wider community directly and offend awareness of health behavior, including DHF. Consistent utilization of the media will increase the likelihood of positive change.¹⁰ Media information can also be done through counseling. A person who has attended health counseling either from government agencies or from private parties will receive information that will then influence behavior change in a better direction. Health education is an educational activity conducted by giving a message, instilling confidence, so that people not only aware, know, and understand but also willing and able to do a suggestion that has to do with health in this case related to the practice of EBP.¹¹

Table 3: Distribution of information media availability

	Media Information Availability	f	%
1.	Acceptance of information	80	84
2.	Source of information		
	a. Newspaper	6	6
	b. Leaflet/brochure	4	4
	c. Poster	1	1
	d. TV	18	19
	e. Radio	1	1
3.	f. Socialization	78	82
	Being participant in socialization of DHF	77	81
4.	Information about DHF		
	a. Definition of DHF and EBP	33	35
	b. DHF Transmission	21	22
	c. DHF Symptom	26	27
	d. DHF Prevention	46	48
5.	e. EBP (plus)	67	71
	Organizer of socialization		
	a. Health center	18	19
	b. Head of village	65	68

In this study, socialization was reported as the most common source of information. The information mostly come from Head of village who give instruction in cleaning the surrounding environment regularly. In Indonesia, especially Java, Head of village become role model and respected by community. This is not similar to previous studies whereby mass media was cited to have a major role in disseminating information about dengue. Another study in Thailand found that health personnel were the main source of dengue fever information. Besides, preventive behaviors were significantly associated with information provided from sources that included heads of villages ($p = 0.031$).^{12,13}

The results of this study indicate that there is relationship between the availability of information

media with the practice of EBP ($p = 0.022$). Other results showed, that the availability of respondents' information media had a significant influence on the behavior of EBP DHF in Karangjati, Blora ($p < 0.001$).¹⁴ The results of the study also in line with the research conducted in which shows that there is a correlation between health counseling with the practice of EBP DHF in Mulyoharjo Sub-district of Jepara Regency ($p = 0,02$).¹⁵ The results of this study are in line with research conducted by Alidan which states that there is a meaningful relationship between health education with the practice of eradicating mosquito breeding in Simpang III Sipin village, Kota Baru Kota Jambi.¹⁶ Other studies also reveal that there is a significant relationship between exposure counseling with the practice of respondents in EBP DHF.¹⁷

Table 4: Correlation between media information availability with EBP practice (n = 95)

Availability of media information	EBP practice				Amount		95% CI	POR	p-value
	No		Yes		n	%			
	n	%	n	%					
Less supporting	17	12,1	8	32,0	25	100,0	1,144-7,890	3,00	0,022
Supporting	29	41,4	41	58,6	70	100,0			

There is a correlation between media availability and EBP practice. Women with less supportive media availability had a 3 times greater risk of not practicing EBP compared to women who had availability of information media support (95% CI= 1,144-7,890).

Accessibility of Information Media: Most of the respondent (68%) received information about EBP during community gathering activities, especially at women gathering called PKK. This makes the source of information obtained with a distance not far (80%) and no cost (98%). Almost all respondents (95%) were exposed to information about EBP once in a month.

Study in Thailand found that the respondents who have media exposure for 2–4 times per week or even more have increasing awareness about DHF. Declining media exposure cause low memory/information retention capacity in the population or lack of consistency.¹⁸

Table 5: Distribution of the accessibility of information media about EBP

Accessibility of information		f	%
1. Place	House	17	18
	Public places	6	6
	Public health center	4	4
	Community gathering	65	68

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2. Distance	Close	76	80
	Moderate	8	8
	Far	11	12
3. Exposure frequency	1 x/month	90	95
	2-3 x/month	2	2
	> 4 x/month	3	3
4. Cost	No cost	93	98
	Paid	2	2

Most respondents (84%) have received information about EBP. Such information is obtained from audio, visual and audio visual media. However, as many as 82% admitted receiving information about the EBP through extension or socialization activities organized by Pudukpayung Health Center as well as head of village and district. Most of the respondents had been participants in the counseling with the theme of DHF and the most frequently heard material was about prevention of DHF through the practice of EBP (Plus).

For the purposes of data processing, then the accessibility of information media is categorized into the accessibility of information media that support and the accessibility of information media is less support. More respondents who practice EBP is in the group that the accessibility of information media support (56%) than the accessibility of information media less support (46.7%). The results of this study indicate that there is no relationship between the accessibility of information media with the practice of EBP ($p = 0.363$).

Access to information media in this study includes place, distance, frequency and cost in obtaining information about DHF. By giving access to supporting information media, it is an opportunity for public to receive more information. The information received can be a source of knowledge that will affect the actions

and behaviors in the EBP and DHF. Access to media information that supports the access is easy to reach, high frequency, and does not require cost that people should pay.

Access to information is easier and more supportable because of the technology. Electronic media becomes a cheap medium, fast and easy to get information. The existence of technology makes people do not need to go far and spend big money to get information. Technology also increases the frequency of a person getting information, such as public service ads on radio or television that are broadcasted more than once a day. With the easy access of information, the level of knowledge of a person will increase which will affect the attitude and practice in implementing EBP and DHF.

Table 6: Correlation between accessibility of information with EBP practice

Accessibility of media information	EBP Practice				Amount		95% CI	POR	p-value
	No		Yes		n	%			
	n	%	n	%					
Less supporting	24	53,3	21	46,7	45	100,0	0,648-3,267	1,46	0,363
Supporting	22	44,0	28	56,0	50	100,0			

CONCLUSIONS

Availability to information media affects the practice of EBP. Women with less supportive information media availability had a 3.00 times greater risk of not doing EBP practices than respondents with availability of supporting information media. Meanwhile, the accessibility of media information about EBP has no effect on the practice of EBP in the community.

Conflict of Interest: The author declares no conflict of interest regarding the publication of this paper

ACKNOWLEDGEMENTS

The author thanks to all respondents who participated on this study.

Ethical Clearance: This research has been in accordance with the approval of the code of ethics from Faculty of Public Health, Diponegoro University.

REFERENCES

1. Ministry of Health RI. Controlling DHF by EBP (Plus). 2018:2-3. <http://www.depkes.go.id/pdf.php?id=16020900002>.

2. Lestari E, Sianturi CLJ, Hestningsih R, Wuryanto MA. DHF Larvae Vector Density. *J R&D Controlling Animal Diseases*. 2014;10(02):71-76.

3. Local Municipal Regulation of Semarang City no 5 Year 2010. 2013:1-27.

4. Ministry of Health RI. *Epidemiology Bulletin*. 2 August.

5. Monintja TCN. Relationship between Personal Characteristic, Knowledge and Attitude toward EBP Practice in Malalayang Manado. *Jikmu*. 2015;5(2b):503-519.

6. Gyawali N, Bradbury RS, Taylor-Robinson AW. Knowledge, Attitude and Recommendations for Practice Regarding Dengue Among The Resident Population of Queensland, Australia. *Asian Pac J Trop Biomed*. 2016;6(4):360-366. doi:10.1016/j.apjtb.2016.01.002

7. Bota R, Ahmed M, Jamali MS, Aziz A. Knowledge, Attitude and Perception Regarding Dengue Fever among University Students of Interior Sindh. *J Infect Public Health*. 2014;7(3):218-223. doi:10.1016/j.jiph.2013.11.004

8. Bakta N, Bakta IM. Relationship between Knowledge and Attitude toward EBP Practice for Preventing DHF in Payangan. 2014.
9. Alobuia WM, Missikpode C, Aung M, Jolly PE. Knowledge, Attitude, and Practices Regarding Vector-borne Diseases in Western Jamaica. *Ann Glob Heal.* 2015;81(5):654-663. doi:10.1016/j.aogh.2015.08.013
10. Harmani N, Hamal DK, Uhamka PF. Relationship between Women Characteristic toward EBP Practice for Preventing DHF in Karang Tengah Cianjur. 2013. <http://lemlit.uhamka.ac.id/files/dbd.pdf>.
11. Bensley, Robert J JB-F. *Community Health Education Methods: A Practical Guide.* 2nd ed. Sudbury: Jonesand Bartlett; 2003.
12. Jeelani S, Sabesan S, Subramanian S. Community Knowledge, Awareness and Preventive Practices Regarding Dengue Fever in Puducherry - South India. *Public Health.* 2015;129(6):790-796. doi:10.1016/j.puhe.2015.02.026
13. Sayavong C, Chompikul J, Wongsawass S, Rattanapan C. Knowledge, Attitudes and Preventive Behaviors Related to Dengue Vector Breeding Control Measures Among Adults in Communities of Vientiane, Capital of the Lao PDR. *J Infect Public Health.* 2015;8(5):466-473. doi:10.1016/j.jiph.2015.03.005
14. Listyorini PI. Factors Influencing EBP Practice in Karangjati Blora. *J Medical Record and Health Information.* 2016;6(1):6-15.
15. Dewi NP, Azam M. Factors Related EBP Practice in Mulyoharjo. 2017;2(1):80-88.
16. Alidan. The Corelation of Knowledge, Attitude and Health Elucidation to the Dengue Hemorrhagic Fever (DHF) Mosquito Breeding Place Eradication in Subdistrict of Simpang III Sipin District of Kotabaru Jambi Municipality. Yogyakarta; 2011.
17. Sarminah. Factors Related to EBP Practice. Public Health Faculty, University of Indonesia. 2012.
18. Boonchutima S, Kachentawa K, Limpavithayakul M. Journal of Infection and Public Health Longitudinal Study of Thai People Media Exposure, Knowledge and Behavior on Dengue Fever Prevention and Control. *J Infect Public Health.* 2017;10(6):836-841. doi:10.1016/j.jiph.2017.01.016

History of Children and Malnutrition Status in Magetan

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ABSTRACT

Malnutrition status in infants will give the long-term impact for the growth of children under five in the future. Family factors, history of the disease, and birth history of infants may affect the current nutritional status of children under five. The purpose of this study was to analyze the history of LBW, history of infectious disease, early breastfeeding, the number of families, and maternal education with the incidence of malnutrition status in toddlers in Magetan, Indonesia. The research method is observational with a case-control approach. The respondents of this study were mothers of children aged 6-60 months with malnutrition status of 54 toddlers as case group. The comparison of case and control respondents is 1:1. Chi-square test was used to analyze research data with 95% significance level ($\alpha = 0,05$). The results showed that there was a correlation between the history of LBW ($p = 0.045$; OR = 2.152; 95% CI = 1.008-4.595, infectious disease ($p = 0,000$; OR = 10,000; 95% CI = 4.405-22,703), early complementary feeding ($P = 0,004$; OR = 2,696; 95% CI = 1,371-5,301); and mother education ($p = 0,000$; OR = 4,796; 95% CI = CI = 1,986-11,579) with the incidence of malnutrition status in toddlers in Magetan. Education of nutritious food intake, besides the given of exclusive breastfeeding and complementary feeding in right time able to increase the nutritional status of children and reduce the incidence of LBW and infectious diseases.

Keywords: *Low-birth weight, disease, complementary feeding, education*

INTRODUCTION

Good nutrition for babies and toddlers early in life has a long-term impact. Children will get optimal growth and reduce the risk of many diseases. Poor nutrition becomes the determinant factor of obesity and non-infectious diseases at the time of entering adulthood¹. In addition, malnutrition causes the occurrence of 2.2 million deaths in children aged less than 5 years². Almost 40% of children under five age suffer from loss of developmental potential caused by stunting. The reduction of stunting could have significant impacts for children and human capital potential.

UNICEF notes that in 2011, it is estimated that about 15% of the 20 million babies born have low birth weight⁴. Appropriate feeding can reduce the incidence of stunting

rapidly. Provision of early complementary feeding (ECF) in infants (<6 months) leads to unsuccessful exclusive breastfeeding. Only about 39% of infants (<6 months) exclusively breastfed⁵. Family with low economic status allows pregnant mother intake in less nutritious. It can make the mother has a low weight as the risk for low birth weight babies (RR = 2.3, 95% CI 1.4-3.8)⁶. They have a significant increase to deliver babies with low birth weight⁷. Monitoring of malnutrition cases needs to be considered for community nutrition improvement decision making.

East Java Provincial Health Office in Indonesia in 2012 recorded the prevalence of malnutrition during 2010-2012 period continued to increase, that is 7,760 cases (0.33%) (2010), 8,410 cases (0.34%) (2011), and 11,056 cases (0.35%) (2012). Magetan regency is one of the districts whose case of malnutrition is fluctuating. The number of children under five who were weighed about 36,270 (2013), identified by 354 (0.98%) nutritional status, 34,487 (95,08%) good nutrition, less than 1.378 (3.80%) and malnutrition 205 (0.57%). Prevalence of malnutrition in the period 2012-2014 also experienced

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fluctuation, that is 112 cases (0,24%) (2012), 205 cases (0,45%) (2013), and 184 cases (0,41%) (2014). Primary health care of Karangrejo in Magetan has the highest prevalence of malnutrition in the period 2012-2016, ie 18 cases (1.3%) (2012), 31 cases (2.9%) (2013), 32 cases (2.5%) (2014), 26 cases (1.6%) (2015), and 16 cases (1.02%) (2016). Cases of malnutrition at Primary Health Care of Panekan were ranked fourth, but the number of under-five children under the Red Line (BGM) and Low Birth Weight (LBW) cases was highest. The prevalence of malnutrition in primary health care is also quite high, ie 11 cases (0.30%) (2013), 14 cases (0.39%) (2014), 22 cases (0.65%) (2015), and 26 cases (0.78) (2016). This study aims to analyze the relationship of toddler conditions (history of LBW, history of infectious disease, early complementary feeding), the number of families, and maternal education with the incidence of malnutrition status in toddlers in Magetan, East Java.

METHOD

This case-control study was conducted on 54 mothers with toddlers (6-59 months) of malnutrition status as case group and 108 mothers with toddlers (6-59 months) good nutritional status as a control group. This research was conducted in May 2016 in Panekan Subdistrict, and Karangrejo Subdistrict, Magetan Regency, Indonesia. The sample selection used with fixed disease sampling for case group and purposive sampling for a control group based on inclusion and exclusion criteria. Inclusion criteria are toddlers with nutritional status either based on the medical record of Panekan and Karangrejo Health Center. Exclusion criteria are the mother of a toddler has died. The data was collected by researchers assisted by four enumerators who are public health students. Enumerator training is conducted before data collection activities.

Information on the history of LBW, the provision of MP-ASI, infectious diseases, the number of family members, and maternal education were obtained through interviews using structured questionnaires. Toddlers are categorized as 'LBW' if the birth weight is ≤ 2500 g or 'not LBW' if the birth weight is > 2500 g, 'has a history of infectious disease' if you have had infectious disease for the last three months or 'no history of infectious disease' months of 'early breastfeeding' if supplementary feeds other than breastmilk from < 6 months of age or 'no early breastfeeding' are supplemented by breastfeeding from the age of 6 months, the number of 'big' family members

if > 4 people or 'small' if ≤ 4 people, and 'malnutrition' if recorded has $< -2SD$ or $> + 2SD$ or 'good nutritional status' if it has a value of $-2SD$ to $+ 2SD$. Under-five child education is categorized as 'low' if graduated \leq junior high school or 'high' if completed $>$ junior high school. Univariate analysis is used to determine the distribution of characteristic frequency of mother and toddler. Bivariate analysis using chi-square test with 95% significance level ($\alpha = 0,05$).

RESULTS AND DISCUSSIONS

The majority of children under five years of age and in control group were normal, ie 37 children under five (68.5%) and 89 under-fives (82.4%). The results showed there was a significant relationship ($p = 0.045$) between the history of LBW and malnutrition incidence in infants. Toddlers who have a history of LBW have a risk of 2.152 times to experience malnutrition compared with infants with a history of normal birth weight. Low birthweight in infants is one of the impacts of maternal infant's lack of nutrition during pregnancy⁸. The tendency of pregnant mothers who are less concerned about food intake greatly affects the nutrients obtained by their infants. UNICEF and WHO noted that the incidence of LBW is common in poor families. The majority of mothers in this study worked as housewives that allow for low access to information about nutritious foods during pregnancy. Besides, the majority of education and low economic status can also contribute to low knowledge and affordability for more nutritious food⁹. The socio-economic conditions of respondents in this study may also affect to malnutrition status among under-fives. But, in Bangladesh showed that higher education of mother and better household socio-economic conditions are not sufficient to reduce prevalence of LBW¹⁰.

Table 1: The performance of maternal and infant characteristics (n = 54 case group; n = 108 control group)

Characteristics	Case f (%)	Control f (%)
Maternal age		
15-19 year	0 (0)	2 (1.9)
20-24 year	1 (1.8)	20 (18.5)
25-29 year	19 (35.2)	32 (29.6)
30-34 year	28 (51.9)	36 (33.3)
35-39 year	6 (11.1)	11 (10.2)
40-45 year	0 (0)	7 (6.5)

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Work status		
Housework	34 (63.0)	59 (54.6)
Enterpreuner	13 (24.1)	31 (28.7)
Civil servant	0 (0)	3 (2.8)
Farmer	7 (13.0)	15 (13.9)
Economic status		
Low	36 (66.7)	33 (30.6)
High	18 (33.3)	75 (69.4)
Infant age		
6-12 month	2 (3.7)	6 (5.6)
13-24 month	10 (18.5)	29 (26.9)
25-36 month	15 (27.8)	28 (25.9)
37-48 month	10 (18.5)	29 (26.9)
49-60 month	17 (31.5)	16 (14.8)
Gender of infant		
Male	21 (38.9)	54 (50.0)
Female	33 (61.1)	54 (50.0)

The proportion of incidence of infectious diseases in toddlers in the case group (83.3%) was higher than that of a control group (33.3%) ($p = 0.000$). Toddlers who have had infectious diseases have a risk of 10 times to experience malnutrition compared to infants who do not have infectious diseases. Healthy life behavior (HLB) can be one of the factors preventing the incidence of infectious diseases. Low of HLB can trigger a variety of infectious diseases that can inhibit the process of absorption of food substances in the body. It can lead to malnutrition status¹¹. The children with handwashing with soap, brushing teeth, and using sandals correctly and regularly every day have a relationship which is significant with the nutritional status it has¹². The low maternal education in this study may have low

knowledge of hygiene and health behaviors. It may have an impact on the high rates of infection among under-fives. The children who born from mothers who were educated had a better nutritional status¹³.

Delivery of early complementary feeding (ECF) (<6 months) also has a significant relationship with malnutrition incidence in infants ($p = 0,000$). This was seen in the size of under-five of the case group given by ECF at age <6 months (74.1%) compared with control group controlled by ECF at age ≥ 6 months (62,9%). Toddlers who were given ECF<6 months will be at risk of malnutrition of 4.857 times compared to infants who were given ECF ≥ 6 months. It is a transitional period for a baby to begin to know food other than breast milk for the first time. At that age, the baby's weight has doubled from birth weight⁵. Supplementary feeding before a 6-month-old baby can cause diarrhea and some illness that leads to malnutrition or even death¹⁴. Early breastfeeding in infants has a long-term effect of becoming the leading cause of obesity in children¹⁵. Other research showed that the provision of ECF before the age of 6 months is related to picky eating behavior when the child is entering pre-school age compared to the child who has been given the ECF at the right time (≥ 6 months). This can be a trigger for the lack of nutritional intake in children during their growth¹⁶.

The practice of early breastfeeding in infants in the case group is possible because the majority of women are poorly educated (87%) and work as housewives (63%). This condition allows the mother of the toddler to have low information access to breast milk, so that needed an intervention to increase its knowledge. Promotional interventions on breastfeeding may reduce stunting cases in 36 month-old children by 36%¹⁷.

Table 2: Significant indicators of malnutrition status of infant

Variables	Case n (%)	Control n (%)	P value	OR	95% CI
Low-birth weight					
Yes	17 (31,5)	19 (17,6)	0,045	2,152	1,008-4,595
No	37 (68,5)	89 (82,4)			
Infectious disease					
Yes	45 (83,3)	36 (33,3)	0,000	10	4,405-22,703
No	9 (16,7)	72 (66,7)			
Early complementary feeding					
Yes (<6 month)	40 (74,1)	40 (37,1)	0,000	4,857	2,357-10,010
No (≥ 6 month)	14 (25,9)	68 (62,9)			

Conted...

Number of family member					
Big (>4 people)	32 (59,3)	39 (36,1)	0,004	2,696	1,371-5,301
Small (\leq 4 people)	22 (40,7)	69 (63,9)			
Maternal education					
Low level (\leq intermediate school)	47 (87,0)	63 (58,3)	0,000	4,796	1,986-11,579
High level (>intermediate school)	7 (13,0)	45 (41,7)			

The number of family members in this study also showed a significant relationship with the incidence of malnutrition in infants ($p = 0.004$). The majority of households in the majority of cases have > 4 people (59.3%), while the majority of family members are \leq 4 (63.9%). Toddlers who have large family members (> 4 people) will be at risk of 2,696 times to experience malnutrition compared to under-fives with smaller family members. A large number of family members will have implications for the high food needs of the family. The results showed that the majority of the economic status of low-grade case families (66.7%) were compared with the control group that mostly had high economic status (69.4%). The low economic status coupled with a large number of family members may have an impact on the fulfillment of nutritional needs in the family that is not achieved. Likewise in Bangladesh, there was finding showed low level of education of parent and poverty were associated with poor nutritional status¹⁸.

The percentage of low maternal education in the under-fives case group (87%) was greater than the control group control group (58.3%). There is a significant relationship between maternal education and malnutrition incidence in infants ($p = 0.000$). Toddlers with low educated mothers are at risk of malnutrition by 4,796 times compared with under-fives who have a higher educated mother. In fact, other studies have shown that low-educated mothers are particularly at risk of poor child feeding¹⁹. Moreover, most of the mothers in case group (63%) work as housewives, so almost 100% matters relating to food is the responsibility of the mother. Therefore, low maternal knowledge of nutritious food intake can affect nutritional content in cooked and served foods. As the other finding noted that women's empowerment needed to increase child nutritional status. Furthermore, rigorous regulation should be established to facilitate women's empowerment in order to strengthen child nutritional well-being²⁰.

CONCLUSIONS

Mothers should pay more attention to and learn about a variety of nutritious foods during pregnancy and postpartum. Low maternal knowledge can also be enhanced by the education of nutrition from health workers who are more proactive in the service places visited by the mother.

Conflict of Interest: Kusuma Estu Werdani, Nurul Isnaini, and Yuli Kusumawati declare that they have no conflict of interest. All procedures followed in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and its later amendments. Informed consent was obtained from all respondents being included in the study.

ACKNOWLEDGEMENTS

The researchers would like to express their gratitude for the support of Panekan and Karangrejo Primary Health Care, UMS Public Health Program students who become research enumerators, and colleagues who always provide support, and cooperation from all respondents involved in research.

Ethical Clearance: This protocol, site-specific informed consent forms (local language and English version), participant education and recruitment materials, and other requested documents – and any subsequent modifications - had been reviewed and approved by the ethical review bodies (Medical Faculty of Universitas Muhammadiyah Surakarta).

REFERENCES

1. USAID. Multi-Sectoral Nutrition Strategy: 2014-2025. 2014;58. Available from: <https://www.usaid.gov/nutrition-strategy>

2. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences. *Lancet*. 2008.
3. Perkins JM, Kim R, Krishna A, McGovern M, Aguayo VM, Subramanian SV. Understanding the Association Between Stunting and Child Development in Low- and Middle- Income Countries: Next Steps for Research and Intervention. *Social Science and Medicine*. 2017.
4. United Nations Children's Fund. Improving Child Nutrition. The Achievable Imperative for Global Progress. 2013.
5. National Health & Medical Research Council. Infant Feeding Guidelines. *Iowa Med*. 2013.
6. El-Gilany A-H, Hammad S. Body Mass Index and Obstetric Outcomes in Pregnant in Saudi Arabia: A Prospective Cohort Study. *Ann Saudi Med*. 2010.
7. Love C, David RJ, Rankin KM, Collins JW. Exploring Weathering: Effects of Lifelong Economic Environment and Maternal Age on Low Birth Weight, Small for Gestational Age, and Preterm Birth in African-American and White Women. *Am J Epidemiol*. 2010.
8. Scott MI. Book Review: Feeding and Nutrition of Infants and Young Children: Guidelines for the WHO European Region, With Emphasis on the Former Soviet Countries. *J Hum Lact*. 2001.
9. United Nations Children's Fund and World Health Organization. . Low Birthweight: Country, Regional and Global Estimates. *Unicef*. 2004.
10. Rahman MS, Howlader T, Masud MS, Rahman ML. Association of Low-Birth Weight with Malnutrition in Children Under Five Years in Bangladesh: Do Mother's Education, Socio-economic Status, and Birth Interval Matter? *Plos One*. 2016.
11. Huy NN. The Correlation between Household Environmental Sanitation, Water Supply, and Mothers' Hygiene Behaviour for Children Under 5 and the Status of Child Nutrition in Vietnam. :1–34.
12. Hakim A. Nutritional Status and Hygiene Practices of Primary School Goers in Gateway to the North Bengal. *Int J Public Heal Res*. 2015.
13. Negash C, Whiting SJ, Henry CJ, Belachew T, Hailemariam TG. Association between Maternal and Child Nutritional Status in Hula, Rural Southern Ethiopia: A Cross Sectional Study. *Plos One*. 2015
14. Weisstaub G, Uauy R. Non-breast Milk Feeding in Developing Countries: Challenge from Microbial and Chemical Contaminants .*Ann Nutr Metab*. 2012.
15. Seach KA, Dharmage SC, Lowe AJ, Dixon JB. Delayed Introduction of Solid Feeding Reduces Child Overweight and Obesity at 10 Years . *Int J Obes*. 2010.
16. Shim JE, Kim J, Mathai RA. Picky Eating During Childhood A longitudinal Study to Age 11 Years," *Journal of the American Dietetic Association* . *Journal of the American Dietetic Association*. 2010.
17. Bhutta ZA, Ahmed T, Black RoE, Cousens S, Dewey K, Giugliani E, et al. What Works Interventions for Maternal and Child Undernutrition and Survival. *The Lancet*. 2008.
18. Islam A, Islam N, Bharati P, Aik S, Hossain G. Socio-economic and Demographic Factors Influencing Nutritional Status among Early Childbearing Young Mothers in Bangladesh. *BMC Women's Health*. 2016
19. Ickes SB, Hurst TE, Flax VL. Maternal Literacy, Facility Birth, and Education are Positively Associated with Better Infant and Young Child Feeding Practices and Nutritional Status among Ugandan Children. *The Journal of Nutrition*. 2015
20. Cunningham K, Ruel M, Ferguson E, Uauy R. Women's Empowerment and Child Nutritional Status in South Asia: A Synthesis of the Literature. *Maternal & Child Nutrition*. 2014.

Mother's Knowledge, Attitude, and Practice of Exclusive Breastfeeding

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ABSTRACT

Background: Low prevalence of exclusive breastfeeding was found in Indonesia. Risk factors for suboptimal exclusive breastfeeding were internal and external factors. Knowledge and attitude of mother are internal factors that can affect exclusive breastfeeding practice. This study aims to analyze mother's knowledge, attitude, and practice of exclusive breastfeeding.

Method: This cross sectional study was done in September-December 2017, 330 mothers who have children under five in Surabaya and Sidoarjo were participated and selected with simple random sampling. The association between knowledge, attitude, and practice were analyzed by Chi Square.

Result: More than half (52.7%) of mothers have a moderate knowledge about exclusive breastfeeding. Half mothers have a positive attitude toward exclusive breastfeeding. Negative attitude to the statements; breast milk can be replace by infant formula and working mothers can easily give exclusive breastfeeding. As much as 47.6% mothers had an exclusive breastfeeding. There were association between knowledge ($p=0.003$) and attitude ($p=0.000$) with exclusive breastfeeding practice.

Conclusion: Mothers with good knowledge and positive attitude have a good practice of exclusive breastfeeding to prevent stunting in the future life.

Keywords: *attitude, children under five, exclusive breastfeeding, knowledge, practice*

INTRODUCTION

Breast milk is a nutritious food and it is often become a gold standard food to support child growth and development. WHO and Indonesian government recommend exclusive breastfeeding for 6 months, and continue until 2 years olds with complementary Feeding⁽¹⁾. Exclusive breastfeeding support the optimal growth. Malnutrition prevalence including stunting prevalence was lower in children with exclusive breastfeeding than non-exclusive breastfeeding⁽²⁾. Children who received exclusive breastfeeding had a better immunity and it could lower the mortality⁽³⁾ and morbidity rate⁽⁴⁾.

The superiority of breast milk as a nutritious food for babies has been well studied⁽⁵⁾. Nonetheless based

on Indonesian Nutritional Status Surveillance 2017, the prevalence of exclusive breastfeeding nationally is only 29.5% in 2016 and 35.7% in 2017. The East java Province also had a low prevalence of exclusive breastfeeding (34.9%).

There are several determinant factors of exclusive breastfeeding such as mothers knowledge, attitude⁽⁶⁾, occupation⁽⁷⁾, socio-economic status⁽⁸⁾, and normal or caesarean section⁽⁹⁾. Breastfeeding knowledge and attitude are positively related to exclusive breastfeeding⁽¹⁰⁾. Some studies about exclusive breastfeeding was done in Indonesia but it has a contradictory results^(11,12) and small samples^(13,14). Therefore this study aims to analyze the association between mother's knowledge, attitude, and practice of exclusive breastfeeding in East Java.

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METHOD

This cross sectional study was conducted in Surabaya and Sidoarjo, Indonesia in September-December 2017. Ethical clearance was obtained from the ethics committee

of Faculty of Public Health, Universitas Airlangga, no 503-KEPK. The sample of this study was 330 mothers who have children under five, which consist of 230 mothers from Surabaya and 100 mothers from Sidoarjo.

DATA COLLECTION

Data were collected through interviews using a structured questionnaire by trained enumerators. The questionnaire consists of individual characteristics, knowledge, attitude, and practice of exclusive breastfeeding. Fifteen questions about exclusive breastfeeding knowledge and 9 statements of attitude were asked to the samples. Three point Likert rating scale from agree to disagree were used to assess mothers attitude. Try out questionnaire was done before data collection and improvement was made according to the results of try out.

DATA ANALYSIS

Data were processed and analyzed using IBM program Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics including estimation of proportion were presented for categorical data. Breastfeeding knowledge were categorized as good (score>80), sufficient (score 60-80), and insufficient (score <60). Breastfeeding attitude from three point Likert rating scale from agree to disagree were recode into positive (score 2), neutral (score 1), and negative (score 0). All responses of attitude statements then summarize, and then times 10 and divided 1.8 so the maximum score was 100. After that, the scores were categorized as positive (score>80), neutral (score 60-80), and negative (score <60). The association between variables were analyzed by Chi-square test.

RESULTS AND DISCUSSIONS

The mothers mean aged was 30.8 years old, meanwhile their children was under 2 years old (13.4 months). Most of them are housewives (80.9%). Working as a private employee was the most common among the working mothers. More than half mothers (56.4%) were graduated from high school, and almost a quarter (23.3%) were junior high school. Only ten percent of mothers who had higher education.

Table 1: Socio-economic characteristics

Characteristics	n (%)
Mothers Occupation	
Housewife	267 (80.9)
Private employee	37 (11.2)
Entrepreneur	14 (4.2)
Labour	5 (1.5)
Civil servant	3 (0.9)
Others	4 (1.2)
Mothers Education	
Elementary school	34 (10.3)
Junior high school	77 (23.3)
High school	186 (56.4)
Diploma	11 (3.3)
Graduate	21 (6.4)
Post-graduate	1 (0.3)
Family Income	
<IDR, 2,000,000	119 (36.1)
IDR 2,000,000 – 3,000,000	105 (31.8)
> IDR 3,000,000 – 4,000,000	79 (23.9)
> IDR 4,000,000 – 5,000,000	12 (3.6)
> IDR 5,000,000 – 7,500,000	9 (2.7)
> IDR 7,500,000	6 (1.8)
Mean of mother’s age (years)	30.8±7.1
Mean of children’s age (months)	13.4±8.5

More than 60% samples had a family income less than IDR 3,000,000 (~ US\$ 230.8). This was lower than regional minimum wages either in Surabaya or Sidoarjo. Only a few samples who had high income (>IDR 4,000,000; ~US\$ 307.7).

Table 2 showed that more than half (52.7%) mothers had a sufficient knowledge with mean score 73.4. The proportion of mothers with good knowledge (30.3%) was higher than insufficient knowledge (17.0%). This implied that most mothers had a sufficient knowledge about breastfeeding.

The items for breastfeeding knowledge instrument were comprised of 15 questions including the definition and benefit exclusive breastfeeding, time to give complementary foods, and when to stop breast milk. There were some items which were not well understood by the mothers, that is, the definition of exclusive breastfeeding, the benefit of breastfeeding for their children (growth, development, immunity, morbidity,

and mortality) and for themselves (mothers had a longer time to delay fertility postpartum so it could be delayed the pregnancy and slim faster).

Table 2: Distribution of subjects by category of breastfeeding knowledge and attitude

Category	n (%)
Breastfeeding knowledge	
Insufficient (score <60)	56 (17.0)
Sufficient (score 60-80)	174 (52.7)
Good (score >80)	100 (30.3)
Mean±SD score	73.4 ± 17.5
Breastfeeding attitude	
Negative (score <60)	37 (11.2)
Neutral (score 60-80)	129 (39.1)
Positive (score >80)	164 (49.7)
Mean±SD score	79.3 ± 14.9

Most mothers know and have heard about exclusive breastfeeding, but they didn't know the definition of it. The low understanding about the definition of exclusive breastfeeding can make the information bias and not synchronize when mothers asked if she gave exclusive breastfeeding for their infants.

Most mothers had a good knowledge about the timing of giving the breast milk and complementary foods. They knew that less than an hour after birth they had to give breast milk. They also knew when the best time to give the complementary foods, and when to stop breast milk.

From table 2, we can reveal that less than half mothers had a positive attitude towards exclusive breastfeeding. This finding was similar to a study from Southwestern Ethiopia⁽¹⁵⁾. Meanwhile more than one third mothers had a neutral attitude. Negative attitude towards statements; breast milk can be substituted by infant formulas, it is hard for the working mothers to give exclusive breastfeeding, and it is need a special training in giving breast milk. The 3 negative attitude can be constrains in giving the exclusive breastfeeding. Many mothers agreed that breast milk can be replace and substituted with infant formulas.

In normal condition, it is not recommended to give the infants other than breast milk. In medical indication, infant formulas were needed. According to the law of

Republic Indonesia no 36/2009 concerning health, article 128 stated "Every infant has the right to receive exclusive breastfeeding since birth for six months, except on a medical indication." The law also suggested that breast milk should be continued until 2 years old, together with complementary feeding⁽¹⁾.

This medical indication (babies and or the mothers condition) described in more detail in the law of Republic Indonesia no 39/2013 concerning infant formula and others baby products, article 10-13. Medical indication are special condition when baby can only receive infant formula such as inborn errors metabolism (galactosemia, maple syrup urine disease, phenylketonuria, an others metabolic disorder), very low birth weight, and preterm birth. Meanwhile mothers medical indication were infected by human immunodeficiency virus, had a severe diseases, infected by herpes simplex virus type 1 and 2 in their breast, had a medical treatment (using psychotropic drugs, iodine 131 radioactive, iodoform topical and or cytotoxic chemotherapy drugs), and or the mothers had passed away, severe mental illness, or separated from the baby⁽¹⁶⁾.

Table 3: Mother knowledge about exclusive breastfeeding

Breastfeeding knowledge	n (%)
Knowing exclusive breastfeeding	261 (79.1)
Exclusive breastfeeding is no other food or drink, not even water, except breast milk for 6 months of life	161 (48.8)
Mothers should give breast milk to the newborn or maximal 1 hour after birth	310 (93.9)
Breast milk is important for infant	323 (97.9)
Breast milk give nutrition for child growth and development and increasing infant immunity	192 (58.2)
Breast milk contain colostrum, antibody, protein, taurine, carbohydrate, and fat	216 (65.5)
Exclusive breastfeeding made children smart, independent, and could decrease infant mortality and morbidity rate	155 (47)
Giving exclusive breastfeeding for 6 months are beneficial for mothers	303 (92.1)
Giving exclusive breastfeeding made mothers had a longer time to delay fertility postpartum so it could delayed the pregnancy and slim faster	149 (45.8)

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Breastfeeding could be replace by other food such as complementary foods	200 (60.8)
Breast milk better than breast milk substituted	324 (98.5)
Breastfeeding are nutritious, practical, cheap, and could increase bonding between mother and baby	205 (62.3)
Complementary feeding are best given at >6 months	288 (87.8)
Mothers should breastfed their baby frequently	265 (80.8)
Baby should be given breast milk until 2 years old	279 (85.1)

Table 4: Mother attitude towards exclusive breastfeeding

Statements	n (%)
Complementary foods for infants can be given at 4 months	82 (25)
Breast milk cannot be substituted with infant formula	126 (39)
Working mother can give an exclusive breastfeeding easily	112 (34.1)
Mothers gave their first breastmilk which were yellowish	307 (93.6)
Every infants have the right to accept exclusive breastfeeding	322 (98.2)
There was no need expertise or special training in giving breast milk	90 (27.5)
Breast milk should be given continuously until 2 years old	305 (93)
There was a differences in growth and development between breast milk and non breast-milk children	259 (79.2)
There was a differences in immunity between breast milk and non breast-milk baby	287 (88)

Another negative attitude toward exclusive breastfeeding were the working mothers cannot continue giving exclusive breastfeeding. Most of the samples said that it was hard to give an exclusive breastfeeding among working mother. This result was in-line with study from South Jordan which showed that working mother were less likely to practice exclusive breastfeeding compared to non-working mother. They perceived that insufficient amount of milk, end of maternity leave and no appropriate place for breastfeeding, wanted to improve babies weight gain, busy with work and no time for breastfeeding were the causes of premature breastfeeding cessation⁽⁷⁾. Study

from Malaysia also revealed that work place and short maternity leave can be the causes of not continuing exclusive breastfeeding⁽⁸⁾.

Table 5 showed that the prevalence of exclusive breastfeeding was 47.6% and it was higher than the national prevalence⁽¹⁷⁾. There was a tendency that mothers who had a good knowledge have a higher proportion of giving exclusive breastfeeding than the lower knowledge level. The same trend also found in breastfeeding attitude. Mothers who had positive attitude have a higher proportion of exclusive breastfeeding than a negative ones.

Chi square analyzed showed that there was a significant association between breastfeeding knowledge (p=0.003) and attitude (p=0.000) with exclusive breastfeeding practice. This result was similar with study Zhang et al. in Shanghai, China⁽¹⁰⁾. This significant association implied that improvement in knowledge and attitude become an important factors in increasing the prevalence of exclusive breastfeeding.

Study from Malawi and Indonesia confirmed that exclusive breastfeeding was associated with stunting^(18,14). Children who had a frequent infections could cost a lot of energy to protect and repair the clinical symptoms and tissue damage. This condition may impair the children growth⁽¹⁹⁾. Therefore it is necessary for the children to receive exclusive breastfeeding. Mothers transfer the immunity to their child through breastfeeding. Breastfeeding made the maternal IgG actively transport to the fetus. This antibodies are important for the infant during several months to protect their health⁽¹⁹⁾. A longer duration of exclusive breastfeeding correlate with lower prevalence of stunting⁽²⁾.

Table 5: Association between breastfeeding knowledge and attitude with breastfeeding practice

Variables	Exclusive Breastfeeding			p value
	Yes	No	Total	
Breastfeeding knowledge				
Insufficient	16 (28.6)	40 (71.4)	56 (100)	0.003
Sufficient	84 (48.3)	90 (51.7)	174 (100)	
Good	57 (57.0)	43 (43.0)	100 (100)	
Total	157 (47.6)	173 (52.4)	330 (100)	
Breastfeeding attitude				
Negative	7 (18.9)	30 (81.1)	37 (100)	0.000
Neutral	54 (41.9)	75 (58.1)	129 (100)	
Positive	96 (58.5)	68 (41.5)	164 (100)	
Total	157 (47.6)	173 (52.4)	330 (100)	

CONCLUSIONS

Improvement in knowledge and attitude will increase exclusive breastfeeding. Good practice of exclusive breastfeeding can be an entry point to prevent growth retardation particularly stunting. Therefore it is important to increase mother knowledge and positive attitude towards breastfeeding. Particularly knowledge about exclusive breastfeeding definition and the benefit of breastfeeding for their children (growth, development, immunity, morbidity, and mortality). Increasing positive attitude about exclusive breastfeeding in working mother, the use of infant formula appropriately and everyone can give breast milk for their baby without any special expertise or special training.

Conflict of Interest: We declare no conflict of interest.

ACKNOWLEDGEMENTS

We would like to thanks to Ministry of Health for funding this research.

Ethical Clearance: This research had received an ethical approval from Faculty of Public Health ethics committee No 503-KEPK.

REFERENCES

1. Ministry of Health. Indonesian Law on Health No 36/2009. 2009.
2. Vesel L, Bahl R, Martines J, Penny M, Bhandari N, Kirkwood BR, et al. Use of new World Health Organization child growth standards to assess how infant malnutrition relates to breastfeeding and mortality. *Bull World Health Organ*. 2010;88(1):39–48.
3. Edmond K, Newton S, Hurt L, Shannon CS, Kirkwood BR, Mazumder S, et al. Timing of initiation, patterns of breastfeeding, and infant survival: Prospective analysis of pooled data from three randomised trials. *Lancet Glob Heal* [Internet]. 2016;4(4):e266–75. Available from: [http://dx.doi.org/10.1016/S2214-109X\(16\)00040-1](http://dx.doi.org/10.1016/S2214-109X(16)00040-1)
4. Khan J, Vesel L, Bahl R, Martines JC. Timing of Breastfeeding Initiation and Exclusivity of Breastfeeding During the First Month of Life: Effects on Neonatal Mortality and Morbidity—A Systematic Review and Meta-analysis. *Matern Child Health J*. 2014;19(3):468–79.
5. Horta BL, Victora CG. Long-term health effects of breastfeeding. *World Heal Organ* [Internet]. 2013;129(8–9):57–64. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20960419>
6. Asfaw MM, Argaw MD, Kefene ZK. Factors associated with exclusive breastfeeding practices in Debre Berhan District, Central Ethiopia: A cross sectional community based study. *Int Breastfeed J* [Internet]. 2015;10(1):1–9. Available from: <http://dx.doi.org/10.1186/s13006-015-0049-2>
7. Altamimi E, Al Nsour R, Al Dalaen D, Almajali N. Knowledge, Attitude, and Practice of Breastfeeding among Working Mothers in South Jordan. *Work Heal Saf*. 2017;65(5):210–8.
8. Leong TK. Knowledge, attitude and practice on breastfeeding in Klang, Malaysia. *Int Med J* [Internet]. 2009;8(1):17–22. Available from: <http://journals.iium.edu.my/imjm/index.php/eimj/article/view/58>
9. Khassawneh M, Khader Y, Amarin Z, Alkafajei A. Knowledge, attitude and practice of breastfeeding in the north of Jordan: a cross-sectional study. 2006;1(17):1–6.
10. Zhang Z, Zhu Y, Zhang L, Wan H. What factors influence exclusive breastfeeding based on the theory of planned behaviour. *Midwifery* [Internet]. 2018;62(April):177–82. Available from: <https://doi.org/10.1016/j.midw.2018.04.006>
11. Yulianah N, Bahar B, Salam A. Relationship between knowledge, attitudes, and trust of mothers with exclusive breastfeeding in Health Community Center of Bonto Cani working area of Bone Rege. 2013;1–13.
12. Thaha ILM, Razak R, Ansariadi A. Determinants of exclusive breastfeeding among multiparous in Jeneponto. *Media Kesehatan Masyarakat Indonesia*. 2015;11(4):247–52. Available from: <http://journal.unhas.ac.id/index.php/mkmi/article/view/534>
13. Hasniati Y, Indah MF, Asrinawaty A, Kasman K. Determinant exclusive breastfeeding in Barito Kuala South Kalimantan. *Media Kesehatan Masyarakat Indonesia*. 2015;11(1):39–43. Available from: <http://journal.unhas.ac.id/index.php/mkmi/article/view/514>

14. Damayanti RA, Muniroh L, Farapti. The difference of nutritional adequacy level and history of exclusive breastfeeding among stunting and non-stunting children under five. *Media Gizi Indonesia*. 2016;II:61–9.
15. Tadele N, Habta F, Akmel D, Deges E. Knowledge, attitude and practice towards exclusive breastfeeding among lactating mothers in Mizan Aman town, Southwestern Ethiopia: Descriptive cross-sectional study. *Int Breastfeed J*. 2016;11(1):5–11. Available from: <http://dx.doi.org/10.1186/s13006-016-0062-0>
16. Ministry of Health. Minister of Health Regulation No 39/2013 on infant formula milk and other baby products. 2013.
17. Ministry of Health. Indonesia health profile 2016. 2017. 1-220 p.
18. Kuchenbecker J, Jordan I, Reinbott A, Herrmann J, Jeremias T, Kennedy G, et al. Exclusive breastfeeding and its effect on growth of Malawian infants: results from a cross-sectional study. *Paediatr Int Child Health* [Internet]. 2015;35(1):14–23. Available from: <http://www.tandfonline.com/doi/full/10.1179/2046905514Y.0000000134>
19. Hanson LÅ, Korotkova M, Lundin S, Håversen L, Silfverdal SA, Mattsby-Baltzer I, et al. The transfer of immunity from mother to child. *Ann N Y Acad Sci*. 2003;987(May):199–206.

Factors Associated with Cerumen Impaction in the Coastal Elementary Schools (Case Study in 1st Grade of five Elementary Schools, Bandaharjo Health Center's Work Area, in North Semarang)

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ABSTRACT

Cerumen impaction on children in six cities of Indonesia is 30.5%. The case of cerumen impaction in 1st grade elementary school in the coastal area, Bandaharjo Public Health Center in 2015-2016 was significantly increased (18.34% and 32.77%). Cerumen impaction which is happened in pupils can caused hearing loss which impacted in abnormality growth, learning derivation, and difficulties in social adaptation. This study aimed to analyze the factors associated with the cerumen impaction case in 1st grade elementary students. This study was an analytic observational study with cross sectional approach conducted on 262 subjects in five elementary schools in the coastal area, Bandaharjo Public Health Center, North Semarang. The selection of the subject was done by simple random sampling to determine the name of the school and the children's name to diagnosed cerumen impaction, then parents of children interviewed using questionnaire. Around 50.8% children suffered cerumen impaction. The history of ear infections is associated with cerumen impaction ($p = 0.004$; $POR = 3.173$; $95\% CI = 1.472-6.842$). Parents need to do infection prevention by not using ear-based cleaning tools and need to be educated about cerumen characteristics and functions.

Keywords: cerumen impaction, factors associated, grade 1 elementary school, coastal, bandaharjo

INTRODUCTION

Indonesian Health Ministry in National Strategic Plan targeted hearing loss can be prevented until 90% for reaching sound hearing in 2030.¹ Cerumen impaction which is happened in pupils can caused hearing loss which impacted in growth disorder, learning derivation, and difficulties in social adaptation.²

A research in South Africa showed that 6.6% students had cerumen impaction and 7.5% was diagnosed as hearing disorder.³ Indonesia Community of Sight and

Hearing Health survey in 7 provinces revealed outer ear disease prevalence was (6.8%) which the main the main cause of the outer ear morbidity was cerumen impaction (3.6%) and the highest case was happened in school-age children (7–18 years old).¹ Previous studies were also showed similar results such as in Semarang amounted 21.4% were suffered cerumen impaction and 6.2% students had hearing disorder⁴ and at Pantai Bahu coastal area revealed 22.6% society had bilateral cerumen, 6.5% had perforated timpani bilateral membrane, dan 12.9% cannot be evaluated due to cerumen blocked ear.⁵

Preliminary study conducted by Community Health Center of Central Java in 2016 showed that cerumen impaction was the first rank of the top ten ear diseases which 2 until 20 patients visited every day. The highest visit prevalence was children at 5–14 years old (28.8%).⁶ Cerumen impaction prevalence in 1st grade of 24 elementary students in coastal area – Bandaharjo Public Health Center in 2015 was 18.34% then increased into 32.77% in 2016.⁷

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Mahardhika revealed that cerumen impaction could be impacted by internal factors such as age, genetic, ear canal diameter, shape and anatomy deformity of ear canal, mental retardation, down syndrome, and body mass index. External factor including socio-economic, environmental condition, knowledge about ear health, cleaning ear with cotton bud behavior, ear infection, and adrenergic drugs used.^{5,8}

In nowadays, research for knowing cerumen impaction factors were still limited and had different results.⁸ This research aimed to analyze factors which contributed to cerumen impaction case in 1st grade of coastal area elementary school, especially Bandarharjo Public Health Center working area, North Semarang.

METHOD

Study Population: A simple random sampling for elementary school name and students' name. This research used 262 of 1st grade students in 5 elementary schools as subject and their parents as respondents.

Study Design: This was an observational analytic with cross sectional approach.

Measurement: Gender was measured by direct observation. BMI was measured by children

anthropometric measurement based on WHO standard. Subject's weight used digital scale and microtoise for height. Respondent's knowledge and behavior, and ear infection history were traced by questionnaire which had been previously trusted by validity and reliability test. Cerumen impaction checkup was done by otoscopy examination method which conducted by ear, nose, and throat doctor from Agency for Hearing Disorder and Hearing Loss Central Java Province.

Statistical Analysis: Univariate and bivariate data analysis were used on this research. Relation in each variable was analyzed by chi square (X^2) test. P value < 0.05 marked as significant in statistic.

RESULTS AND DISCUSSIONS

Cerumen Impaction Case: The proportion of gender of 262 1st grade students in 5 elementary schools was slightly different. The age ranged from 6 until 9 years old. Subject's parents were about 25-45 years old. Most of the parents had graduated from senior high school (SHS). Majority of father worked as private sector employees (41.6%) and most of mothers were housewife (50.8%). The cerumen impaction case proportion was more than a half from total sample (50.8%) (Table 1).

Table 1: Frequency Distribution of Cerumen Impaction Case

Elementary School Name	Cerumen Impaction Case				Total	
	Positive		Negative		f	%
	f	%	f	%		
Tanjung Mas	37	14.1	10	3.8	47	17.9
Kusuma Bhakti	24	9.2	30	11.5	54	20.6
Bandarharjo 2	29	11.1	15	5.7	44	16.8
Dadapsari	33	12.6	22	8.4	55	21.0
Sultan Agung 2	20	7.6	42	16.0	62	23.7
Total	133	50.8	129	49.2	262	100.0

Table 2: Variables of Gender, BMI, parents knowledge, parent behaviour, and infection with cerumen impaction case

Variables	Subvariables	Cerumen Impaction				Test of Significance
		Positive		Negative		
		f	%	f	%	
Gender	Female	58	49.2	60	50.8	P value : 0.728 POR : 0.889
	Male	75	52.1	69	47.9	

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BMI	Fat-obesity	33	45.8	39	54.2	P value : 0.399 POR : 0.762
	Thin-normal	100	52.6	90	47.4	
Parents Knowledge	Lack	64	51.6	60	48.4	P value : 0.891 POR : 1.067
	Good	69	50.0	69	50.0	
Parents Behaviour	Risky	42	57.5	31	42.5	P value : 0.221 POR : 1.459
	Safe	91	48.1	98	51.9	
Ear Infection History	Available	28	73.7	10	26.3	P value : 0.004 POR : 3.173
	Not available	105	46.9	119	53.1	

More Than 50% Cerumen Impaction Case: This result is similar with previous studies mentioned the high score cerumen in the children group was caused by cerumen production increase due to sebaceous glands production starting to increase in 7 years old children and continuing by ages, cerumen score will decrease in middle age, adult, and elder, and will rise again in the late elder age.^{9,10}

No Relation Between Gender and Cerumen Impaction Case: Substances which consisting cerumen are variative depend on gender, age, and menstruation phase. Cerumen sample which is taken on follicular stage from 19-40 years old women having higher cholesterol and squalene level, in the same age men's cholesterol level were lower than women's.¹¹

This result might happen because the subject were 1st grade students (7-9 years old) (Table 2), which not enter puberty phase yet, so at their age there is no differences in ester and cholesterol level either in girls or boy. In cerumen subject, the highest ester and cholesterol level was placed by 1-10 years old children (for girls and boys).¹¹

Cerumen impaction is commonly happened in men rather than women, it was impacted by hair in men's ear hole was thicker and rougher can disturb natural cerumen cleaning.¹² There was also relation between seasonal diet and triglyceride cerumen production, sexual hormone contributed only in small part in lipid substance and cerumen production level.¹³ Cerumen sebum production decrease in men and women correlated with age, cerumen sebum level rise peaked in age 15-35 and slumped along adult age.^{14,15}

No Relation Between Body Mass index and cerumen Impaction Case: The obese person having metabolism disturbance tendency—over lipogenesis, so can increase free fatty acid level (major compound of cerumen) in the body.¹⁶

That no relation can be caused by homogeneity of the samples or imbalance total number of samples which were compared; cerumen impaction case mostly happened in children with thin-normal BMI (52.6%) rather than happened in samples with fat-obesity BMI (45.8%) (Table 2).

Previous study revealed no remarkable relation between BMI and cerumen impaction case number ($p = 0.803$) caused imbalance of samples compared, patients with weight less than standard until normal (71.9%) were higher than upper standard weight patients (28.1%).¹⁷

However, other research showed relation between seasonal diet and triglyceride production.¹³ Research differences can be caused by the more accurate laboratory testing method in her research for identifying the availability of triglyceride decrease in respondent who did seasonal diet. Meanwhile BMI measurement on this research used direct height and weight measurement.

No Relation Between Parent Knowledge and Cerumen Impaction Case: Good ear cleaning knowledge will give good result in hearing disturbance prevention. Majority of people think that cerumen is a dangerous waste for the body. It affects manual individual ear cleaning.^{18,19} Hubson observed in 325 people then resulted that majority of people cleaning their ears using cotton buds routinely and did not know their drawback effect from this activity.²⁰

The no relation might be because knowledge was not direct influence factor in cerumen impaction case. Proportion of parents who have good knowledge in this study is more than half the number of respondents, merely (52.7%) (Table 2). This result also can be caused by good knowledge parent had probability to not applied their knowledge in their daily live. It can be showed by parent who knew that cleaning cerumen with cotton

buds can push cerumen entering deeper into the ear (66.8%), and (55%) parent knew that cleaning cerumen with cotton buds can injure ear-hole-skin (Table 2). Meanwhile majority of parent (85.1%) used cotton buds for cleaning their children ear. Moreover, on site research found 9.2% parent used hard material for cleaning ear, such as stainless (Table 2). The habit to clean ear with cotton buds or hard material tools for ear cleaning can disturb natural cleaning mechanism and can push skin cells death and cerumen into eardrum, so the earwax accumulated which can caused cerumen impaction.²¹

No Relation Between Ear Cleaning and Cerumen Impaction Case: Cotton buds that used uncarefully can impacted tympanic membrane damage and damaging ear canal epithelium skin, so cerumen migration outside was disturbed.^{22,23,24} This result similar with previous study which presented that swabs of cotton was not influence in right ear samples examined (p value=0.270), while connected with 75% cerumen impaction case of children's left ear (p value=0.02), this difference can be caused by different technique in left or right ear cotton buds used.²⁵

This research result can be impacted by other factor that can influenced, such as outer ear infection history. It means that even majority of parent had safety behavior (not risky) merely 72.1%, but if children had infection history in multiple time can caused inflammation reaction in ear, in consequence cause over apocrine glands production in ear canal as body defense to protect ear canal so produced accumulated product which blocked ear.^{23,26}

Ear canal (*canalis acusticus externus*) diameter size was also predicted as a caused of no relation both these two factors in 1st grade students. First two decades of young age groups were founded having externa canal auditory diameter relatively smaller rather than adult.⁹ Cerumen score decrease in adult until elderly age due to ear canal has met its maximum size and does not grow anymore.⁹ On site research found that one of cerumen impaction children suffered bilaterally and cerumen extraction could not be taken due to the left ear canal was narrow.

Relation Between Ear Infection History and Cerumen Impaction Case: Multiple ear infection or allergy can cause inflammation reaction in the ear, so impacted in over apocrine glands production on ear canal as body defense to protect ear canal which caused blocked ear by product accumulation.^{23,26}

This research showed that ear infection history associated with cerumen impaction case with p value=0.004 (p<0.05). This correlation was reflected by 14.5% children who had outer ear infection history, cerumen impaction children proportion was 73.7%, it was higher than children without cerumen impaction (26.3%). In addition, association strength could be seen from POR value=3.173 (CI 95%=1.472-6.842), it means that children with outer ear infection history had bigger risk in suffering cerumen impaction 3.172 times than children who never had outer ear infection history (Table 2).

Predisposing factors which contributed in outer ear infection including minor trauma when prying ear, trauma due to scratches by hair clip, matchstick, or others tools which not supposed to cleaning ear, frequently cleaning ear after swimming when canal skin had macerated.²⁷ The suitable ear caring can be done by simple steps such as cleaning external ear using clean wet fabric, then if cerumen accumulation is founded should be handled by doctor.²⁸ The parent's behavior (Table 2) can impact in canal ear lipid layer skin loose. Lipid layer in ear canal skin aims to skin macerate prevention and block bacteria when entering skin by apopilosebacea skin. If lipid layer loose due to multiple ear cleaning, so pathogen organism which embedded in ear canal can grow then make easier ear infection.

CONCLUSIONS

Cerumen impaction case proportion were more than a half of total samples (50.8%). Gender (p value=0.728), body mass index (p value=0.399), parent knowledge (p value=0.891), parent behavior (p value=0.221) did not have significance relation with cerumen impaction case. Meanwhile, ear infection history (p value=0.004) had significance relation with cerumen impaction case. Need parent's education on how to prevent cerumen impaction.

Conflict of Interest: The authors declare that we have no conflict of interest.

ACKNOWLEDGEMENTS

Authors are grateful to Diponegoro University and Public Health Faculty which have supported in this research. Thanks to Bandarharjo Public Health Center and 5 schools, Librarian of Ear Nose Throat (ENT) Section Kariadi Hospital, ENT medical specialist team PGPKT Central Java Province, and all Diponegoro University colleagues who participated on this research process.

Ethical Clearance: Ethical clearance was obtained from Commission of Ethics of Medical and Public Health Research, Faculty of Public Health, Diponegoro University (number : 39/EC/FKM/2017)

REFERENCES

1. National Hearing Loss and Deafness Mitigation Plan to Achieve Sound Hearing 2030. Number 879. Jakarta: Indonesian Health Ministry; 2006. 4-5 p.
2. Boies L Textbook for Ear Nose Throat. edition to 6. Harjanto E, editor. Jakarta: EGC; 1997.
3. Mahomed F, Swanepoel DW, Eikelboom RH. Hearing loss in urban South African school children (grade 1 to 3). *Int J Pediatr Otorhinolaryngol.* **2016;84:27–31.**
4. Alriyanto CY. Hearing impairment (Case Study in Grade V Elementary School Students in Semarang City). Essay. Faculty of Medicine. Diponegoro University. 2010;
5. Rian S P G, Ora I P, Olivia P. Coastal Community Ear Health Survey. 2015;3.
6. Community Health Center of Central Java. Ear Nose Throat Clinic Disease Recap Index. 2016.
7. Bandarharjo Health Center. Annual Report of School Health. North Semarang ; 2015
8. Maharddhika M. Factors that influence the formation of Serumen Obsturan (case study in fifth grade elementary school in Semarang city). Essay. Faculty of Medicine. Diponegoro University. 2010;
9. Carr MM, Smith RL. Ceruminolytic efficacy in adults versus children. *J Otolaryngol.* **2001 Jun;30(3):154–6.**
10. Gleitman RM, Ballachanda BB, Goldstein DP. Incidence of cerumen impaction in general adult population. *Hear J.* **1992;45:28–32.**
11. Koçer M, Güldür T, Akarçay M, Miman MC, Beker G. Investigation of age, sex and menstrual stage variation in human cerumen lipid composition by high performance thin layer chromatography. *J Laryngol Otol.* **2008 Sep 12;122(9):881–6.**
12. Stone M, Fulghum RS. Bactericidal activity of wet cerumen. *Ann Otol Rhinol Laryngol.* **93(2 Pt 1):183–6.**
13. Cipriani C, PharD G, Taborelli G, Gaddia G, Melagrana A, Rebora A. Production Rate and Composition of Cerumen. *Laryngoscope.* **1990 Mar;100(3):275–6.**
14. Jacobsen E, Billings JK, Frantz RA, Kinney CK, Stewart ME, Downing DT, et al. Age-Related Changes in Sebaceous Wax Ester Secretion Rates in Men and Women. *J Invest Dermatol.* **1985 Nov;85(5):483–5.**
15. Jabor MA, Amedee RG. Cerumen impaction. *J La State Med Soc.* **1997 Oct;149(10):358–62.**
16. Blaak EE. Fatty acid metabolism in obesity and type 2 diabetes mellitus. *Proc Nutr Soc.* **2003 Aug 5;62(3):753–60.**
17. Rahman IM. Analysis of Factors Affecting the created of cerumen obturans in Outpatient at Regional Hospital Labuang Baji Makassar City. Essay. Makassar: Hasanudin University Library; 2014.
18. Waskhito S. Description of Knowledge and Characteristics of Ear Cleansing Case study in Tanjung Pura 1 Senior High School and Harapan 1 Medan Senior High School. Medan; 2015. 2 p.
19. Gabriel OT, Mohammed UA, Paul EA. Knowledge, Attitude and Awareness of Hazards Associated with Use of Cotton Bud in a Nigerian Community. *Int J Otolaryngol Head & Neck Surg.* **2015;4(3):248–53.**
20. Hobson JC, Lavy JA. Use and abuse of cotton buds. *J R Soc Med.* **2005 Aug;98(8):360–1.**
21. Bailey BJ, Johnson JT, Newlands SD. *Head and Neck Surgery - Otolaryngology.* 4 Volume 2. Philadelphia: Lippincott Williams & Wilkins; 2006.
22. Guest JF, Greener MJ, Robinson AC, Smith AF. Impacted cerumen: composition, production, epidemiology and management. *QJM.* **2004 Aug 1;97(8):477–88.**
23. Soetjipto D, Mangunkusumo E. *Textbook Ear Nose Throat Health.* 7th ed. A E, Nurbaiti, editors. Jakarta: publishing agency : Faculty of Medicine Indonesia University; 2012. 59-60 p.
24. McCarter DF, Courtney AU, Pollart SM. Cerumen impaction. *Am Fam Physician.* **2007 May 15;75(10):1523–8.**

25. Macknin ML, Talo H, Medendrop S V. Effect of cotton-tipped swab use on ear-wax occlusion. *Clin Pediatr (Phila)*. 1994 Jan;33(1):14–8.
26. Osguthorpe JD, Nielsen DR. Otitis externa: Review and clinical update. *Am Fam Physician*. 2006;74(9):1510–6.
27. Humaira CF. Otomycosis Prevalence in Student of Jakarta Syarif Hidayatullah State Islamic University FKIK and Affecting Factors. Essay. Jakarta: Syarif Hidayatullah State Islamic University Library; 2012. 25 p.
28. Roland PS, Smith TL, Schwartz SR, Rosenfeld RM, Ballachanda B, Earll JM, et al. Clinical practice guideline: Cerumen impaction. *Otolaryngol Neck Surg*. **2008 Sep;139(3_suppl_1):S1–21.**

Exploring the Compliance Test for X-ray in Health Facilities Security of Makassar Region

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ABSTRACT

The initial observation on compliance test for X-ray facilities reported that some of them were failed to meet the obligation of compliance test provided by the Health Facilities Security of Makassar Region or BPFK Makassar. The purpose of this study was to explore the reasons for their failure to fulfill the obligation on X-ray facilities compliance and services. This research employed qualitative methods. The ten informants of 9 primary informants and 1 secondary informant from the X-ray health facilities in Makassar of South Sulawesi Island were interviewed. The result behind the success in their compliance test was mainly due to the presence of the supervision team from the Nuclear Energy Regulatory Agency of Indonesia. Additionally, another factor such as the presence of internal and external supervision also played significant support to be able to fulfill the compliance test for X-ray facilities. At the other side, inadequate funding and lack of understanding about the purpose and obligation of the compliance test were mostly informed by the respondents as the main reasons for their failure to comply with the calibration test of the X-ray facilities. Therefore, external and internal supervision should be strengthened to increase the compliance test among X-ray health facilities in Makassar.

Keywords: *Compliance Test, X-ray, Health Facilities, Nuclear Energy Regulatory Agency*

INTRODUCTION

The Minister of Health of Indonesia Regulation Number. 432/MENKES/SK/IV/2007 on occupational safety and health management for the hospital stipulated that radiation is one of potential physical hazards to be concerned by planning, organizing, implementing, and controlling aiming to cultivate occupational safety and health in the hospital especially in radiology examination.

The ionizing radiation that involves the human body can cause deterministic effects such as skin erythema, cataract, sterility, nausea, diarrhea, fetal death, stochastic effects such as cancer, and hereditary defects.¹ The radiation protection is useful to prevent the deterministic effects and to decrease the probability of stochastic effects among workers.

Meanwhile, the compliance test is an assurance of the X-ray used to prevent unnecessary radiation dose on the patients, the workers and the person who may around. The x-ray machine reliability assurance in Indonesia is regulated by BAPETEN Regulation Number 9/2011 regarding the implementation of the compliance test and the Indonesian Minister of Health Regulation Number 54/2015 on the medical equipment compliance test. According to BAPETEN Regulation Number 9/2011, every health facilities that request a new permit or an extension of the license of X-ray machine is mandated to apply for the compliance test. If a case occurs.²

The services of the compliance test applied by BPFK Makassar include 10 zones in eastern Indonesia: South Sulawesi, West Sulawesi, Central Sulawesi, Southeast Sulawesi, Gorontalo, North Sulawesi, North Maluku, Maluku, Papua, and West Papua. From 2015 to 2017 some 124, 114, 134, and 145 facilities around the Eastern part of Indonesian territory had the compliance test once or twice. The Director General of Health Services of the Ministry of Health Republic Indonesia showed that 315 hospitals under BPFK Makassar's coverage of General Hospitals and Specialty Hospitals had the X-ray

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facilities.³ Unfortunately, many of them did not meet the standard of twice compliance tests annually. According to a theory, the input, the process, and the output in health administration is unique according to who and how to deal with their limitation.⁴

There are some aspects such as health facilities, fund, policy, and feedback that are in need to boost the fulfillment of twice compliance tests for the X-ray facilities annually.

METHOD

This research was qualitative research. The government’s X-ray facilities that implement twice tests continuously or called ‘SP.A,’ while the private X-ray facilities are called ‘SP.B.’ The government health facilities that do not implement the twice tests

periodically are called ‘SP.C,’ and the private ones are called ‘SP.D.’ The informants consisted of management staff and a technical worker from both sides, the X-ray facilities and the BPFK of Makassar. An in-depth interview was employed to gather data. A total of ten informants from the X-ray health facilities in Makassar of South Sulawesi Island were interviewed, and their responses were re-check using triangulation with the BPFK staff and technical operator.

RESULTS

Data Analysis of BPFK Makassar: According to BPFK Makassar services, the compliance test from 2014 to 2017 increased in term of the number of test participants, besides the decreasing number of health facilities from 124 facilities to 114 from 2014 to 2015. The result of the implementation of the test can be shown in Table 1..

Table 1: A number of health facilities implement the compliance test and calibration in the year of 2014–2018

Province	2014	2015	2016	2017	2018*
North Sulawesi	8	8	8	10	6
South East Sulawesi	9	5	7	12	2
Central Sulawesi	11	7	11	15	8
South Sulawesi	57	51	66	55	17
West Sulawesi	4	4	3	7	0
West Papua	6	1	3	2	1
Papua	7	9	7	9	2
North Maluku	5	4	7	4	4
Maluku	6	2	5	8	2
Gorontalo	6	14	6	9	2
Outside The Working Area of BPFK Makassar	5	9	11	14	4
Total	124	114	134	145	48

*The data until 2018 May

South Sulawesi is a province with the largest number of health facilities in East Indonesia. Almost half or 44.29% implemented the compliance test with BPFK Makassar annually. In 2017, there was an increasing number of compliance test participants up to 70% of X-ray facilities.

Table 2: The number of Health Facilities based on both possession of government and private from year of 2014-2018

Health Facilities	2014	2015	2016	2017	2018*
Central Government	4	4	6	5	4
Province Government	12	11	12	17	3
County/City Government	48	40	56	57	16
Another Minister	2	2	2	3	0
Private Hospitals	28	24	29	30	7
Clinics	24	26	14	24	7
BUMN	1	2	3	0	0
Companies	2	2	4	2	4
TNI/POLRI	3	3	8	7	7
Total	124	114	134	145	48

*The data until 2018 May

In the input, process, and output are shown in figure 1. the X-ray facilities attached to the government showed an increase in compliance test fulfillment, but the private ones didn't show any progress.

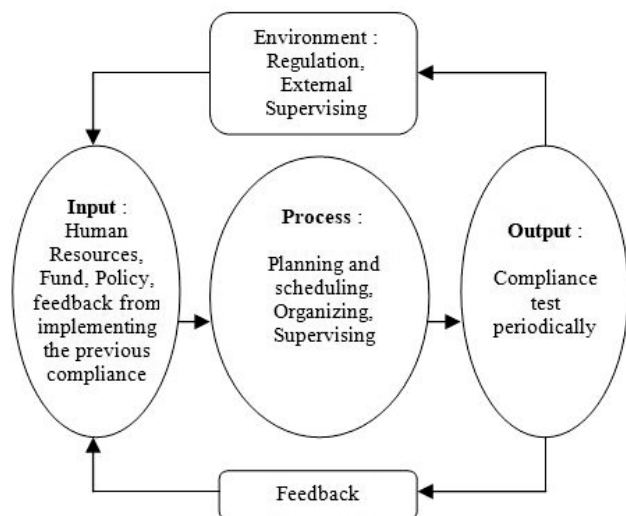


Figure 1: Scheme of the application of the compliance test and calibration with Systems Theory

Interviews Result

Input: All management and staff in ‘SP.A,’ ‘SP.B,’ and ‘SP.C’ knew the latest regulation of the compliance test that should be fulfilled biennial or once every two years along with the extension of the license. Funding was the main reason for failure in the fulfillment of the compliance test.

Subsequently, the standard operating procedure had to be implemented for the X-ray facilities if the facility sought the compliance test and licensed to operate it.

The ‘SP.A,’ ‘SP.B’ and ‘SP.D’ obtained the compliance test with BPFK Makassar. However, ‘SP.C’ had calibrated with private labs in 2017. Financially, one of the respondents said that the cost of medical equipment calibration by BPFK Makassar is too expensive.

Process: Planning for the test was conducted annually. The X-ray Facilities with (‘SP.A’) could not schedule the test because they had no staff to be in charge of the implementation achievement. The ‘SP.B’ code of X-ray facility usually set a reminder on the 90th days before the expiration of the X-ray license.

Staffing had been applied by the management ‘SP.A,’ ‘SP.B,’ and ‘SP.C’ by employing staff for coordinating this implementation of the compliance test and calibration. A radiation protection officer directly involved in the

process of the test. The ‘SP.D’ code for the radiology clinics own by private did not have the coordinator for their compliance test. Therefore, a radiation protection officer should take in charge of compiling the documents of the standard of the permission for the compliance test.

Nuclear Energy Regulatory Agency (BAPETEN) once conducted inspections in all of the research subject. The compliance test related to the accreditation requirements as well as a mean to protect the patient. Subsequently, marketing aspects are also taking advantages of the compliance aspects of the X-ray facilities.

Output: Research subjects ‘SP.A’ and ‘SP.B’ applied the compliance test and calibration periodically, due to human resources awareness on the rules and the benefit of the compliance test. Currently, a significant fund is available to cover the test by BPFK Makassar. However, the calibration was not implemented in ‘SP.C’ due to the insignificant fund, even though ‘SP.C’ was supported by the input system.

The implementation of the calibration periodically could not be applied in ‘SP.D’ due to the lack of understanding the implementation of calibration for every year, but mere applying the compliance test for the standard of the permission for two year.

DISCUSSIONS

Health facilities in two areas such as both West and South Sulawesi could apply the compliance test and calibration due to the close distance with BPFK Makassar. However, health facilities in West Papua could use this test least due to this reason. West Papua is a large area, where most of the regions are wildlife jungle. Technical Unit in Papua could not afford this compliance test, so Papua and West Papua must invite the BPFK testers. According to Weeren (2016), convenience places affected partially.⁵

Input: The supervision from Nuclear Energy Regulatory Agency towards the X-ray facilities and the requirement for a license are the contributor for their implementation of the compliance test. A sanction is enforced according to the Regulation on nuclear energy Number 10/1997.⁶

The compliance test and calibration of the X-ray facility are related to the availability of funding as informed by the respondent. Lack of financing among ‘SP.C’ X-ray facilities was the reason for not being able

to fulfill the compliance test. Although the commitment of the organization presence, without sufficient funding, the compliance test was trying to enforce.⁷ Government Regulation Number 21/2013 stipulated that funding should cover the accommodation, transportation, and daily allowance for the person who conducted the test. However, many X-ray facilities perceived a significant burden to accommodate the compliance test cost.⁸

The BPFK Makassar has the dimension of service quality with top categories and the aspect of services quality with sufficient excellent facilities that put them in a pressure to work harder in convincing and advocating X-ray facilities to obtain the compliance test.

Process: The correct information system can strengthen the importance of the planning, and ensure the preparation run well.⁹ SPB applies the information system through plan ordered in the last year, concerning the limit time of the certificate, so SPB can afford to employ the calibration test punctually.

As BAPETEN Chairman's Regulation No. 4/2013, health facilities utilizing the source of ionizing radiation should have the radiation protection officers. Health facilities had the radiation protection officers even though the officers were not the permanent employees. The test coordinator pointed is to be expected to ease the implementation of the compliance test and calibration periodically. Even though SPC had the test coordinators but the fact of the lack of fund caused not the application of the compliance test and calibration regularly. The role of radiation protection officer is essential, but if their obligations are violated, merely used as the standard of nuclear energy permission, so the sanction will be conducted as mentioned in Regulation Number 10/1997.¹⁰

The most effective supervision is an inspection from BAPETEN. However, it is just limited to the implementation in the compliance test for the permission. People should concern labeling applied by BAPETEN for their common safety. In the calibration implementation, the factor of accreditation assessments done by health facilities becomes the supporting factor of the execution of the compliance test and calibration routinely. SPB also did the internal supervision through the internal audit for every year. This audit is a management step as the supervision effort if disobedience is found in the result of the internal review so that the top management can stop the operational examination permission. The

health facilities supervising the implementation of compliance test and calibration to reduce doses received by the officer, although the addition of radiation doses is also influenced by use inappropriate personal protective equipment.¹¹

Output: The implementation of the compliance test and calibration routinely applied by 'SP.A' and 'SP.B' was affected by the changed input: knowledge and obedience of the human resources towards the regulation of these two tests, the availability of sufficient fund, of procedure, run well, changed the process of planning, staffing, and supervising can increase this implementation.

The application of radiation safety management by applying the quality control of x-ray machine in health facilities should be conducted as it mentioned in its regulations.¹²

CONCLUSIONS

The X-ray facilities without complying with the regulation on compliance test existed in the coverage area of BPFK Makassar.

The inspection by BAPETEN supported the implementation of the compliance test. The requirement to extend the license operation of the X-ray facility contributed to comply with the compliance test.

Source of Funding: Funding also played an essential role in meeting the compliance test mandatory.

Conflict of Interest: The Authors declare no conflict of interest in this article. This research is self funded.

Ethical Clearance: The Ethical Clearance was obtained from the Committee of Ethical Research No. 069/EC/FKM/2018 on 04 June 2018

REFERENCES

1. Goodman TR. Ionizing Radiation Effects and Their Risk to Humans. Am Coll Radiol. 2010;
2. Oey, Gardiner M. Study Of The Role Of the Indonesian Institute Indonesia (LIPI) in Brdging between research and development policy. 2011.
3. Handayani PW, Hidayanto AN, Pinem AA, Hapsari IC, Sandhyaduhita PI, Budi I. Acceptance model of a Hospital Information System. Int J Med Inform. 2017;

4. Novick, Morrows. Public Health Administration: Principles for Population-Based Management. USA: Michael Brown; 2013. 53-78 p.
5. Weeren RJ van, Williams WL, Hardcastle MJ, Shimwell TW, Rafferty DA, Sabater J, et al. LOFAR FACET CALIBRATION. *Astrophys J Suppl Ser.* 2016;
6. Arifin Z. Challenges to Implementation of Knowledge Management on Drafting of Nuclear Regulation Indonesia. 2007;
7. Handayani PW, Hidayanto AN, Sandhyaduhita PI, Kasiyah, Ayuningtyas D. Strategic hospital services quality analysis in Indonesia. *Expert Syst Appl.* 2015;
8. State S. Law of the Republic of Indonesia. 2002;(19):1–19. Available from: http://portal.unesco.org/culture/en/files/30382/11424187703id_copyright_2002_en.pdf/id_copyright_2002_en.pdf
9. Raghunathan T., W.R.King. The Impact Of Information Systems Planning on The Organization. *Omega* 16.2; 1988. 85-93 p.
10. Utami S., Putero S. Regulatory Framework for the Decommissioning of Indonesian Nuclear Facilities. *J Nucl Eng Radiat Sci.* 2017;3(4).
11. Mohamed A, Elamin T. Radiation Safety Awareness and Practice in Sudanese Medical Facilities: A Descriptive. *Int J Sci Res ISSN (Online Index Copernicus Value Impact Factor.* 2013;
12. Briggs-Kamara M, Okoye P. Radiation safety awareness among patients and radiographers in three hospitals in Port Harcourt. *Am J Sci Ind Res.* 2013;

A Comparative Analysis between Integrated Occupational Safety and Health Management System in a Support Mining Company and the Indonesian Mining Safety Management System

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ABSTRACT

A support mining company implements the main company's, Occupational Safety and Health Management System (OSH-MS) called "FRESH" Management System. Meanwhile, the current management system of the Indonesian Mining Safety Management System has to fulfilled by all mining company, regardless main or support or sub-contractor company.

This research aimed to analyze the fulfilment of the existing integrated Occupational Safety and Health Management System toward the Indonesian Mining Safety Management System.

The approach of this action research was a qualitative design. The subject of this research was the Occupational Safety and Health Management System of a supporting company called "X". Data was gathered from the implementation of the "Hazard Identification Risk Assessment and Determination Control (HIRADC)" as well as the existing integrated Occupational Safety and Health Management System included the person in charge as to be matched with the Indonesian Mining Safety Management System

This study resulted in a new format of standardized elements of Occupational Safety and Health Management System for the company X in accordance with the Government Regulation of Republic Indonesia Mining Safety Management System. The result indicated that a positive feedback from the company's top management to make a pilot project using the new format standard of the supporting company "X." In conclusion the new design from this study is implemented.

Keywords: Occupational Safety Health Management System, Mining Safety Management System, Design.

INTRODUCTION

In 2014, the Government of the Republic of Indonesia established the Regulation of the Minister of Energy and Mineral Resources MINERBA No. 38 concerning Mining Safety Management System.¹ The

regulation was established to ensure the availability of an integrated system in controlling the risk of occupational safety and health in mining operations. The legal basis of the establishment of the Regulation of Minister of Energy and Mineral Resources is the Constitution of 1945, Act No. 13 year 2003 concerning Manpower and Government Regulation No. 50 Year 2012 concerning the Implementation of Occupational Safety and Health Management System.

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PT.X is a company of Power Plant and Distribution Transmission operating in the mining environment of PT. Y. Located on the same site, the company is a supporting company specialized in power supply to the mining area of PT. Y. PT. X applies similar management system to its parent company, known as FRESH (Freeport Safety Health Management System). The elements of FRESH are:

1. Premises and Housekeeping
2. Mechanical, Electrical, and Personal Safeguarding
3. Management of Fire and other Emergency Risk
4. Incident Recording and Investigation
5. Organizational Management

FRESH is based on National Occupational Safety Association (NOSA) CMB 150N, Regulation of Minister of Energy and Mineral Resources No. 555 Year 1995, Mine Safety Health Association (MSHA), Occupational Safety Health Association (OSHA) and Occupational Health and Safety Assessment Series (OHSAS) 18001. PT. X responded to the Regulation of the Minister of Energy and Mineral Resources MINERBA No. 38 concerning Mining Safety Management System by reorganizing current OSH-MS.

RESEARCH METHODOLOGY

The research was a qualitative research with inductive approach.² Sample of the research was managerial staffs acting as the member of Occupational Safety and Health Committee (OSH Committee), who master the implementation of Mining Safety Management System, consisting of General Manager as the Chief of the committee (1 person), OSH as Secretary (2 persons), and General Superintendent as committee members (6 persons).

RESULT

Assessing the Implementation of Hazard Identification Risk Assessment and Determination Control (HIRADC) in PT. X: From the implementation of Hazard Identification Risk Assessment and Determination Control (HIRADC) in PT. X, a manager in steam-electric power plant

Based on the response, it can be concluded that the implementation of HIRADC in PT.X is as expected, which has been done thoroughly and profoundly on all aspects of work. The highest risks observed in PT.X were:

1. Electricity Shock
2. Failure in Energy Isolating
3. Lifting operation failure
4. Falls from Height
5. Hand or Body Injury
6. Spinal Injury/Low Back Pain
7. Traffic Collision
8. Exposure to Toxic Gases
9. Hearing loss
10. Financial loss

The identified hazards and risks are already included in hazard control so that the risk can be mitigated at an acceptable level. From the interview, it was clear that PT.X had committed to prioritize the safety and health of its assets, which are the employees.

Gap Analysis between OSH-MS of PT.X and Mining Safety Management System: The result shows that OSH-MS of PT.X has achieved 85% compliance to Indonesian

Mining Safety Management System. From al 555 elements (including sub-elements and sub sub-elements) of Indonesian Mining Safety Management System, all of which has been implemented by PT.X, yet the implementation has not met the terms as required. Some of the elements as well as its sub-elements were identified as impossible to be implemented since the elements are not compatible with the operational of PT.X.

There were no significant or critical differences from seven elements of Indonesian Mining Safety Management System to five elements of OSH-MS implemented by PT.X, which means that urgent actions are not necessary. The element with the lowest compliance was Management Review. PT.X has just implemented the element after the establishment of Indonesian Mining Safety Management System. The following tables present compliance percentage from each element.

Table 1: Compliance of OSH-MS to Mining Safety Management System

No.	Elements	Max Points	Compliance Point	Percentage (%)
1.	Policy	200	171	85%
2.	Planning	200	146	71%
3.	Organization and Personnel	150	142	94%
4.	Implementation	200	156	78%
5.	Evaluation and Follow-up	150	115	77&

Conted...

6.	Documentation	50	30	60%
7.	Review from Management	50	28	57%
TOTAL		1000	852	85%

Design of Standard Elements of OSH-MS of PT.X:
The model of OSH-MS design based on the following description is suitable to be apply into the power generation and transmission distribution company in mining operation.

There are seven standard elements, which are in line with standard elements of Indonesian Mining Safety Management System. Those elements are:

1. Policy
2. Planning
3. Organization and Personnel
4. Implementation
5. Evaluation
6. Documentation
7. Management Review

The concept of Indonesian Mining Safety Management System is more specific compared with other concepts of OSH-MS elements.

Table 2: Design of Element 1 (Policy) and Element 2 (Planning)

No.	Description of Standard Elements	Article No.
1. POLICY		
1.1	Policy of Occupational Safety and Health (OSH) and Operational Safety (OS)	Article 6
2. PLANNING		
2.1	Hazard Identification Risk Assessment and Determination Control (HIRADC)	Article 7a,7b
2.2	Management of Change	Article 7a,7b
2.3	Regulatory Compliance	Article 7.c
2.4	Goals, Objectives, and Programs	Article 7.d
2.5	Work plan and Budget of OSH and OS	Article 7.e

Element 3 “Organization and Personnel” that was listed in elements of Indonesian Mining Safety

Management System should be carefully designed for mining company since there are specific role in OSH committee, like Chief of Mining Engineering or Operational Responsible Person. Another element, that is Element 6 or Documentation, should be also considered since the element provide a method to provide an aspect of ease to manage documents and mining company has many documents to be managed.

Table 3: Design of Element 3 (Organization and Personnel)

No.	Description of Standard Elements	Article No.
III. ORGANIZATION AND PERSONNEL		
1.	Organizational Structure	Article 8.a
2.	Appointment of Operations Responsible Person	Article 8.c
3.	Organizational Structure of OSH and OS Section	Article 8.d
4.	Appointment of Operational and Technical Supervisor	Article 8.e
5.	Safety Accountability Program for Supervisors	Article 8.e
6.	Appointment of Specialized Technical Personnel	Article 8.f
7.	OSH and OS Committee	Article 8.g
8.	Emergency Response Team	Article 8.h
9.	Selection and Placement of Personnel	Article 8.i
10.	OSH and OS Representatives	Article 8.i
11.	OSH and OS Education, Training, and Competence	Article 8.j
12.	OSH and OS Communication	Article 8.k
13.	OSH and OS Administration	Article 8.l
14.	OSH and OS Participation, Consultation, Motivation And Awareness	Article 8.m

Substandard elements in Mining Safety Management System were designed according to articles in the Regulations of Ministry of Energy and Mineral Resources by adjusting previous OSH-MS

standards through the result of analysis on HIRADC implementation and the result of gap analysis between the standard and substandard elements of Mining Safety Management System and previous OSH-MS.

Table 4: Design of Element 4 (Implementation)

No.	Description of Standard Elements	Articles No.
IV.	IMPLEMENTATION	
1.	Work Procedure	Article 9.a
2.	Working at Height	Article 9.a
3.	Open Hole	Article 9.a
4.	Coal Handling	Article 9.a
5.	Working over or near water	Article 9.a
6.	Work Permit	Article 9.a
7.	Personal Protective Equipment	Article 9.a
8.	Work Environment and Occupational Health Management	Article 9.b, 9c
9.	Work Environment Management – Physical Threats	Article 9.b, 9c
10.	Work Environment Management – Chemical Threats	Article 9.b, 9c
11.	Work Environment Management – Biological and Ergonomic Threats	Article 9.b, 9c
12.	Work Environment Management - Housekeeping	Article 9.b, 9c
13.	Office Safety	Article 9.b, 9c
14.	Hearing Conservation Program	Article 9.b, 9c
15.	Heat Stress	Article 9.b, 9c
16.	Management of work-related fatigue	Article 9.b, 9c
17.	Radioactive Management	Article 9.b, 9c
18.	Occupational Health Management	Article 9.b, 9c
19.	Operational Safety	Article 9.d
20.	LOTOTO	Article 9.d
21.	Boiler, Pressure System and Gas Container	Article 9.d
22.	Moving assets Operational Safety	Article 9.d
23.	Elevator and Crane	Article 9.d
24.	Fixed Asset Management	Article 9.d

Conted...

25.	Warning, Signage, and Traffic Signs	Article 9.d
26.	Safety Barrier	Article 9.d
27.	Stairs and Ladders	Article 9.d
28.	Installation Security	Article 9.d
29.	Electrical Security	Article 9.d
30.	Safety in Transmission and Distribution	Article 9.d
31.	Safety in Generator	Article 9.d
32.	Safety in Distribution Panel, MCC	Article 9.d
33.	Safety in Switchgear	Article 9.d
34.	Safety in Switchyard	Article 9.d
35.	Fire Protection	Article 9.d
36.	Mechanical Safeguarding	Article 9.d
37.	Hand Tool	Article 9.d
38.	Safety in Workshop	Article 9.d
39.	Safety on Boats	Article 9.d
40.	Dangerous Substance Management	Article 9.d
41.	Planning and Engineering Management System	Article 9.f
42.	Purchase System	Article 9.g
43.	OSH of Contractor	Article 9.h
44.	Emergency system Management	Article 9.i
45.	First Aid	Article 9.j
46.	First Aid Kit	Article 9.j
47.	Off-job Safety	Article 9.k

These substandard elements were considered as the additional results of observations on documents and procedures related to the operation of power plants and transmission of electrical distribution, including standard operating procedure based on the result of the focus group discussion and self-administered questionnaire.

Table 5: Design of Element 5 (Evaluation)

No.	Description of Standard Elements	Articles No.
V.	EVALUATION	
1.	Monitoring, Measurement and Evaluation of OHS and OS Performance	Article 10.a
2.	OSH and OS Inspection	Article 10.b

Conted...

3.	Evaluation of Regulatory Compliance	Article 10.c
4.	Incident Management	Article 10.d
5.	Near miss Management	Article 10.d
6.	Fatality Risk Management Program	Article 10.d
7.	Evaluation of OSH and OS Administration	Article 10.e
8.	Internal Audit	Article 10.f
9.	Non-conformance, Preventive and Corrective Action	Article 10.g

Standard elements were arranged based on the Articles number in Mining Safety Management System.

Table 6: Design of Element 6 (Documentation) and Element 7 (Management Review)

No.	Description of standard Elements	Article No.
VI. DOCUMENTATION		
6.1	Manual of OSH-MS	Article 11.a
6.2	Document and Record Control	Article 11b,c,d
VII. MANAGEMENT REVIEW		
7.1	Management review	Article 12

DISCUSSION

Implementation of Hiradc in PT.X: Evaluation on HIRADC applied by PT.X has resulted in the level of dangers in the company’s work environment. The level of dangers and risks in PT. X was categorized as HIGH, because or risk factors related to electricity. The steps to manage accidents are in line with the number of accidents because of shift system³. The highest risk level in PT.X shows that the dangers and risks are related with the core business of the company i.e. electricity. The effectiveness of controls conducted by PT.X was measured by percentage of the activity, yet the controls should be developed in accordance with scientific methods.

Gap between OSH-MS and Mining Safety Management System: Gap analysis was conducted to assess the compliance to Indonesian Mining Safety Management System. The evaluation was based the Indonesian Mining Safety Management System assessment method which refers to Attachment II of the Regulation of Ministry of Energy and Mineral Resources

No. 38 Year 2014 and compared to Relative Importance method to describe the level of priority in compliance to regulations. ⁴

From the observation on Indonesian Mining Safety Management System compared to OSH-MS PT.X, there was 85% gap, which meant that PT.X was in need to follow up the non-conformities that occur from the core elements to sub-elements.

Design of Standard Elements Of OSH-MS of PT.X: Overall, Operational Safety was the most important and significant aspect in Indonesian Mining Safety Management Program.

Policy and Planning: Work plan and budget of OSH and OS are the only elements that should be designed since the element has not been listed in the previous OSH-MS. The preparation was in line with Indonesian Mining Safety Management System, article 7e, on work plan and budget of mining safety system.¹

Article 10 Section 4 Point C stated that occupational health and safety planning implementation should be supported with adequate budget⁵.

Organization and Personnel

Organizational Structure: Organizational structure has been listed on Indonesian Mining Safety Management System, article 8a, on planning and establishment of organizational structure, duties, responsibilities, and authority¹.

In line with Major Labor Laws No. 13 Year 2003, Article 87 section 1, OSH-MS is part of company management system, which comprises of organizational structure, planning, implementation, responsibilities, procedure, process, and resources. These elements are needed for policy development, compliance, analysis, and maintenance on occupational health and safety to control risks related to work activities in order to establish a safe, efficient, and productive workplace.⁶

According to Government Regulation No. 50 Article 12, section e, continued in Article 13, it is stated that OSH information should be made available for every employee. To achieve that, a clear organizational structure is needed.⁵

Appointment of Operational Responsible Person: Appointment for Operational Responsible Person has

been listed on Indonesian Mining Safety Management System, article 8c. It is in line with OHSAS Clause 4, element 4.4, and sub element 4.4.2 stating that setting the role, responsibilities, and accountability to facilitate the effectiveness of management system can be accomplished by appointing Operational Responsible Person, which is necessary in Mining Safety System⁷.

Organizational Structure of OSH and OS Section:

Organizational Structure of OSH and OS Section has been listed on Indonesian Mining Safety Management System, article 8d, on formation and appointment of OSH and OS of Mining. It is in line with OSH-MS, article 10 section 4a stating that organization/units are responsible for their OSH. Related to Operational Safety, OSH-MS article 10, section 4c has listed standard operation procedure, as well as information, reporting and documentation procedure.¹

Appointment of Operational Superintendent and Technical Superintendent:

Appointment of Operational Superintendent and Technical Superintendent has been listed on Indonesian Mining Safety Management System, article 8e on appointment of operational superintendent and technical superintendent. It is in line with OSH-MS Article 14 section 1 stating that employers are required to supervise and evaluate OSH in their company

Appointment of operational superintendent and technical superintendent is necessary to be included in Mining Safety Management System.

Appointment of Specialized Technical Staff:

Appointment of specialized technical staff has been listed on Indonesian Mining Safety Management System, article 8f, on Appointment of specialized on mining technical staff. It is in line with OSH-MS Article 10 section 3b stating that authorization in OSH should be equipped by work permit from authorized institution.¹

Administration of OSH and OS: Administration of OSH and OS has been listed on Indonesian Mining Safety Management System, article 8l, on Administration Management of OSH and OS. In line with OHSAS element 4.4.4 on documentation, all documents related to occupational safety should be filed. Furthermore, element 4.4.5 mentioned that required documents for OSH-MS and OHSAS standard must be controlled.

Implementation: The design of the element is unique since all the standard elements of electricity especially

power plants and distribution transmissions are listed in the design. The aspects are included in electrical safety aspects, including the dangers of Arc Flash and other electrical aspects⁸.

Open Hole: Open hole has been listed in Indonesian Mining Safety Management Program, Article 9a, on Operation Management Implementation¹.

Open hole is an operational work that must be done in mining area.

That is in line with FCX 01- Open Hole Policy stating that any excavation work resulting in open hole must include a warning sign to inform workers about the excavation work in the area.

Coal Handling: Coal handling has been listed in Indonesian Mining Safety Management Program, Article 9a, on Operation Management Implementation¹.

This in line with OSHA 29CFR 1926.555 and OSHA 49CFR Chapter 2, describing that any work related to coal are hazardous due to the dust and other dangers. It is important to notice any handling such as personal protective equipment, shift change time, as well as operational management to protect workers and work tools⁹.

Occupational Health and Environment Management:

Occupational Health and Environment Management has been listed in Indonesian Mining Safety Management Program, Article 9b and 9c, on Occupational Health Management Implementation and Mining Operational Safety Management Implementation¹.

It is in line with Act No. 13 Year 2003 Article 71 section 2 point c stating that work condition and environment should not interfere with physical, mental, social, and learning time in school. Work environment should not restrict occupational health. Occupational health is the responsibility of employers⁶.

Evaluation

Evaluation of Regulatory Compliance: Evaluation of Regulatory Compliance has been listed in Article 10.e. of Indonesian Mining Safety Management System concerning Evaluation of Regulatory Compliance. The evaluation is in line with OHSAS element 4.5.2 concerning evaluation of compliance, or in line with the commitment of organization to comply, the organization should establish, implement and maintain procedures to evaluate their compliance with relevant regulation.

Evaluation of Administration of OSH and OS: Evaluation of Administration of OSH and OS has been listed in Article 10.e. of Indonesian Mining Safety Management System concerning Evaluation of Mining Safety Administration Management ¹.

Source of Funding: This research is self funded

Ethical Clearance: The Ethical Clearance was obtained from the Committee of Ethical Research No. 038/EC/FKM/2018 on 25 April 2018.

CONCLUSION

From the research, it can be concluded that:

1. Hazard and risk related to all work in PT.X have been identified and all risk has categorized based on the level of risk. Control measures have been established and performed consistently starting from the highest risk level to the lowest level of risk, so that the design of the standard elements created can be directly integrated to the results of HIRADC process
2. Compliance level of OSH-MS standards implemented by PT.X to Indonesian Mining Safety Management System was 85%, which can be categorized as SATISFACTORY, or based on the regulation of Ministry of Energy and Mineral Resources MINERBA, the compliance level has been certified as SILVER.
3. Design of element and sub-element standard for OSH-MS PT.X is in line with the regulation of Indonesian Mining Safety Management System, from five elements to seven elements. The additional elements were Organization and Personnel (Element 3) and Documentation (Element 6). Several sub-elements were merged into a new element based on the requirements from Indonesian Mining Safety Management System as well as PT.X operation in electricity.

RECOMMENDATION

The design of OSH-MS conforming Mining Safety Management System should be consistently applied and reviewed for its elements and sub-elements along with the conditions of companies operating in mining.

Conflict of Interest: The Authors declare no conflict of interest in this article.

REFERENCES

1. Bharata, A. Y., & Syaaf, R. Z. (2014). Synchronization Of Panca Nirbhaya With SMKP Minerba/MSMS 3814 (Regulation Of The Minister Of Energy And Mineral Resources Of The Republic Of Indonesia Number: 38 Year 2014). Proceeding International Conference Of Occupational Health and Safety 2017 (ICOHS) 2017, 86.
2. Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health promotion practice*, 16(4), 473-475.
3. Nonstandard shift schedules and the risk of job-related injurie, *Scand J Work Environ Health* 2006;32(3):232-240. 2006
4. Norway Standard, NORSOK Standard S-006 Rev.2 December 2003
5. Government Regulation Of The Republic Of Indonesia Number 50 Of 2012 about The implementation Of Occupational Safety and Health Management System.
6. State Gazette Of The Republic Of Indonesia. Act Of The Republic Of Indonesia Number 13 Year 2003 concerning Manpower.
7. Occupational Health and Safety Assessment Series-OHSAS 18001-2007. 2007
8. National Fire Protection Association, NFPA 70 E Standard for Electrical Safety in the Workplace. 2007
9. Occupational Safety Health Administration, OSHA 29CFR 1926.555, OSHA 49CFR Chapter 2. 1970

The Correlation between Regulation Understanding by Inter-Professional first 1000 days of Life Health Workers and the Acceleration of Toddler Stunting Prevention

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ABSTRACT

Promoting exclusive breastfeeding, infant and young child feeding (IYCF) practice are strategies to solve and prevent stunting. However, in fact, this effort does not yet achieve the expected target. Regulations on exclusive breastfeeding and IYCF have been provided and widely socialized so far. This study aims to analyze the correlation between regulation understanding (focusing on exclusive breastfeeding and IYCF) by inter-professional health workers collaboration and the implementation of stunting prevention in urban areas. Observation based study with mixed method using cross sectional design was performed in Surabaya city (33 primary health care centers) and Sidoarjo district (13 primary health care centers), during September-December 2017. The subjects of 199 health workers were selected purposively. The data were collected through interview using structured questionnaire combined with Focus Group Discussion (FGD). Then, the data were evaluated using descriptive and contingency coefficient analysis. The understanding of regulation by inter-professional health workers on the exclusive breastfeeding and IYCF varied with average of 76.4% and 63.6%, respectively. The implementation of this regulations by the inter-professional health cares did not yet in line with the condition of stunting program prevention. However, the performance synergism of multisector institutions and the cross profession to achieve the exclusive breastfeeding target was stronger than that of IYCF. According to contingency coefficient analysis ($p < 0.05$), good understanding, well-organized documents availability, and the regulation conformity by health workers significantly correlated with the implementation of exclusive breastfeeding regulation. Good understanding of health workers on exclusive breastfeeding and IYCF regulations is a key factor in the practical collaboration of inter-professional health workers to educate people to achieve the target and to implement the cross sectional programs to prevent toddler stunting.

Keywords: *regulation; coloboration; inter-professional; stunting*

INTRODUCTION

The implementation of the accelerated program of nutrition improvement through the rescue movement of the first 1000 days of life in Indonesia, is one of the efforts to achieve the target of SDGs. The achievement of the SDGs targets can only be done if the majority of policy concern are given to the nutritional improvement (Input, Output) on sustainable development. According to The National Team for The Acceleration of Poverty Reduction (TNP2K) in 2017⁽¹⁾, the first 1000 days of life program has not shown encouraging results such as lack of integration planning, budgeting implementation,

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service, monitoring and evaluation, as well as the lack of common purpose and agreement of the importance of handling the first 1000 days of life issue. Similarly, policy and intervention programs as effectively stunted because policy and regulation related to stunting intervention have not been maximally used as a common ground for handling stunting.

Stunting in children is the most fundamental challenge in the world to promote development⁽²⁾. Childhood stunting, being short for one’s age, has life-long consequences for health, human capital and economic growth⁽³⁾. In Indonesia, stunting prevalence of children under five are 37%. Promoting exclusive breastfeeding and IYCF are strategies to solve and prevent stunting. However, in fact, this effort does not yet achieve the expected target. Regulations on exclusive breastfeeding and IYCF have been provided and widely socialized so far.

Both regulation and policy related to the first 1000 days of life, particularly regulation on exclusive breastfeeding and IYCF, are available in form of rules: Laws, Health Ministerial Decree as well as Regional Regulation. The rules are: Law No. 36/2009 concerning health, Government Regulation (Government Regulation No. 33/2012 about exclusive breastfeeding), and Health Ministerial Decree RI No.450/Menkes/SK/IV/2004 about exclusive breastfeeding in Indonesia; and Provincial Government Regulation of East Java No 11/2011 about nutrition improvement⁽⁴⁾. However, the main challenges to execute the nutrition policy⁽⁵⁾ are the coordination complexity inter and intra sectors, the lack of concern of decision makers about scale and the impact of nutrition problem on socioeconomic as well as for the next generation growth, and lack of social pressure and advocacy leading to low commitment.

The challenges as previously mentioned give impact directly and indirectly on the achievements of nutrition improvement, which are not optimum yet such as the implementation on exclusive breastfeeding and IYCF. The earlier implementation on breastfeeding initiation is accounted as 50% out of total given birth mothers and 65% of the infants get less than 6 months

exclusive breastfeeding⁽⁶⁾. This study aims to analyze the correlation between regulation understanding (focusing on exclusive breastfeeding and IYCF) by inter-professional health workers collaboration and the implementation of stunting prevention in urban areas.

METHOD

Observation based study with mixed method using cross sectional design was performed in Surabaya city (33 primary health care centers) and Sidoarjo district (13 primary health care centers), during September-December 2017. The subjects of 199 health workers (head of primary health care unit, medical doctor, nutritionist, midwife, and others health workers) were selected purposively. The data were collected by interview using structured questionnaire and combined with focus group discussion (FGD).

Data collection was performed by trained enumerator and inspected by investigator team work. The data were collected through surveillance to health workers, and then FGD was conducted on them. The data were further analysed descriptively using frequent distribution, presented in tables and narations. The correlation between variables was performed with contingency coefficient. Ethical clearance was obtained from the ethics committee of Faculty of Public Health, Universitas Airlangga, no 503-KEPK.

RESULTS AND DISCUSSION

The characteristics of health workers selected for this study were presented in Table 1. The average age of both planner (head of primary health care unit) and program executor (medical doctor, nutritionist, midwife, and others health workers) were 39.6 years old. The head of primary health care unit as planner, around 48.9 years old; and medical doctor, nutritionist, midwife and other health professionals as program executor, around 37.7 years old. Most of the selected health workers were female, with the education level of BSc and medical doctor (72.7%) for planner, and D3/D4 for nutritionist, midwife, and others.

Table 1: Characteristics of Health Workers

Variable	Head of Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professionals	Total
Age (years)	48.9 ± 6.2	38.3 ± 7.2	42.2 ± 9.4	36.8 ± 9.6	33.3 ± 9.8	39.6 ± 9.9

Conted...

Gender						
Male	8 (24.2%)	3 (9.4%)	11 (31.4%)	0 (0)	4 (20%)	26 (13.2%)
Female	25 (75.8%)	29 (90.6%)	24 (68.6)	77 (100%)	16 (80%)	171 (86.8%)
Education Level						
D1	0 (0)	2 (5.7)	0 (0)	0 (0)	0 (0)	2 (1)
D3/D4	0 (0)	0 (0)	25 (71.4)	74 (96.1)	9 (40.9)	108 (54.3)
Bachelor (BSc)	24 (72.7)	26 (81.3)	8 (22.9)	2 (2.6)	13 (59.1)	73 (36.7)
Graduate (master)	9 (27.3)	6 (18.8)	0 (0)	1 (1.3)	0 (0)	16 (8)

Regulation and Understanding: In general, policies that become national programs will be strengthened institutionally with local regulations. The regulation and policy related to the first 1000 days of life, especially regulation on exclusive breastfeeding and IYCF are provided in 19 regulations in different level such as Laws, Health Ministerial Regulation, Health Ministerial Decree as well Government Regulation. If traced further, not all region follow up the Presidential Regulation No 42/2013 about the Movement of the first 1000 days of life. East Java is the only province in Indonesia that has a Provincial Government Regulation for the nutrition improvement, and the district of Sidoarjo is also the first district that has a Regional Regulation No 1/2016 concerning nutrition improvement and exclusive breastfeeding⁽⁷⁾. Among 19 regulations, 14 regulations (8 on exclusive breastfeeding and 6 regulations on IYCF) were asked to health workers regarding to their understanding, documentation, reading and implementation.

The knowledge of regulation on exclusive breastfeeding: The knowledge of health workers on exclusive breastfeeding regulation is presented in Table 2. Government regulation no. 33/2012 on Exclusive Breastfeeding regulation and Law No. 36/2009 on Health, are the most widely known regulations by the subjects (health workers). Regulations on exclusive

breastfeeding such as Government regulation no. 3/2012 (Exclusive breastfeeding), Health Ministerial Decree RI No. 15/2013 on provision of nursery facility, Kepmenkes RI no.450/Menkes/SK/IV/2004 on exclusive breastfeeding to infant in Indonesia, are well known by head of primary health care unit, nutritionist and midwife. Other regulations known by the health workers particularly in Sidoarjo district is Regional Regulation Sidoarjo District no. 1//2016 on nutrition improvement and exclusive breastfeeding.

Documentation of Regulation on Exclusive Breastfeeding: Based on the documentation, more than 50% subjects did not have the document about exclusive breastfeeding regulation. Among the subjects who told that knowing well and have the document regulation, regrettably they couldn't showed the document. Among the regulations which were well known by the subjects (Government Regulation No. 33/2012 on Exclusive Breastfeeding), only 30% of the health workers could showed the document.

Among 8 regulations as shown in table 2, the most frequently read and implemented regulations by the subjects were Government Regulation no. 33/2012 and Law no. 36/2009. Between those regulations, Government Regulation no. 33/2012 was the most widely known regulations, available documents, reads, and implemented by health personnel.

Table 2: The Health Workers Who Knew the Exclusive Breastfeeding Regulations

Regulation	Head of Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professionals	Total
Government regulation (PP No. 33/2012)	26 (83.9)	18 (56.3)	32 (91.4)	61 (85.9)	18 (81.8)	155 (81.2)
Health Ministerial Decree RI No. 15/2013	24 (77.4)	12 (37.5)	25 (71.4)	52 (73.2)	13 (59.1)	126 (66)

Conted...

Health Ministerial Decree RI No. 450/Menkes/SK/IV/2004	22 (71)	11 (34.4)	26 (74.3)	49 (68.1)	13 (59.1)	121 (63)
Ministerial regulations on women's empowerment and child protection RI No. 3/2010	18 (58.1)	8 (25)	21 (60)	40 (54.1)	5 (25)	92 (47.9)
Law No. 36/2009 about health	28 (90.3)	19 (59.4)	29 (82.9)	62 (84.9)	15 (75)	153 (80.1)
Presidential Regulation No. 42/2013	19 (61.3)	5 (15.6)	22 (62.9)	41 (56.2)	5 (25)	92 (48.2)
Health Ministerial Decree RI No. 25/2014	18 (58.1)	11 (34.4)	22 (64.7)	44 (61.1)	7 (35)	102 (54)
Health Ministerial Decree RI No.15/2014	19 (61.3)	9 (28.1)	23 (65.7)	43 (59.7)	8 (40)	102 (53.7)

Based on the contingency coefficient study, there is a significant correlation ($p < 0.05$) between knowledge, availability of document, regulations read, and the implementation of exclusive breastfeeding regulations. This result suGovernment Regulationorts the urgency of regulation socialization, document provision physically, regulation that can be read by health personnel so the regulation can be optimally implemented.

IYCF regulation knowledge: About 6 regulations were asked to health workers (subjects). There were fewer subjects who knew the IYCF regulation compared to the exclusive breastfeeding one (Table 3). As show in the table, less than 50% subjects knew the IYCF regulation. Among 6 regulations asked, only Health Ministerial Decree RI no. 39/2013 about infant formula milk and other products was known by half of the subject especially head of primary health unit, nutritionist, and midwife.

As shown in table 3, more than 60% of the subjects did not have the document of IYCF regulation. Among the health workers possessing the regulation document, less than 15% of them could showed the document. The document shown by 11% of the health workers was Health Ministerial Decree RI No. 39/2013 about infant formula milk and other products, and Health Ministerial Decree RI No. 224/2007 about technical specification on complementary food.

There is less than 30% of the health workers have read the IYCF regulation. This regulation was most widely read by nutritionist. Overall, IYCF regulation which was most widely read by health workers was Health Ministerial Decree RI No. 240/MENKES/

PER/V/1985 about breastfeeding meanwhile, the IYCF regulation which was most widely read by nutritionist was Health Ministerial Decree RI No. 224/2007 about technical specification on complementary food.

The IYCF regulation was more implemented by nutritionist than other health professionals. The most implemented regulations were Health Ministerial Decree RI No.39/2013 about infant formula milk and other products, Health Ministerial Decree RI No. 240/MENKES/PER/V/1985 about breastfeeding substitution, and Kepmenkes RI No. 224/2007 about technical specification on complementary food.

Based on the contingency coefficient test, there was a significant correlation ($p < 0.05$) between knowledge, document availability, regulations read, and the implementation of IYCF regulation. This result also suGovernment Regulationort the urgency of regulation socialization, document provision, and regulation reading to achieve optimum implementation of IYCF regulation.

The understanding of regulation by inter-professional health workers on exclusive breastfeeding and IYCF varied with average of 76.4% and 63.6%, respectively. The implementation of this regulations by these inter-professional health cares did not yet in line with the condition of stunting program prevention.

According to contingency coefficient analysis ($p < 0.05$), good understanding, well-organized documents availability, and the regulation conformity by health workers significantly correlated with the implementation of exclusive breastfeeding regulation.

Table 3: The Health Workers Who Knew the IYCF Regulations

Regulation	Head Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professional	Total
Health Ministerial Decree RI No. 240/MENKES/PER/V/1985	15 (48.4)	7 (21.9)	19 (54.3)	36 (51.4)	8 (40)	85 (45.2)
Health Ministerial Decree RI No. 39/2013	17 (54.8)	7 (21.9)	22 (62.9)	41 (55.4)	9 (45)	96 (50)
Health Ministerial Decree RI No. 49/2014	15 (48.4)	8 (25)	20 (57.1)	33 (45.2)	8 (36.4)	84 (43.5)
Health Ministerial Decree RI No. 51/2016	12 (38.7)	7 (21.9)	16 (47.1)	31 (42.5)	3 (15)	69 (36.3)
Health Ministerial Decree RI No. 237/Menkes/SK/IV/1997	13 (41.9)	7 (21.9)	18 (52.9)	30 (40.5)	3 (15)	71 (37.2)
Health Ministerial Decree RI No. 224/2007	13 (41.9)	7 (21.9)	19 (54.3)	39 (52.7)	6 (30)	84 (43.8)

The commitment of multisectoral and intra professional institutions: Table 4 shows the health workers commitment at planner and executor levels. Most of the planners and the executors have strong commitment to achieve the target of exclusive breastfeeding, early initiation of breastfeeding, and IYCF.

More than 50% of the health workers both at planner and executor levels showed very strong commitment

to achieve exclusive breastfeeding, early initiation of breastfeeding, and IYCF targets. While, more than 1/3 of the health workers have strong commitment. As shown in the table, the commitment to achieve exclusive breastfeeding target was stronger as compared to both early initiation of breastfeeding and IYCF targets. The performance synergism of multisector institutions and the cross profession to achieve the exclusive breastfeeding target was stronger than that of IYCF.

Table 4: The Commitment of Health Workers on Exclusive Breastfeeding, Early Initiation of Breastfeeding, and IYCF

Variables	Head of Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professionals	Total
The commitment to achieve exclusive breastfeeding target						
Very strong	23 (69.7)	22 (68.8)	24 (68.6)	40 (51.9)	11 (50)	120 (60.3)
Strong	9 (27.3)	9 (28.1)	11 (31.4)	34 (44.2)	11 (50)	74 (37.2)
Moderate strong	1 (3)	1 (3.1)	0 (0)	3 (3.9)	0 (0)	5 (2.5)
The commitment to achieve EARLY INITIATION OF BREASTFEEDING target						
Very strong	21 (63.6)	19 (59.4)	17 (48.6)	37 (48.1)	12 (54.5)	106 (53.3)
Strong	9 (27.3)	10 (31.3)	14 (40)	38 (49.4)	10 (45.5)	81 (40.7)
Moderate strong	3 (9.1)	3 (9.4)	4 (11.4)	2 (2.6)	0 (0)	12 (6)
The commitment to achieve IYCF target						
Very strong	18 (54.5)	19 (59.4)	22 (62.9)	34 (44.2)	13 (59.1)	106 (53.3)
Strong	11 (33.3)	10 (31.3)	12 (34.3)	37 (48.1)	9 (40.9)	79 (39.7)
Moderate strong	4 (12.1)	3 (9.4)	1 (2.9)	6 (7.8)	0 (0)	14 (7)

More than 50% of the health workers both at planner and executor levels showed very strong commitment to achieve exclusive breastfeeding, early initiation of

breastfeeding, and IYCF targets. While, more than 1/3 of the health workers have strong commitment. As shown in the table, the commitment to achieve exclusive

breastfeeding target was stronger as compared to both early initiation of breastfeeding and IYCF targets. The performance synergism of multisector institutions and the cross profession to achieve the exclusive breastfeeding target was stronger than that of IYCF.

CONCLUSIONS

Good understanding of health workers on exclusive breastfeeding and IYCF regulations is a key factor in the practical collaboration of inter-health workers to educate people to achieve the target and to implement the cross sectional programs to prevent toddler stunting. The equal commitment of all health professionals on breastfeeding-related policies as well as regulations is urgently needed to achieve optimal target of stunting prevention acceleration.

ACKNOWLEDGEMENTS

We would like to thanks to Ministry of Health, Surabaya Health Office, and Sidoarjo Health Office for their help to complete this research.

Conflict of Interest: The authors declare there are no conflict of interest.

Ethical Clearance: This analysis was aGovernment Regulationroved by the Ethics Committe of Faculty of Public Health Airlangga University and all patients gave their written informed consent.

Source of Funding: This research was funded by Ministry of Health Republic of Indonesia.

REFERENCES

1. TN2PK. 100 Regencies/Cities for Intervention of Dwarf Children. Jakarta: National Team for Achieving Poverty Reduction. 2017.
2. Antonio Suarez, Weise. Stunting Polickey Brief. WHO Global Nutrition Target. 2014 page 2-4.
3. Shekar, M. Kakietek, J. D'Alimonter MR. Rogers HE. Eberwein JD. Akuoku JD. Akuoku JK. Pereira A. Soe-Lin S. Hecht R. Reaching the global target to reduce stunting an investment framework. *Health Policy an d Planning*. 2017; 32,2017, 657-668.
4. East Java Province Regional Regulation No 11 of 2011. Concerning Nutrition Improvement Policies. 2011.
5. Ecker, O. and Nene, M. Nutrition Policies in Developing Countries: Challenges and Highlights. Policy Note, International Food Policy Research Institute. 2012.
6. Pocket Book of Nutritional Status Monitoring and Nutrition Performance Indicators. Indoneisa Helth Ministry. 2015.
7. Sidoarjo Regency Regional Regulation Number 1 of 2016 Concerning Improvement of Nutrition and Exclusive Breastfeeding. 2016.

Cadres Outreach Program to Mothers Improve Nutritional Status of Under Two Year Old Children

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ABSTRACT

After exclusive breastfeeding period, complementary feeding is the key elements for under two year old children growth. The lack of nutritious complementary feeding can result in growth failure. This research aimed to improve the nutritional status of under two children through cadres outreach to mothers in providing nutritious complementary food. This quasi experimental study was done at the working area of Puskesmas Genuk, Semarang City, Indonesia. Forty pairs of mother-children under-two in each of two neighborhood area were recruited in the study, as the intervention and control groups. Thirty four pairs in the intervention group, and 32 pairs in the control group finished the study. Ten cadres were trained in providing nutritious complementary feeding foods practices for under-two children. Every cadre outreached 2 mothers in the intervention group for two month period. Data collection was conducted by interviews using structured questionnaires. Weight measurements were done at baseline and at the end of the study. Preceding the study, the average age, weight, WAZ (weight for age Z scores), breastfed status, socioeconomic status between the groups were comparable, but not for gender. There were higher weight changes (0.4 ± 0.31 vs 0.2 ± 0.19) kg and WAZ (0.1 ± 0.95 vs -0.2 ± 0.18) in the intervention compared to the control group. After controlled for gender, WAZ change was still better in the intervention group. There was no difference in mothers' knowledge on nutrition, but there were better attitude toward nutritious feeding practice, better food preparation sanitation and feeding practice scores in the intervention group after two months. It was concluded that cadres' outreach to the mothers for two months increased growth of under two year old children through a better complementary feeding practice and food preparation sanitation.

Keywords: complementary feeding, outreach, cadre, WAZ, feeding practice

INTRODUCTION

Stunting prevalence was very high in Indonesia. Riskesdas data showed that the prevalence of stunting was 37.2%.¹ Although it has already decreased in 2018 to 30.8 %, this level was still to high. ²Studies has shown that stunting prevention was the most sensitive if it was

done during the first 1000 days of life. ^{3,4} In Indonesia, intervention during pregnancy has been done through some programs, however many problems still occurred, thus the low birth weight still a problem. Therefore, to prevent stunting, intervention to children after deliveries until two years old should be done to prevent stunting, as this is the best time to do the intervention. ⁵ Furthermore the growth of under two children will also affect the longitudinal growth after this period. ⁶

Studies has shown that outreach and education program are needed, instead of supplementation only, for the women in urban area, to improve the nutritional status of the children. ⁷ Therefore this study will be conducted through an outreach program. Moreover, to

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increase the nutrition program sensitivity, empowerment to the community is one of the key factors.⁸ Therefore, this study was conducted through training the cadres, who were part of the community. The cadres then empowered the the mothers of under two children through an outreach program. The nutritional status improvement was the target of the study.

METHOD

This quasy experimental study was done in the working area of Genuk Primary Healthcare Center, Semarang, Central Java, Indonesia. Eighty pairs of mothers and their under two year old children were recruited from the *posyandu* in two areas of neighborhood (40 pairs in each group) , which has the similar characteristics in general. One area was chosen as the intervention group and the other area was used as the control group. At the end of the study, 34 pairs in the intervention group and 32 pairs in the control group stayed in the study. They were followed up for two months after the intervention started.

In the intervention groups, the mothers were outreached by health cadres. The health cadres were gathered and trained by the researchers. They were taught about the importance of nutrition for the health of under two children, what are the nutrient requirements for under two children and how to give them nutritious food, including the recipes and demonstration on how to cook complementary feeding to under two children. They also received handbook about the training materials. Then, they were asked to gathered the mothers once a month to provide them with communication, information and education about nutrition for under two children, including the demonstration on how to cook several nutritious complementary feeding for under two year old children. Every health cadres also visited two pairs of mother and child every week to follow up the message and look after the growth of the children, in the first month. After that, they were visited every months. If the mothers had questions regarding the nutrition, health cadres tried to help with their knowledge. The control group did not received this kind of intervention.

At the beginning of the study, data on characteristics of the subjects were gathered by interviews to the mothers using structured questionnaires. Data on food consumption were also gathered during the study. At baseline, one month and two months after

the intervention, anthropometric measurements on weight and height were also done. Children weight were weighed by a digital scale until the nearest 0.1 kg in a standardize procedures. WAZ scores were then calculated using WHO Anthro calculator software. Some additional variables related to feeding practice behavior were also collected at the end of the intervention. The additional variables included mother's knowledge about nutrition and complementary feeding, maternal attitudes in feeding, frequency of feeding each day, hygiene and feeding practice.

Then, data were checked on their distribution. After cleaning and coding, data were compared between baseline and after the intervention in each group and the changes between the intervention and the control groups. Data on weight at baseline was normally distributed, but weight at after intervention and weight changes were not normally distributed. Independent t-tests were used for comparing normally distributed data and Wilcoxon test were used for non normally distributed data. Chi square tests were used for comparing categorical data. Logistic regression was also used for controlling the WAZ score changes by gender difference between the groups.

RESULTS AND DISCUSSIONS

The characteristic data in the intervention and control groups were listed in Table 1. There was no difference in age, mothers' education level, mothers' working status, family income and breastfed status between the groups. However, the control group has more boys, while the intervention group has more girls.

Table 2 shows the weight and WAZ scores of the subjects at baseline. There was no difference weight and WAZ between the groups at baseline. Thus, the subjects were at the same condition at the beginning of the study.

Table 3 shows the weight and WAZ Scores data after 2 months of intervention in the intervention and control groups. There were significant difference between the groups in weight after the intervention, but not in WAZ scores. The control group had higher weight compared to the intervention group.

Table 4 shows the comparison between the groups in weight and WAZ score changes. The weight changes in the intervention group was higher than the control group. WAZ scores was decrease in the control group, but increase in the intervention group. In these period of

age, (6 to 24 month old) studies showed that children in low and middle income countries were delivered at low WAZ and falters until 2 years old. Thus, the window of opportunity for intervention is at this age.⁵ Thus, without

intervention, WAZ scores of the children in Indonesia generally decrease. The intervention should be done before 2 years old to prevent decrease in WAZ scores which in turn will also lead to a decrease in HAZ scores.

Table 1: Characteristics of the subjects

Variables	Control (n = 32)	Intervention (n = 34)	p-values ^s
Mean age (months)	12.6 ± 3.81	14.2 ± 5.02	0.204
Sex			
Boys	17 (53.1)	11 (32.4)	0.048
Girls	15 (46.9)	23 (67.6)	
Mothers' education level			
Junior High or lower	5 (40.6)	4 (22.7)	0.543
Senior High School or higher	27 (59.4)	18 (77.3)	
Mothers' working status			
Working	7 (36.8)	4 (18.2)	0.161
Not working	12 (63.2)	18 (81.8)	
Family's income			
Lower than regional minimum level	18 (56.3)	11 (50.0)	0.430
The same or higher than regional minimum level	14 (43.7)	11 (50)	
Breastfed status			
Not breastfed	9 (28.1)	8 (30.7)	0.478
Breastfed	23 (71.8)	26 (69.2)	

^sChi Square tests

Table 2: Anthropometric status of the subjects at baseline (n = 66)

Variables	Control (n = 32) Mean ± SD	Intervention (n = 34) Mean ± SD	p value
Weight (kg)	10.6 ± 2.48	9.8 ± 2.30	0.118*
WAZ Scores	0.6 ± 1.90	-0.1 ± 1.56	0.434 [#]

*Independent t-test

[#]Wilcoxon test

After controlled for gender differences in the intervention and control group, WAZ changes still showed the better in the intervention group. By logistic regression analysis, it was shown that the chance of the subjects in the intervention group to have a positive change in WAZ scores was 39.8%, while the chance in the control group was only 12.25%. Among the boys, the chance to have a positive WAZ score change was 14.3% while the chance of the girls was 28.9%. The studies in Ethiopia showed that the boys were tent to

be underweight than the girls, as the boys were more influenced by environmental stress, compared to the girls.⁹ This study in Indonesia also showed that girls had shown more benefited from the intervention program.

Table 3: Anthropometric status after intervention (n = 66)

Variables	Control (n = 32) Mean ± SD	Intervention (n = 34) Mean ± SD	p value
Weight (kg)	10.8 ± 2.52	10.2 ± 2.32	p<0.001 [#]
WAZ Scores	0.4 ± 1.92	0.1 ± 1.27	0.281 [#]

[#]Wilcoxon test

Table 5 shows the feeding behaviors of the mothers after the intervention, to find out the reason for weight changes in the intervention group at the end of intervention. Mothers' attitude toward feeding nutritious food to their children were better in the intervention group. The food preparation sanitation and feeding practice scores were also better in the intervention group

compared to the control groups. Thus the changes in WAZ scores in the intervention group can be explained by the feeding behaviors of the mothers.

In this study, the subjects were at 5 to 12 month year old, and the effect of intervention was measured in weight and WAZ score changes only. The reason for this was the short period of intervention and the underweight was the first sign to show the growth faltering, which started at this age. At 6-7 months, Indonesian infants start to falter their growth and showed in more underweight (32%), rather than stunting (24%).¹⁰ This study also showed that WAZ scores decreased in the control group from 0.6 ± 1.90 to 0.4 ± 1.92 after two months of follow up, while the intervention group increased their WAZ scores from -0.1 ± 1.56 to 0.1 ± 1.27 . Therefore intervention at this period of time may prevent or postponed the growth faltering. In the long term, this condition may lead to decrease stunting. As the prevalence of stunting in Indonesia was very high, 37.2% among underfive children, based on 2013' Indonesian Basic Health

Survey (Riskesdas) and 30.8, based on 2018' Indonesian Basic Health Survey.²

The factors associated to underweight in developing countries such as Indonesia, included low birthweight status, low sanitation,¹¹ mothers' feeding practice of to their toddlers.¹² This study also showed that mothers feeding practice in the intervention group was better after the study. Better mothers' feeding practice led to the higher intake of energy, protein and micronutrients, which then resulted in higher weight changes in the intervention group.

Regarding the sanitation, food preparation sanitation was also have an impact on nutritional status as the better food preparation sanitation resulted in lower diarrhea problems.¹² In this study, although diarrhea problem was not measured, but the food preparation sanitation practice was better after the intervention. This condition also explained the better WAZ changes in the intervention group.

Table 4: Comparisons of the increments between the groups (n = 66)

Variables	Control (n = 32) Mean ± SD	Intervention (n = 34) Mean ± SD	p value [#]
Weight (kg)	0.2 ± 0.19	0.4 ± 0.31	0.027
Δ WAZ Scores	-0.2 ± 0.18	0.1 ± 0.95	0.048

[#]Wilcoxon test

Table 5: Mothers' Feeding behavior after the intervention

Variables	Control (n = 32) Mean ± SD	Intervention (n = 34) Mean ± SD	p value [#]
Feeding frequency	3.2 ± 0.47	3.1 ± 0.74	0.426
Mothers' knowledge on nutrition scores	24.4 ± 4.47	25.6 ± 5.05	0.223
Mothers' attitude on feeding practice scores	8.3 ± 2.64	9.50 ± 3.79	0.046
Food preparation sanitation scores	6.1 ± 2.0	6.9 ± 1.84	0.038
Feeding practice scores	6.7 ± 1.98	8.4 ± 3.51	0.043

[#]Wilcoxon test

The children in this study received a low energy and protein before the intervention. In the intervention, good source of protein were introduced and the mothers were motivated to cook their complementary feeding food. In general, the mothers in this study had a good education level. Therefore they can received the information from the cadres very well. This condition led the mothers to have more self efficacy to provide the food to their children.

There was no difference in the nutrition knowledge between the groups. However, the mothers in the intervention group had a better attitude and feeding practice to provide nutritious food for their children. A study in Turkey, has also shown that mothers' nutritional knowledge resulted in a better attitude and feeding practice to their children.¹³ Although this study was done on much older children, however, the similar condition

could also be applied on mothers' feeding practice for toddlers. Another study in Kenya showed almost the same results, in which the knowledge of the mothers did not related to the children nutritional status but the mothers knowledge about the health consequences if they did not follow the dietary recommendation was related. ¹⁴Thus, improving mothers knowledge, attitude and feeding practice were very important for increasing the nutritional status of their children.

The results of this study also inline with the results of a systematic reviews which showed that maternal counseling alone resulted on the increase in weight of children at these age (6-24 months), thus recommended to be done in developing countries. ¹⁵ This study was done through outreach program by the cadres, which can show an effect on WAZ scores of the children. Thus, the program can be done in a wider area, at least in the urban setting.

The limitation of the study is the limited sample size and the short period of outreach program. Therefore a the larger study and the longer period of outreach program are suggested. The strength of this study was the intervention was given to the cadres, thus the cadres can continue the intervention to the other under two mothers who they met in posyandu. The cadres also have more self efficacy in providing advice to the mothers regarding providing nutritious food to the under two children. Undertwo children are extremely needed for nutritious food for their brain and nerve system development.

The implication of the study: This study can be implemented in a more broader area, by training the cadres and monitoring their work more continuously, so the prevention of stunting and malnutrition can be done.

CONCLUSIONS

Cadres' outreach program for two months to the mothers of under two children can increase weight and WAZ scores through a better complementary feeding practice and food preparation sanitation.

ACKNOWLEDGEMENTS

This study was funded through the project of Intervention package on nutrition problem and the implementation of the first one thousand days of life in the middle part of Indonesia, a collaboration

work between The Ministry of Health, Republic of Indonesia and Diponegoro University (Agreement no. KM.04.01/2/2283/2017 and No. 3595/UN7.5.9/KS/2017).

The researchers would like to thank the Head of Genuk Community Health Center, all of the health cadres who involved in this study and also all of the subjects in this study. We also would like to thank the enumerators who helped in data collections. Without their help, this study would not be implemented well.

Conflict of Interest: There is no conflict of interest of the researchers regarding the study and the results.

Ethical Clearance: This study has fulfilled the requirement for getting the ethical clearance from the Health Ethical Committee of Faculty of Public Health, Diponegoro University No. 213/EC/FKM/2017.

REFERENCES

1. Ministry of Health Republic of Indonesia. Indonesia Health Profile 2013. Published in 2014. <http://www.depkes.go.id/resources/download/pusdatin/profil-kesehatan-indonesia/Indonesia%20Health%20Profile%202013%20-%20v2%20untuk%20web.pdf>
2. Ministry of Health Republic of Indonesia. Potret Sehat Indonesia dari Riskesdas 2018. Published on 2 November 2018. <http://www.depkes.go.id/article/view/18110200003/potret-sehat-indonesia-dari-riskesdas-2018.html>
3. Black MM, Pérez-Escamilla R, Rao SF. Integrating Nutrition and Child Development Interventions: Scientific Basis, Evidence of Impact, and Implementation Considerations. *American Society for Nutrition. Adv Nutr* 2015;6:852–9; doi:10.3945/an.115.010348.
4. Prentice AM, Ward KA, Goldberg GR, Jarjou LM, Moore SE, Fulford AJ, Prentice A. Critical windows for nutritional interventions against stunting. *Am J Clin Nutr* 2013;97:911–8.
5. Victora CG, de Onis M, Hallal PC, Blössner M, Shrimpton R. Interventions Worldwide Timing of Growth Faltering: Revisiting Implications for Intervention. *Pediatrics* 2010;125:e473; DOI: 10.1542/peds.2009-1519. <http://pediatrics.aappublications.org/content/125/3/e473.full>.

6. Ross ES, Krebs NF, Shroyer ALW, Dickinson M, Barrett PH, Johnson SL. Early growth faltering in healthy term infants predicts longitudinal growth. *Early Hum Dev.* 2009 September ; 85(9): 583–588. doi:10.1016/j.earlhumdev.2009.06.004.
7. Robbins S, Ettinger AK, Keefe C, Riley A, Surkan PJ. Low-Income Urban Mothers' Experiences with the Supplemental Nutrition Assistance Program. *J Acad Nutr Diet.* 2017;117:1538-1553. <http://dx.doi.org/10.1016/j.jand.2017.01.008>
8. Ruel MT, Alderman H, Maternal and Child Nutrition Study Group. Maternal and Child Nutrition 3. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet.* Published online June 6, 2013 [http://dx.doi.org/10.1016/S0140-6736\(13\)60843-0](http://dx.doi.org/10.1016/S0140-6736(13)60843-0) https://www.unicef.org/ethiopia/3_Nutrition-sensitive_interventions_and_programmes_how_can.pdf. Accessed on November 2018
9. Tosheno D, Adinew YM, Thangavel T, Workie SB. Risk Factors of Underweight in Children Aged 6–59 Months in Ethiopia. *Hindawi Journal of Nutrition and Metabolism* Volume 2017, Article ID 6368746, 8 pages. <https://doi.org/10.1155/2017/6368746>
10. Schmidt MK, Muslimatun S, West CE, Schultink W, Gross R, Hautvast JGAJ. Nutritional Status and Linear Growth of Indonesian Infants in West Java Are Determined More by Prenatal Environment than by Postnatal Factors. *J. Nutr.* 132: 2202–2207, 2002.
11. Adhikari D, Khatri RB, Paudel YR, Poudyal AK. Factors associated with Underweight among Under-Five children in eastern Nepal:community-Based cross-sectional study. *Front. Public Health* December 2017: 5:350, pp. 1-9. doi: 10.3389/fpubh.2017.00350.
12. Agrina, Omote S, Tsuda A, Okuwa M, Kimura R, Syahrul, Saito R. A study of determining factors of underweight among toddlers in Riau, Indonesia. *Journal of Wellness and Health Care* 2017. vol. 41 (1), 61-69.
13. Yabancı N, Kışaç I , Karakuş SS. The effects of mother's nutritional knowledge on attitudes and behaviors of children about nutrition. *Procedia - Social and Behavioral Sciences* 116 (2014) 4477 – 4481. doi: 10.1016/j.sbspro.2014.01.970
14. Debela BL, Demmler KM, Rischke R, Qaim M. Maternal nutrition knowledge and child nutritional outcomes in urban Kenya. *Appetite* 116 (2017) 518-526. <http://dx.doi.org/10.1016/j.appet.2017.05.042>
15. Imdad A, Yakoob MY, Bhutta ZA. Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. *BMC Public Health* 2011, 11(Suppl 3):S25. <http://www.biomedcentral.com/1471-2458/11/S3/S25>

Positive Emotion, Engagement and Meaning of Life of the Elderly in *Pesantren* (Islamic Boarding School)

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ABSTRACT

Successful aging has been the focus of researcher on elderly since it has been believed that the terminal objective of every human is being a happy and healthy elderly. The aim of the study was to obtain an overview of positive emotion, engagement and meaning of life in the elderly who live as student/santri in Islamic Boarding School. The research was a qualitative method. Techniques to collect data were observation and interview. Variables in the research are positive emotion, engagement and meaning of life. Population of subject was 31 elderly, both male and female. Samples were chosen based on purpose sampling method which consisted of eight elderlies having following criteria: living in Payaman Islamic Boarding School, Magelang, above 60 years old, and healthy (not suffering from any acute nor chronic diseases). Data were analyzed using Interpretative Phenomenology Analysis (IPA). The research shows that social support, gratitude, autonomy and inner peace are the main themes of positive emotion. Engagement, orientation, role of kyai/nyai, and competition in worship are the main themes of engagement. Optimism, self-esteem, self-existence, and akhirah-oriented life are the main themes of meaning of life. Elderly in pesantren has developed positive emotions where they feel comfortable and close to the administrators of pesantren and fellow santri, and fully engaged to activities in pesantren. The more they attached to life in pesantren; they obtained deeper meaning of life. It can be concluded that positive emotion and engagement that were continuously established in pesantren has developed the meaning of life in elderly.

Keywords: *Positive Emotion; Engagement; Meaning of Life; Elderly; Islamic Boarding School*

INTRODUCTION

Getting old is a fate when human has the chance to live long. Entering the phase of getting old, individuals have to be ready to face any changes in their body. Physical, cognitive, social, and psychological degenerations are certain, yet all aspects are related to their lifestyle. In the life of the elderly, the phenomenon of losing a partner is considered normal, especially since the death of a spouse. Whereas mental illness can occur, such as depression, because there are many changes experienced by the elderly, such as feeling lonely due to losing a partner, peers, lack of attention from children,

social isolation, stress due to illness, and retirement¹. Based on the statement, successful aging has been the focus of researcher on elderly since it has been believed that the terminal objective of every human is being a happy and healthy elderly.

A research based on grounded theoretical framework and supported by interview to 23 elderlies aged 62-88 years old was conducted in Zapopan, Mexico. The aim of that research was to explore the perspective of Mexican adults on successful aging. The result shows that successful aging is a multidimensional concept, which is affected by intrinsic and extrinsic factors. Overall, the definition of successful aging is acceptance and adaptation to transitions and living conditions, strong engagement with family and friends, faith to God, achievement of personal goals, and growing old in one's residence². In addition, high resilience is required by the elderly because the result of this study is significantly correlated to positive results, namely successful aging, lower rate of depression, and long life³.

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Elderly is categorized as non-productive group of society. When an individual has categorized into elderly group, generally, the individual had retired from the job and not all of them has earnings. In line with the growing number of elderly population in urban areas, residential areas have become important since elderly spends most of their time at home⁴. A qualitative research conducted on elderly in Banyumanik Housing Complex, Semarang, shows three categories of spaces, namely: micro, meso, and macro and the existing condition i.e. living alone, living with children and grandchildren, living with spouse, and living with spouse as well as children and grandchildren⁵. The result shows that many elderly live with their family.

In contrast, elderly living in *pesantren* (Islamic boarding houses), like in Payaman, Magelang which established in 1930, shows different issues. A research has proposed that *pesantren* has contributed to the formation of social capital, especially in form of religiosity, which also contributes to community wellbeing⁶. In addition to the religiosity, elderly has the opportunity to learn in boarding school. One study stated that lifelong learning for parents can improve their psychological well-being and integrate their skills to achieve a healthy and active aging or known as successful aging⁷.

In a research on a group of elderly, it has been explained that in living life, meaning of life has become important because it forms its subjective well-being, although stable internal resources such as optimism and pessimism affect their subjective wellbeing. On the other hand, subjective well-being has the role as one of the determinants of successful aging⁸. In *pesantren*, elderly are busy conducting their routines. Other research suggested that elderly will be more productive if they focus not only on physical activities but also on their meaning of live to ignite their fitness, considering their limitations on physical activities⁹. In their old age, individuals determine what kind of life they will live. Mentioned in the study, spiritual and meaning of life have become important factors to protect themselves from psychological pressures¹⁰.

A research stated that Moslem students claim that they are close to God and serving Him makes them have a meaningful life¹¹. In *pesantren*, the elderly as *santri* routinely conduct activities of worship, and according to the survey, they have inner peace and comfort because they perform worship freely, without any other activities like when they were not in *pesantren*. As they live in

pesantren, they have more experiences that cultivate positive emotions. A study related to emotional aging, such as emotional experiences, emotional regulation, emotional perceptions, emotion-related concerns, and memory, is performed on a group of people of all ages. The result of the research emphasizes multidirectional differences of the final development of life in functional domain. Furthermore, it is important to understand the emotional state of the elderly because it is related to the physical condition and welfare of the elderly¹².

From a study conducted on elderly individuals in Indonesia and Japan, it shows that what is important for living condition supporting elderly life is security, comfort, health, affordability, independence, and close relationships with the social environment⁵. Elderly living in *pesantren* raise intense ties with other elderly who also live in *pesantren*. Those *santries* live harmoniously, helping each other and sharing stories. This positive stimulation can grow positive emotion in elderly in *pesantren*. The research was conducted on a group of subjects to compare attention bias of 35 subjects of elderly and 35 subjects of middle adult. The stimuli used are expressive faces that feature expressions such as neutral, disgust, fear, and happiness. Compared to younger subjects, the elderly pay more attention to happy faces and tend to avoid frightening faces. These findings confirm that positive stimulus effects, such as a pleasant social environment, can develop positive emotions in the elderly¹³. Positive emotions also develop elderly health and wellbeing¹⁴.

According to the results of the initial survey, elderly in *pesantren* receive social support from fellow elderly, as well as the board and the kyai of the *pesantren*. Social relations in *pesantren* and the comfort felt by elderly *santri* in *pesantren* stimulate elderly attachment to the life in *pesantren*. From the results of a research, it shows that individuals who attach to an environment will be much involved and learn from the environment, so that individuals will be more creative and able to solve problems independently, meaning that those individuals are more mentally healthy¹⁵. Another study on group of elderly and people with disability discovered that social participation, attention to them in a social network, form an established and important social bond in fostering their well-being¹⁶. Social support from significant other is very important for the elderly since it can develop elderly psychological wellbeing¹⁷.

Positive Psychology is progressing from time to time. The main purpose of positive psychology is to discover our potentials, which will support our productivity. The following constructs: establishing positive emotion, building engagement in an environment, and building meaning of life are parts of positive psychology, have become important especially for the elderly. The aim of the study was to obtain an overview of positive emotion, engagement and meaning of life in the elderly who live as *santri* in Islamic Boarding School.

METHOD

The research was a qualitative research. Techniques to collect data were observation and interview. Semi-

structured interviews were conducted to select samples based on purposive sampling method, which consisted of eight elderlies having following criteria: living in Payaman Islamic Boarding School, Magelang, above 60 years old, and healthy (not suffering from any acute nor chronic diseases). Data were analyzed using *Interpretative Phenomenology Analysis (IPA)* to observe how participants construe their personal and social life as well as to explore their experiences. IPA emphasized on construing from the points of view from both participants and researchers.

RESULTS AND DISCUSSIONS

Result: The following table presents subjects' social-demographic data.

Table 1: Social-Demographic Data of Subjects (n = 8)

Subject	Sex	Age	Status of Spouse	Occupation	Length of Stay in <i>Pesantren</i> (Year)	Origin
1	F	65	Passed Away	Entrepreneur	3	Ambarawa
2	F	66	Alive	Homemaker	2	Batang
3	M	78	Alive	Government employee	2	Kebumen
4	M	75	Alive	Entrepreneur	2	Pekalongan
5	F	69	Alive	Homemaker	3	Demak
6	M	76	Alive	Teacher	5	Slawi
7	M	68	Alive	Employee of Finance Dept.	1	Jakarta
8	F	62	Passed Away	Trader	4	Temanggung

The following table presents some main themes from the constructs, which were obtained from interview.

Table 2: Main Themes from Data of Subjects (n = 8)

Variable	Main Theme
Positive Emotion	Social supports from others Motivation and thankfulness Autonomy and conducting a healthy life Inner peace
Engagement	Engagement to activities in Islamic Boarding School Orientation of living in Pondok Sepuh The roles of <i>Kyai & Nyai</i> Strive in worship
Meaning of Life	Positive expectancies toward the future Efforts to prove personal existence Self-esteem Orientation to akhirah

DISCUSSIONS

Elderly living in *pesantren* have to do challenging daily routines. *Pesantren* is an institution to learn more about Islam. Generally, the students of *pesantren*, or *santri*, consist of children and teenagers. *Pesantren* Payaman Magelang has elderly *santris*, which is unique since elderly are usually reluctant to study and attach to rules of conduct. Elderly also selectively chose their social environment, including living in *pesantren*¹⁸. This qualitative research involved 4 female elderly and 4 male elderly coming from various jobs and origins. They joined *pesantren* and live a life accompanied by worship routines. The feeling of togetherness has developed positive emotions. From the interview, several main themes were obtained, such as social supports, thankfulness, autonomy and inner peace. In *pesantren*, elderly get social support either from fellow *santri* or from *ustad* and *kyai*. Such support appears as information and religious knowledge, togetherness to share stories, and attention and assistance provided in daily activities.

When positive emotion is formed, spirituality in elderly will also improve¹⁹. Elderly experience degeneration in various aspects, both physical and psychological, including lower emotional ability like emotional control. Elderly have challenges to control his anger, get sad easily and cry for some life events, and it lasts for a period. So studying this aspect of emotional aging is important to be developed¹².

The elderly at *pesantren* revealed that they became passionate in living and worshipping. They are thankful because at that age, they are still given the health, strength and opportunity to undergo *pesantren* activities, study and worship. In addition, they formed a healthy lifestyle and self-reliance in *pesantren*, such as being responsible for their needs of clothing and food, and even cleaning the area of boarding schools together with other elderly.

In *pesantren*, the elderly formed inner peace and positive emotion. These aspects are considered the most important aspects, which appear in all subjects. A theory stated that sleep mechanisms plays an important role in the process of emotional regulation²⁰. This is evident that one of the evidence of inner peace is that the elderly can sleep soundly every day and their health conditions are maintained. Another research stated that maintaining positive emotion increases elderly's mental and physical health²¹. Furthermore, a research shows that positive emotions is beneficial to reduce, even cure dementia²².

The interview revealed that the elderly are happy to be involved in all activities in the *pesantren*, which formed a full engagement of the elderly. The main theme of engagement can be established, that is full involvement, orientation, role of kyai/nyai, and competition in worship. One of the respondents mentioned that he got an additional task in *pesantren*, and it actually formed a positive feeling: needed by his environment. A research mentioned that elderly engagement in productive activities leads to elderly wellbeing²³. Another study on 2750 elderly respondents mentioned that there were variations of elderly engagement in rural areas. Most of the elderly were reluctant to be actively involved in their environment, unless the engagement were established from local attractions and social supports²⁴. In another study mentioned that to survive living in a place of life, elderly needs adequate facilities and social support, to foster elderly social wellbeing²⁵. This is contrary to the results of this study, where *pesantren* research

sites have limited facilities, and the reason why the elderly are willing to be fully involved in all *pesantren* activities and to stay in *pesantren* for many years was interpersonal closeness with fellow *santri* and kyai/nyai of the *pesantren*.

A study in China to 14.507 elderly respondents from 393 areas suggests that one of the factors establishing elderly engagement to their environment is social concern to the elderly²⁶. Supportive environment condition to do religious activities has stimulated elderly *santri* to compete in worship. The serenity to do worship and increased quality of faith has developed engagement to *pesantren*.

In terms of construing life by elderly in *pesantren*, there are several main themes as the result of the interview, namely, optimism, proving self-existence, self-esteem, and akhirah-oriented life. A research conducted to elderly suffering from cancer suggested eight values of life forming one's meaning of life, namely: comfort, sustainability, humility, dignity, honesty, optimism, hope, and readiness²⁷. The result is in line with the findings of the research on elderly in *pesantren*, that optimism develops meaning of life in elderly. Self-esteem and self-existence formed in the elderly is a manifestation of self-dignity, as one of the values of life. Finally, akhirah-oriented life that appears on all respondents indicated that elderly *santri* is emphasized on the increased quality of worship and their faith as the meaning of their life

Being healthy, optimistic and needed by others develop spiritual conditions of individuals and their meaning of life, and in turns, increase individual's quality of life¹⁰. Elderly subjects in *pesantren* are not prone to chronic and acute diseases because of the meaning of positive life have stimulated their quality of life. The results of the study on elderly suffering from depression shows that the elderly who have hope and meaning of life can minimize the depression²⁸

Elderly need an activity and appreciation from the environment to avoid depression. The environment can come from a family or nursing home or *pesantren*²⁹. Elderly experience positive emotions in the form of gratitude and inner peace while in the *pesantren*. Furthermore, positive emotions can motivate elderly to engage in *pesantren* activities in *pesantren* including building emotional attachment to fellow elderly *santri* and kyai/nyai, thus creating an environment of competing

in worship. Positive emotions and engagement, which are maintained by the elderly when in boarding school, can develop life optimism, prove personal existence and self-esteem and live an akhira-oriented life.

CONCLUSIONS

The elderly living in Islamic Boarding School has gained many experiences to develop positive emotions as well as motivate them to engage in every activity in the boarding school. Their positive emotion and engagement lead to meaning of life in elderly.

ACKNOWLEDGEMENTS

This study was supported by a research grant from faculty of Psychology Diponegoro University Indonesia. Great thank for Payaman Islamic Boarding School, Magelang, especially for eight subject samples.

Conflict of Interest: Nil

Ethical Clearance: Authors used informed consent for subject samples.

REFERENCES

1. Indriana Y. Remarriage in elderly: A qualitative research. *Journal of Education Review*. 2013, 3(11), 870–880. <http://www.academicstar.us/UploadFile/Picture/2014-3/20143207327545.pdf>
2. Uribe ACR. Perceptions of successful aging among Mexican older adults. *Journal of Behavior, Health & Social Issues*. 2015; 7 (2), 9-17. <https://doi.org/10.5460/jbhsi.v7.2.52888>.
3. MacLeod S, Musich S, Hawkins K, Alsgaard KRN, Wicker ER. The impact of resilience among older adults. *Geriatric Nursing*. 2016; 37 (4), 266-272. <https://doi.org/10.1016/j.gerinurse.2016.02.014>.
4. Richard S. A comprehensive resource on gerontology and geriatrics. New York: Springer Publishing Company. 2006.
5. Setioko, Wijayanti B, Pandelaki EE. Spaces of the elderly based on the living arrangement (Case Study: Banyumanik Public Housing). *Procedia - Social and Behavioral Sciences*. 2016; 227, 568-573. open access. <https://doi.org/10.1016/j.sbspro.2016.06.116>.
6. Risti P. 2011. The presence of religious organisations, religious attendance and earnings: Evidence from Indonesia. *The Journal of Socio-Economics*. 2014; 40 (3): 247-258. <https://doi.org/10.1016/j.socec.2011.01.006>.
7. López MPD, Parra JMA, Liria RL, Pérez PR, Muñoz MEV, Góngora DP. Skills for successful ageing in the elderly. *Education, well-being and health. Procedia - Social and Behavioral Sciences*. 2017; 237, 986-99. <https://doi.org/10.1016/j.sbspro.2017.02.140>.
8. Ju H, Shin J, Kim C, Hyun M, Park, J. Mediatonal effect of meaning in life on the relationship between optimism and well-being in community elderly. *Archives of Gerontology and Geriatrics*. 2013; 56 (2), 309-313 <https://doi.org/10.1016/j.archger.2012.08.008>.
9. Haewon J. The relationship between physical activity, meaning in life, and subjective vitality in community-dwelling older adults. *Archives of Gerontology and Geriatrics*. 2017; 73, 120-124. <https://doi.org/10.1016/j.archger.2017.08.001>.
10. Bernard M, Strasser F, Gamondi C, Braunschweig G, Forster M, Veri SW, Borasio GD. Relationship between spirituality, meaning in life, psychological distress, wish for hastened death, and their influence on quality of life in palliative care patients. *Journal of Pain and Symptom Management*. 2017; 54 (4), 514-522. <https://doi.org/10.1016/j.jpainsymman.2017.07.019>.
11. Mohamad A, Razak L, Mutiu S. Meaning in life among muslim students. *Procedia - Social and Behavioral Sciences*. 2011; 30, 743-747. open access. <https://doi.org/10.1016/j.sbspro.2011.10.145>.
12. Kremer S, Uijl L. Studying emotions in the elderly. *Emotion measurement*. Sagepub publisher. 2016; 537-571. <https://doi.org/10.1016/B978-0-08-100508-8.00022-9>.
13. Gronchi G, Righi S, Pierguidi L, Giovannelli F, Murasecco I, Viggiano MP. Automatic and controlled attentional orienting in the elderly: A dual-process view of the positivity effect. *Acta*

- Psychologica. 2018; 185, 229-234. <https://doi.org/10.1016/j.actpsy.2018.02.008>.
14. Kennedy JRM, Danaher TS, Gallan AS, Orsinger C, Olsen LL, Verma R. How do you feel today? Managing patient emotions during health care experiences to enhance well-being. *Journal of Business Research*. 2017; 79, 247-259. <https://doi.org/10.1016/j.jbusres.2017.03.022>.
 15. Spagnoletti P, Resca A, Sæbø Ø. Design for social media engagement: Insights from elderly care assistance. *The Journal of Strategic Information Systems*. 2016; 24 (2), 128-145. <https://doi.org/10.1016/j.jsis.2015.04.002>.
 16. Rainer S. Social participation and social engagement of elderly people. *Procedia - Social and Behavioral Sciences*. 2014; 116, 780-785. open access. <https://doi.org/10.1016/j.sbspro.2014.01.297>.
 17. Desiningrum D.R. Family's social support and psychological well-being of the elderly in Tembalang. *Anima, Indonesian Psychological Journal*. 2010; 26 (1): 61-68. http://www.academia.edu/6560136/Familys_Social_Support_and_Psychological_Well-Being_of_the_Elderly_in_Tembalang
 18. Desiningrum D.R. Socioemotional selectivity (future time perspective, goal orientation) and subjective well being, *Proceeding of Padjajaran International Conference*. 2012; 2 (1), 89-104. <http://eprints.undip.ac.id/35264/1/paperdinieunpad.pdf>
 19. Ulvoas GM. Positive emotions and spirituality in older travelers. *Annals of Tourism Research*. 2017; 66, 151-158. <https://doi.org/10.1016/j.annals.2017.07.020>.
 20. Hot P, Zsoldos I, Carrier J. The relationship between sleep and emotion among the elderly. Sleep and affect. Assessment, theory, and clinical implications. 2015; 441-460. <https://doi.org/10.1016/B978-0-12-417188-6.00020-7>.
 21. Baños RM, Etchemendy E, Castilla D, Palacios AG, Quero S, Botella C. Positive mood induction procedures for virtual environments designed for elderly people. *Interacting with Computers*. 2012. 24 (3), 131-138. <https://doi.org/10.1016/j.intcom.2012.04.002>.
 22. Chou WY, Waszynski C, Kessler J, Clarkson PJ. Exploring the feasibility of using affective pictures to elicit positive emotion with nursing home residents with dementia. *Procedia Manufacturing*. 2015; 3, 2219-2222. open access. <https://doi.org/10.1016/j.promfg.2015.07.364>.
 23. Hu S, Das D. Quality of life among older adults in China and India: Does productive engagement help? *Social Science & Medicine*. In Press, Corrected Proof. *Social Science & Medicine*. 2018; Available online 30 June 2018.
 24. Utomo A, Mcdonald P, Utomo I, Cahyadi N, Sparrow R. Social engagement and the elderly in rural Indonesia. *Social Science & Medicine*. Available online 8 May 2018. In Press, Corrected Proof What are Corrected Proof articles? 2018; <https://doi.org/10.1016/j.socscimed.2018.05.009>.
 25. Mohammad SA, Dom MM, Ahmad SS. Inclusion of social realm within elderly facilities to promote their wellbeing. *Procedia - Social and Behavioral Sciences*. 2016; 234, 114-124. open access. <https://doi.org/10.1016/j.sbspro.2016.10.226>.
 26. Zhang W, Wu YY Individual educational attainment, neighborhood-socioeconomic contexts, and self-rated health of middle-aged and elderly Chinese: Exploring the mediating role of social engagement. *Health & Place*. 2017; 44, 8-17. <https://doi.org/10.1016/j.healthplace.2016.12.006>.
 27. Ebenau A, Gulp J, Hasselaar J Life values of elderly people suffering from incurable cancer: A literature review. *Patient Education and Counseling*. 2017; 100 (10), 1778-1786. <https://doi.org/10.1016/j.pec.2017.05.027>.
 28. Hedayati MAM, Khazaei MAM. An investigation of the relationship between depression, meaning in life and adult hope. *Procedia - Social and Behavioral Sciences*. 2015; 114, 598-601. open access. <https://doi.org/10.1016/j.sbspro.2013.12.753>
 29. Indriana Y. Self esteem rehabilitation in panti wreda. *Historical and Cross-Cultural Aspects of Psychology. Beitrage zur Padagogischen und Rehabilitations psychologie, Herausgegeben Von Evelin Witruk*. Pg. 391-398.

Health Professional's Perception toward Impact of Hospital Accreditation on Quality of Care in Asia: A Systematic Review

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ABSTRACT

Hospital accreditation is an effective way to evaluate the quality of a hospital and important tool for improving the standard of the hospitals. Due to improve the quality of health services, hospital accreditation should be supported. Accreditation is a long-term process that demands commitment of the entire organization to work together. The health care professionals skepticism about the positive impact of accreditation programs is the most important barrier to implementation that program. This study aims to assess the perceptions of health professionals on the impact of hospital accreditation and implementation of change towards the delivery of quality patient care in Asian countries. We systematically searched five electronics databases from May 14th – 21st 2018, for eligible systematic reviews in Asia region with English for language limitation. Five publications met the inclusion criteria. Findings from the included studies found positive perceptions of health professionals to hospital accreditation impact on improving the quality of health services. These studies have heterogenic variables to explore the health professional perception toward impact of hospital accreditation and quality of care. The implementation of hospital accreditation requires commitment, support, and motivation from government, leadership, and all human resources in the hospital. There are many factors affecting performance of accreditation such as quality of care, leadership, and culture. These factors need strategies to strengthen the way accreditation for improving quality of care, strengthen leadership, and culture. The findings are expected to provide valuable lessons for preparing or implementing accreditation.

Keywords: *perception, impact, hospital accreditation, health professionals, nurses*

INTRODUCTION

According to the World Health Organization (WHO) Regional Office for Europe in 2003 has responded to the highlights of low-quality research and increasing patients' expectations, ensuring the safety of patients and staff and improving the quality has become an important objective for all national health systems in developed and developing countries⁽¹⁾. The Government regulations in developing countries increasingly used hospital accreditation as a tool to guarantee quality of health services⁽²⁾.

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In the late 1990s The Joint Commission International (JCI) founded to survey hospitals outside of the United States, creates a mark on the world map and increases business through medical tourism⁽¹⁾. For more than 60 years hospitals accredited by JCI, approximately 4,023 general, psychiatric, pediatric, rehabilitation and special hospitals, and 366 hospitals with critical access, through a separate accreditation program⁽³⁾.

In Asia due to healthcare has become the main focus, efforts are being made to change the healthcare system for better quality of care to make the benchmark the best worldwide. In India the National Association Board for Hospitals and Healthcare Providers (NABH) established for hospital accreditation. The low of standards puts the patient at risk. One of the World Health Organization (WHO) studies showed that the highest incidence of hospital infections in Southeast Asia was at 10%, meanwhile the eastern Mediterranean was at 11.8%, which was the highest⁽²⁾.

Asian countries are quickly becoming known as medical destinations. A combination of factors, including but not limited to high quality and relatively lower costs, makes it a favorite destination for many international patients⁽⁴⁾. Medical tourism has encouraged Asian hospitals to strive for world-class quality standards⁽²⁾.

Hospital accreditation has been defined as “A self-assessment and external peer assessment process used by health care organizations to accurately assess their level of performance in relation to established standards and to implement ways to continuously improve”⁽¹⁾. The accreditation process is designed to ensure compliance and improvement by encouraging positive and longitudinal changes in organizational and clinical practice, and the goal is to contribute to the production of high quality and safe care for consumer benefits⁽⁵⁾. Hospital accreditation is an effective way to evaluate the quality of a hospital and important tool for improving the standard of the hospitals. Accredited hospitals provide high-quality care to their patients also offer an edge over the competition in healthcare sector and strengthen the public’s trust in the quality and safety of care, care and services. Overall hospital accreditation improves risk reduction and risk management, organize and strengthen patient safety efforts and creates a culture of patient safety⁽²⁾. There is consistent evidences to suggest that hospital accreditation programs improve health care by improved clinical outcomes or a broad spectrum of clinical conditions. That is the reason accreditation programs should be supported as a tool to improve the quality of health services⁽⁶⁾.

Accreditation is a long-term process that demands commitment of the entire organization to work together⁽⁷⁾. The performance of health sector depends on employee’s motivation, with service quality, efficiency and fairness, all mediated directly by the willingness of the employees to apply their task. Motivation in a work context can be defined as the level of individual willingness to create and sustain an effort toward organizational goals⁽⁸⁾. Many factors that influence implementation of hospital accreditation programs, the health care professionals skepticism regarding the positive impact of accreditation programs is the most important barrier to implement that program^(4,5).

METHOD

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement is an evidence-based approach for conducting systematic reviews and meta-analyses that was applied in this systematic review⁽¹¹⁾.

Data Sources: Relevant English language articles published from 2008–2017 were sourced using five databases (EBSCOhost, Google Scholar, Proquest, Sage, and Scopus). Combination of terms were used in multi-field search, relating to perception of health professional (physician, nurses and another health practitioner) on impact of hospital accreditation (quality of care and the perceived contributing factors that can explain change in quality of care).

Eligibility Criteria: The eligibility criteria for inclusion were research journal articles that included a perception of health professional on impact of hospital accreditation on quality of care. Eligible studies were restricted to articles with full-texted access published in English within the years 2008 – 2017. Research that were eligible were start from all over the world then narrows to Asian countries. Articles were excluded if they did not meet the above criteria or were theses, systemic review and dissertations. Criteria of exclusion is any study that does not match the above criteria.

Study Selection and Data Extraction: Electronic databases were searched during the week of 14–21 May 2018 independently by the authors and collectively screened for duplication. The authors reviewed the titles and abstracts generated by the search engines to assess their eligibility for further review based on the selection criteria, and chose relevant articles for possible inclusion. The following data were extracted from each publication: author(s), publication year, location of study. Publications have heterogenic variables to explore the health professional perception toward impact of hospital accreditation on quality of care. Findings were therefore synthesized in a narrative synthesis around the study objectives.

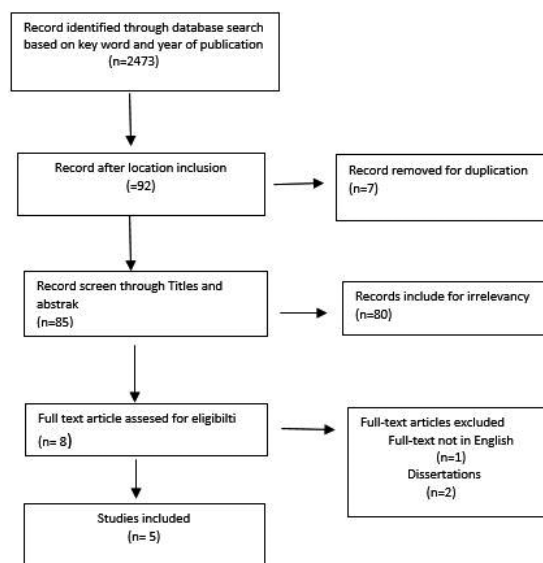


Fig. 1: Prism flow chart

RESULTS AND DISCUSSIONS

After removing duplications 92 records were identified. Title and abstract screening identified 8 references that potentially fulfilled the inclusion criteria and copies of the full publications were sought. A total of 5 publications fulfilled the eligibility criteria and were included in the reviews.

Summary of study and findings for comparison:

Husein et al (2017) used cross-sectional survey for their journal "Perception of hospital accreditation among health professionals in Saudi Arabia". The aim of their journal to assess the perceptions of health professionals on the impact of JCI accreditation and implementation of change towards the delivery of quality patient care. The outcome measure(s) of this research by using participation in accreditation, benefits of accreditation, and quality of results of accreditation, and the result of hospital accreditation was given a worthy response from the general view of 901 health professionals ⁽¹²⁾

Mostafa et al (2014) used a cross sectional for their journal's "Nursing Perception towards Impact of JCI Accreditation and Quality of Care in a Tertiary Care Hospital, Central Saudi Arabia". The aim of their journal were: 1) to assess nurses' perception to JCI accreditation impact, 2) to assess nurses' perception to quality of health care (QHC), and 3) to identify the predictive factors for perception to accreditation and QHC at King Abdulaziz Medical City (KAMC), Riyadh, Saudi Arabia. These research incorporates two domains: degree of staff involvement and benefits of accreditation, the results of 751 nursing personnel surveyed, older and less educated nurses were significantly more likely to report positive perception to accreditation impact. Nurses' perception to accreditation impact was a significant predictor of perception of quality of care. Higher quality of care was more likely to be perceived by the less educated and less experienced nurses, and nurses with direct patient care. The perceived contributing factors that can explain change in quality of care in this research were leadership, commitment and support, use of data, quality management, staff Involvement⁽¹³⁾

Fadi et al (2008) used a cross sectional for their journal "The impact of hospital accreditation on quality of care: perception of Lebanese nurses". The aim of their journal to assess the perceived impact of accreditation on quality of care through the lens of health care professionals,

specifically nurses. This paper also investigates the perceived contributing factors that can explain change in quality of care. The result of the high score for the variable 'Quality Results' indicates that nurses perceived an improvement in quality during and after the accreditation process. The perceived contributing factors that can explain change in quality of care in this study were leadership, commitment and support, use of data, quality management, staff Involvement and hospital size. The variable Quality Management, as measured by the scale of Quality Management, had the greatest impact in medium-sized hospitals while the subscale measuring Staff Involvement had the greatest impact in small-sized hospitals ⁽¹⁴⁾.

Ahmet et al (2014) used a cross sectional for their journal "Perceptions of nurses on the impact of accreditation on quality of care a survey in a hospital in Turkey". The aim of their journal to investigate perceptions of Turkish nurses on the impact of Accreditation on quality of care and the effect of accreditation on quality results. The result of this research that the nurses had generally high scores for the items concerning the benefits of accreditation. There was a statistically significant positive correlation between the dependent variable (quality results) and the independent variables (benefits of accreditation and participation of employees). Patient satisfaction scores increased after accreditation ⁽¹⁵⁾.

Diab et al (2011) used a cross sectional for their journal "The Extent to Which Jordanian Doctors and Nurses Perceive the Accreditation in Private Hospitals". The aim of their journal to know if the doctors and nurses in the Jordanian private hospitals have a perception about the accreditation and to know if there's a different between the doctors and nurses perception and understanding the accreditation standard at their hospitals. The results of this study showed that doctors and nurses have a positive attitude regarding their perception of accreditation standards, with no different between their perception. And the perceived contributing factors that can explain change in quality of care in this study were management and leadership, strategic planning for quality, human resources utilization, quality management, and the accreditation process and implementation ⁽¹⁶⁾

All publications use data from 1 Asian country, the relevant publications are predominantly originated from Western Asian countries, 2 from Saudi Arabia, 1 from

Turkey, 1 from Lebanon and 1 from Jordania. The health professionals population from 3 studies were nurses, 1 of this study were doctors and nurses, and the other one were physicians, nurses, medical technologists, dietitians, and other allied healthcare professionals. Five studies provided data regarding positive perceptions of health professionals to hospital accreditation impact on improving the quality of health services and 3 of studies provided predictors data of better quality results. Among 4 studies, 1 study in Turkey compared patient satisfaction before and after hospital accreditation and showed increased satisfaction after accreditation. Five of publications used cross-sectional study design.

The Perceived Impact of Accreditation on Quality of Care through the Lens of Health Care Professionals:

All of 5 studies showed health professionals in 4 Western Asian Countries (Saudi Arabia, Turkey, Lebanon and Jordania) have positive perception of the impact of quality on care.

Of the two studies in Saudi Arabia, one main outcome measure(s) by using participation in accreditation, benefits of accreditation, and quality of results of accreditation, and the result of hospital accreditation was given a worthy response from the general view of 901 health professionals⁽¹²⁾. The other one using two previously validated tools of different domains, to assess accreditation impact on Quality Of Health Care(QHC), as perceived by nurses. This tool incorporates two domains: degree of staff involvement domain and benefits of accreditation domain. Of 751 nursing personnel surveyed, older and less educated nurses were significantly more likely to report positive perception to accreditation impact⁽¹³⁾.

Study in Turkey showed that nurses had generally high scores for the items concerning the benefits of accreditation. There was a statistically significant positive correlation between the dependent variable (quality results) and the independent variables (benefits of accreditation and participation of employees)⁽¹⁷⁾.

In Lebanon, the high score for the variable quality results indicates that nurses perceived an improvement in quality during and after the accreditation process⁽¹⁴⁾.

Study in Jordania showed perception of doctors and nurses have a positive attitude regarding their perception on impact of accreditation⁽¹⁶⁾.

The perceived contributing factors that can explain change in quality of care: Study in Lebanon, Jordania and one of study in Saudi Arabia showed the contributing factors that can explain change quality of care were leadership, commitment and support, use of data, quality management, staff Involvement^(8,11,16). Study in Lebanon added hospital size as one of the contributing factors. The variable Quality Management, as measured by the scale Quality Management, had the greatest impact in medium-sized hospitals while the subscale measuring Staff Involvement had the greatest impact in small-sized hospitals⁽¹⁴⁾. Study in Jordania added strategic planning for quality as one of contributing factors⁽¹⁶⁾.

DISCUSSION

Publications regarding health professional's perception toward impact of hospital accreditation and quality of care in Asian countries were limited. Although not all variables investigated in 5 publications have the same variables, all studies showed positive perceptions of health professionals on impact of hospital accreditation to improve quality of services and safety of the care organization.

In this systematic review, the predictors of better quality results of hospital accreditation showed in Lebanon, Jordania and one of studi in Saudi Arabia studies were leadership, commitment and support, use of data, quality management, staff Involvement. Based on study in Lebanon, hospital size include better quality predictors of quality. The study's findings in Lebanon are important because evidence shows that larger organizations are more likely to value and benefit from accreditation whereas smaller organizations may be burdened by surveys and compliance costs compared to their overall budgets. Large hospitals tend to be more hierarchical and bureaucratically organized that make the implementation quality of work more challenging.

Participation in the accreditation process promoted a quality and safety culture that exceeded the organizational boundaries. Insights into employee motivation can be applied to involve employees in promoting learning, overcoming organizational boundaries and improving quality services and safety in healthcare institutions⁽¹⁸⁾. Motivated employees are needed to improve the quality and safety of the care organization. Encouraging and involving employees to participate in the accreditation process is a big challenge⁽¹⁸⁾.

This systematic review reports the evidence of health professionals perception toward impact of hospital accreditation on quality of care in Asian countries from full text studies published in English during the last ten years. Research in the field of health professionals perception are limited in Asia, and notes for further implications of research as results in different settings may differ. The setting of the studies were not homogenous, which may cause confounding bias. Another confounding bias was the fact that the 5 results of the study is based on the perception of health professionals. Only 1 among 5 studies compared patient satisfaction before and after hospital accreditation, while other studies without further analysis of patient outcome data and outcome indicators.

CONCLUSIONS

The implementation of hospital accreditation requires commitment, support, and motivation from government, leadership, and all human resources in the hospital. The positive perceptions of health care professionals will be motivate health professionals to support the implementation of hospital accreditation. There are many factors affecting performance of accreditation such as quality of care, leadership and culture. These factors need strategies to strengthen the way accreditation for improving quality of care, strengthen leadership, and culture. Researches regarding the impact of hospital accreditation in Asia are still limited, implicating a need for future research. The findings are expected to provide valuable lessons for preparing or implementing accreditation.

ACKNOWLEDGEMENTS

The author would like to acknowledge Dr. Pujiyanto S.KM., M.Kes for contribution and support in the process of creating this systemic review.

Conflict of Interest: The authors declare that there is no conflict of interest in this journal.

Ethical Clearance: No ethical clearance needed since no patient involvement in this study.

Source of Funding: No need source of funding

REFERENCES

1. Qualitydigest. A Guideline for Quality Accreditation in Hospitals | Quality Digest [Internet]. 2010 [cited 2018 Jul 5]. Available from: <https://www.qualitydigest.com/inside/twitter-ed/guideline-quality-accreditation-hospitals.html>
2. Akhil Tandulwadikar, Rajeshwer Chigullapalli. World-class via Accreditations | Asian Hospital [Internet]. 2018 [cited 2018 Jul 5]. Available from: <https://www.asianhnm.com/healthcare-management/healthcare-accreditations>
3. The Joint Commission. Facts about Hospital Accreditation | Joint Commission [Internet]. 2017. [cited 2018 Jul 17]. Available from: https://www.jointcommission.org/facts_about_hospital_accreditation/
4. Bart Van den Mooter. Medical Tourism in Asia-Pacific: Strategies for Medtech Firms – Brink – The Edge of Risk [Internet]. 2017 [cited 2018 Jul 17]. Available from: <https://www.brinknews.com/asia/medical-tourism-in-asia-pacific-strategies-for-medtech-firms/>
5. Braithwaite J. Health service accreditation as a predictor of clinical and organisational performance: a blinded, random, stratified study. *BMJ*. 2010;
6. Alkhenizan A, Shaw C. Impact of accreditation on the quality of healthcare services: a systematic review of the literature. *Ann Saudi Med* [Internet]. 2011 [cited 2018 Jul 13];31(4):407–16. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21808119>
7. Worldhospitalsearch.org. The Value of JCI Accreditation | World Hospital Search [Internet]. 2017 [cited 2018 Jul 5]. Available from: <https://www.worldhospitalsearch.org/the-value-of-jci-accreditation/>
8. Franco LM, Bennett S, Kanfer R. Health sector reform and public sector health worker motivation: a conceptual framework. *Soc Sci a Med* [Internet]. 2002 [cited 2018 Jul 14];54:1255–66. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.457.1049&rep=rep1&type=pdf>

9. Johnston J, Cowling B, Kb G, Gilberto N, Leung K, Johnston JM, et al. Factors affecting implementation of accreditation programmes and the impact of the accreditation process on quality improvement in hospitals: a SWOT analysis. *Hong Kong Med J* [Internet]. 2013 [cited 2018 May 16];19:434–46. Available from: <http://www.hkmj.org/system/files/hkm1310p434.pdf>
10. Hittinahalli V, Golia S. NABH Accreditation and its status in the Country. *US Natl Libr Med enlisted J* [Internet]. 2013 [cited 2018 May 16];6(1). Available from: <http://ajms.alameenmedical.org/ArticlePDFs/AJMS V6.N1.2013 p 3-6.pdf>
11. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Ann Intern Med* [Internet]. 2009 Aug 18 [cited 2018 Jul 8];151(4):264. Available from: <http://annals.org/article.aspx?doi=10.7326/0003-4819-151-4-200908180-00135>
12. Algahtani H, Aldarmahi A, Manlangit J, Shirah B. Perception of hospital accreditation among health professionals in Saudi Arabia From the. *Ann Saudi Med* [Internet]. 2017 [cited 2018 May 1];37(4):326–32. Available from: <http://orcid.org/0000-0001-9484-9838>
13. Abolfotouh MA, Alkelya M, Abukhalid N, Salam M, Alamry A. Nursing Perception Towards Impact of JCI Accreditation and Quality of Care in a Tertiary Care Hospital, Central Saudi Arabia. *Int J Med Med Sci* [Internet]. [cited 2018 May 16];47(1):2051–5731. Available from: https://s3.amazonaws.com/academia.edu.documents/39523777/Nursing_Perception_Towards_Impact_of_JCI.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1526492783&Signature=cJAEllqMz6uEdZsZdWNXNHZQyrQ%3D&response-content-disposition=inline%3Bfilename%3DNursing_perception_towards_JCI_accredita.pdf
14. El-Jardali F, Jamal D, Dimassi H, Ammar W, Tchaghchaghian V. The impact of hospital accreditation on quality of care: perception of Lebanese nurses. *Int J Qual Heal Care* [Internet]. 2007 Nov 30 [cited 2018 Apr 26];20(5):363–71. Available from: <https://academic.oup.com/intqhc/article-lookup/doi/10.1093/intqhc/mzn023>
15. Yildiz A, Kaya S. Perceptions of nurses on the impact of accreditation on quality of care A survey in a hospital in Turkey. 2014 [cited 2018 Apr 26]; Available from: <https://remote-lib.ui.ac.id:2078/docview/1525630970/fulltextPDF/4BD1C4BD28814692PQ/1?accountid=17242>
16. Diab SM. The Extent to Which Jordanian Doctors and Nurses Perceive the Accreditation in Private Hospitals. *Int J Mark Stud* [Internet]. 2011 [cited 2018 Jul 13];3(1). Available from: www.ccsenet.org/ijms
17. Yildiz A, Kaya S. Perceptions of nurses on the impact of accreditation on quality of care A survey in a hospital in Turkey. [cited 2018 May 21]; Available from: <https://remote-lib.ui.ac.id:2063/docview/1525630970/fulltextPDF/701A052A91B24CCEPQ/2?accountid=17242>
18. Greenfield D, Pawsey M, Braithwaite J. What motivates professionals to engage in the accreditation of healthcare organizations? *Int J Qual Heal Care* [Internet]. 2011 Feb 1 [cited 2018 May 21];23(1):8–14. Available from: <https://academic.oup.com/intqhc/article-lookup/doi/10.1093/intqhc/mzq069>

The Evaluation of Acute Appendicitis Clinical Pathway

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ABSTRACT

Introduction: Acute Appendicitis is the 1st emergency case for the abdominal disease in Indonesia. In 2014, Clinical Pathway is one of the requirements that must be met in the hospital's accreditation standards. It is crucial for the hospital having a successful of implementation of clinical pathway as Indonesia run universal health coverage. As the 4th year of this regulation, all hospital needs to implement clinical pathway as a tool for variations control. Objects of this research are: 1) how is compliances in acute appendicitis management after using clinical pathway, 2) is clinical pathway successful as a tool to reduce variances.

Method: This research used mix methods. A retrospective analysis of medical records (July 2016 - June 2017) was performed. The CP comprised the following indicators of compliance: doctor visit, laboratory tests, medication, anaesthesia consultation, technic of surgery and nutrition. In-depth interview was performed to those who involved in the implementation of CP by purposive sampling technique.

Results: There were 35 patients of which 25 (71%) were female and 10 (29%) were male. The compliance to clinical pathway were 37% patient for length of stay (3 days), 29% patient in medication and laboratory tests, 36% patient in anaesthesia consultation, 94% in Open Appendectomy, 100% in doctor visits and nutrition.

Conclusions: Compliance to CP of Acute Appendicitis was low especially in medication and laboratory tests. Clinical pathway is unsuccessful as a tool to reduce the variances.

Keywords: acute appendicitis; pathway evaluation; pathway implementation; clinical pathway; acute pathway.

INTRODUCTION

Acute appendicitis is one of the most common diseases emergency cases, with about 250,000 cases in America and 40,000 in the UK per year^{1,2}. Acute appendicitis is one disease that has a high prevalence rate. By 2015, in North America the incidence rate reaches 100 per 100,000 people \pm year with a diagnosis of 400,000 Appendicitis. The incidence of acute appendicitis in developing countries is lower than in developed countries³. In Southeast Asia, Indonesia ranks first as the highest incidence of acute Appendicitis with

a prevalence of 0.05%. According to Household Health Survey (SKRT) 2014 in Indonesia, Appendicitis ranked highest among emergency cases of abdomen⁴.

Clinical pathway (CP) was originally intended to shorten the length of hospitalization days and lower the cost of health services. In Japan, CP is also used to standardize medical services and improve patient satisfaction⁵. In acute appendicitis management, CP is an important tool because it has clinical symptoms that vary. Diagnostic of Acute appendicitis is sometimes difficult to do, though by an experienced physician⁶.

In 2014, Indonesia run universal coverage (BPJS) and changed the payment mechanism to health-providers from fee-for-service to case-based-schemes. This mechanism aims to improve health service and health care cost beneficial which CP is one of tools to achieve that. CP is a document that allow all staffs know all aspect in treatment plan⁷.

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Implementation of CP is one of the requirements that must be met in the hospital’s accreditation standards in Indonesia⁸. It is crucial for the hospital having a successful of implementation of CP as Indonesia run universal health coverage. As the 4th year of this regulation, all hospital needs to implement clinical pathway as one of main subject in quality insurance of health care delivery system. Objects of this research are: 1) how is compliance in acute appendicitis management after using clinical pathway, 2) is clinical pathway successful as a tool to reduce variances.

METHOD

This study was conducted at one of private hospital in Jakarta. A retrospective analysis of medical records (July 2016 - June 2017) through Hospital Information System (HIS) was performed. The inclusion criteria were: uncomplicated Acute Appendicitis, inpatient surgical patients, age>15 years, elective case. The exclusion criteria were: found comorbidity, complications during treatment, patient is referred to another health service. The Medical Committee developed the CP on Open Appendectomy. Uncomplicated open appendectomy was done for diagnosis of acute appendicitis with ICD-10 code is K35.9.

The CP comprised the following indicators of compliance: length of stay, doctor visit, laboratory tests, medication, pre-anaesthesia consultation, technique of surgery and nutrition. Data were analyzed univariate by using «Pre-Clinical Pathway Development and Clinical Pathway Evaluation Tools version beta 2.6». Data was presented as utilization (average) and percentage which ever were applicable.

RESULTS AND DISCUSSIONS

Thirty-five patients were included in the study. Sample’s characteristics (35 patients) were mean of age was 30.6 years, 29% were male and 71% were female [Table 1].

Table 1: Sample’s characteristic

Variables	
Age (Mean ± SD)	30.6 ± 11.4
Sex (%, n=samples)	Male (29%, n = 10)
	Female (71%, n=25)

The compliance of CP presented in percentage shows in table 2, which the highest compliance (100%) was doctor’s visits and nutrition. The lowest (29%) was lab test and medication.

Table 2: CP Compliance

Variables	CP Compliance (%)
ALOS	37
Doctor’s visit	100
Lab test	29
Medication	29
Open Appendectomy	94
Pre-anaesthesia consultation	36
Nutrition	100

Average length of stay (ALOS) was 3.66 days, of which longer than 3 days (recommendation in CP). The average utilization of doctor’s visits was 3.66. This indicates that in average length of stay 3.66 days, doctors have visited patient as 3.66 times or can be interpreted that doctor has visited patient each day during treatment period. 100% compliance of laboratory test was just HbSAg (utilization=1.00). Medication according to CP is Antibiotics (Cefotaxime or Ceftriaxone) and Analgesic (Ketorolac Injection or Ketorolac Tablet). All informants said that variances on medication is given as patient’s indication. The biggest variances medication was mefenamic acid and cefixime cap, which given as home medication. Another variance on medication was anti-emetic (Ondansetron) [Table 3].

Based on document reviews and interviews, human resources were sufficient and ready to implement acute appendicitis CP. In financial aspect, the management has no funds or expenses specifically budgeted for the preparation, implementation and evaluation of CP. CP’s team received a training to prepared CP forms, but it was not specific. It was part of training to prepare for hospital accreditation. Documents that support the implementation of CP were : Clinical Practice Guideline (CPG) of Acute Appendicitis, Drug Formulary which containing the availability of drugs in the hospital (2016), Standard Operating Procedures of Nursing Services. CP’ forms was made in accordance to all that documents and another existing hospital policy.

Medicines and medical devices was always available and in a good condition. According to all informants, the

number of bed and operating room was sufficient to give health services to acute appendicitis patients. CP forms was always available in all room.

CP preparation process consists of : identification of stakeholders and leaders, identification of CP leaders and team, deciding on CP to be developed, patient mapping process, preliminary audit and data collection, CP development, pilot phase and implementation, periodic evaluation. According to one of the informants that identification of stakeholders and leaders was done simultaneously by an external researcher team. While identification of CP leader and team was performed by the director of the hospital.

Before deciding on which CP to be made, CP team conducted initial audits and data collection. Most of informants revealed that data collection was based on such as volume, cost and risk. Acute appendicitis was the fifth largest cases. CP have been developed in accordance with existing data. CP is a patient-centered treatment plan. Team must understand what the patient need in

each phase of treatment throughout the hospitalization. Mapping or flow of patient has been considered in the form of CP.

The development of CP has involved the medical team, nurses, pharmacists and support teams. CP preliminary process started by the CP team (medical committee) make draft of CP, then submitted to Surgery Medical Team. There after another meeting of nurses, pharmacists, and lab were held to assess whether the draft was in accordance with their practice guideline. Once everything is in accordance with practical guideline and other hospital's policies, then CP will be launched to all related section.

CP socialization step done by a staff meeting at managerial level, then managers will forward all information about CP to their respective staffs. The obstacle that was felt at that time was the difficulty of medical team to able to attend together. For medical team member who can not attend the meeting, CP team will deliver the information personally.

Tabel 3: Utilization of CP's compliances

Pathway	Utilization (average)	Variances*	Utilization (average)
Average Length of stay (ALOS)	3.66 days		
Doctor' visits	3.66		
Lab test:			
Haematology	0.86	Pathology Anatomy	0.63
HbSAg	1.00	Ureum	0.49
Blood clotting time	0.60	Creatinin	0.46
Bleeding time	0.60	PT	0.34
Pregnancy test	0.00	APTT	0.34
Abdomen USG	0.06		
ECG	0.03		
Ro Thorax	0.08		
Medication:		Cefixime Cap	7.81
Cefotaxime Inj	0.72	Mefenamic Acid tab	9.81
Ceftriaxone Inj	1.86	Co-Amoxyclave tab	1.44
Ketorolac Inj	3.19	Metronidazole Inf	1.31
Ketorolac Tab	0.08	OndansentronInj	1.42
Pre-anaesthesia consultation	0.39		
Open Appendectomy	0.94	Laparoscopy	0.06
Nutrition	1.00		

*the biggest five utilization

The evaluation of CP of Acute appendicitis has been performed once. It should be done at least twice a year. However, this is understandable because of lack of staff to conduct CP implementation evaluation, which are only performed by two members of CP team. The result of evaluation was presented at a meeting attended by doctors, directors and head of nurse.

The main symptom of Appendicitis is presence of right lower abdominal pain accompanied by nausea and vomiting. Most important examination is physical examination, but laboratory tests can support the accuracy of diagnosis⁹. It was not only for diagnostics purposes, but also for surgical procedures. Routine haematology test is one of laboratory tests that must be performed in surgical case. In this study some patients came from another section (general and internal disease) and have done routine haematology test.

In this hospital, CP is designed for all patient without considering payment scheme (Private, Private Insurance , universal coverage-BPJS) and room care classification. BPJS patients was equal with private patients (Table 4).

Table 4: Payment schemes distribution

Payment schemes	(%) (n = patients)
BPJS	37% (n = 13)
Private Insurance	26% (n = 9)
Private	37% (n = 13)

Hospital in Indonesia has different ward or room care with different facility and price. CP is designated for all patient. The distribution of patients according to room care shows in table 5.

Table 5: Room Care Distribution

Room Care	n = patients	(%)
I	2	6
IA	2	6
IIA	10	28
IIB	3	9
III	11	31
VIP	6	17
VVIP	1	3

Considering to one of informants, CP is addressed to all patients, but this hospital more emphasizing

implementation of CP performed on BPJS patients. While in other patients, clinical treatment plan is more flexible. This may affect level of CP compliances.

ALOS in this study was longer than 3 days (CP recommendation). Length of stay (LOS) influenced by possibilities of comorbidity, post-anesthesia complications, surgical wound infections, complete diagnostics tests.

Rate of pre-anaesthesia consultation was low. Data of this study was taken from patients billing system, any activities that was not counted on billing system, can not be analyzed. Pre-anaesthesia consultation is a mandatory procedure in surgical case. Due to hospital's billing system only counts pre-anesthesia consultation that conducted in ward or room care, while consultation that conducted in the surgery room (just before the surgery start) was not counted. It shows lack of management on financial to count any activities or services to patients.

Variances in medication could caused by imperfect CP. In this study, CP was not considered home medication, symptoms and pain management post-surgery. In post-surgery gastrointestinal tract, nausea and/or dyspepsia is a very common symptom. To reduce these symptoms by given anti-emetic and anti-ulcer. The analysis of variances is vital in CP development to improve best practices met the existing needs¹⁰. Seeing this, the pathway team needs to evaluate whether home medication (such as mefenamic acid and antibiotics), anti-emetic need to included in clinical pathway.

In implementing CP, human resources (HR) plays an important role. The succeed of implementation was not just depend on quantity and quality, but also on commitment of all team members. Cooperation and acceptance of doctors in implementation of CP is the key. Compliances to CP could reflected commitment of medical team.

Strong commitment of all staff can also generated from the adequacy of socialization and evaluation. At socialization stage, communication between all parties is an important factor for a successful implementation of CP. All staff must understand their role in CP and how far this could affect the output to patient.

Advantage of CP is the possibility of continuous improvement to give a positive effect on service delivery to the patient by performed a periodic evaluation. Form

CP as one of material to conducted evaluation must fulfilled correctly. In this study, found several forms' CP that filled incorrectly (for appendicitis with perforation or comorbidities). This indicates that staffs did not understand very well about how to complete CPs' forms. It was crucial, as data collection and analysis of service variances (different services provided with recommendations written on CPs' forms) are essential for CP development.

In this hospital, staffs must fill two similar form, forms' CP as quality control and another form (which is very similar to forms' CP) as cost control. It could add burden to staffs and caused incorrect on filling form. In the future evaluation, CP team need to make a questionnaire on form fillings' process. This can help the team to understand of any obstacle in ground level, while for staffs also can increase awareness of the importance of CP implementation.

Directors and managers of hospital has an important role in providing direction and example to all staff on the implementation of CP. In addition, hospital leader must translate the vision and mission of CP by communicating to all staff at every meeting. A successful implementation of CP is responsibility of all health care members, from the director to the staff who give health services to patients. Based on interview, from preparation to evaluation of CP, was CP team responsibilities of which only two staffs of medical committee. Inefficiency of CP team can affect the quality of CP dan compliance to CP. And also key to CP success lies in the acceptance and cooperation of clinicians, leadership and support from hospital management, and dedication from case managers, doctors, nurses and other relevant professions¹⁰.

This study's results show that CP was unsuccessfull for reducing variances. Obviously, the results of our study were limited by small number patients (35 patients). We suggest extending the scope (include cost) and number of patients to give more precisely results for CP development for the next study.

CONCLUSSIONS

Compliance to CP of Acute Appendicitis was low especially in medication and laboratory tests. CP was unsuccessful as a tool to reduce variances.

ACKNOWLEDGEMENTS

The author would like to thank the staff and managers who involved in this research. The authors have indicated they have no conflicts of interest to disclose.

Conflicts of Interest: There are no conflicts of interest.

Source of Funding: The study is supported by Directorate of Research and Community Sevices of University of Indonesia.

Ethical Clearance: This study has received the approval of a research ethics committee of the University of Indonesia.

REFERENCES

1. Deng, Y., Chang, D.C., Zhang, Y. et al. Seasonal and day of the week variations of perforated appendicitis in US children. *Pediatr Surg Int.* 2010; 26: 691. <http://sci-hub.tw/10.1007/s00383-010-2628-z>
2. Simpson, J., Samaraweera, AP., Sara, RK., & Lobo, DN. Acute appendicitis--a benign disease? *Ann R Coll Surg Engl.* 2008; Vol.90, No.4, p.313-316.
3. Ferris, Mollie BSc, DVM, MD, et al. The Global Incidence of Appendicitis: A Sistematic Review of Population-based Studies. *Annals of Surgery.* 2017; 266(2):237-241.
4. Ministry of Health of Indonesia. Household Health Survey (Survey Kesehatan Rumah Tangga : SKRT), 2013.
5. Takegami, K., Kawaguchi, Y., Nakayama, H. et al. Impact of a clinical pathway and standardization of treatment for acute appendicitis. *Surg Today.* 2003; 33:336.
6. Guo, C. and Zou, Z.H. The effect of clinical pathway in patients with acute complicated appendicitis. *Surgical Science.* 2016; 7:286-290. Available from: <http://dx.doi.org/10.4236/ss.2016.77040>
7. Hilario AL, Oruga JDH, Turqueza MPB, Hilario DV. Utilization of clinical pathway on open appendectomy: A quality improvement initiative in a private hospital in the Philippines. *International Journal of Health Sciences.* 2018;12(2):43-49.

8. Hospital Accreditation Committee of Indonesia. National Standard of Hospital Accreditation. 1st edition; 2017. Available from: <http://doi.org/10.1186/1749-7922-5-5>
9. Memisoglu, K., Karip, B., Mestan, M., & Onur, E. The value of preoperative diagnostic tests in acute appendicitis, retrospective analysis of 196 patients. *World Journal of Emergency Surgery*. 2010.
10. Cheah, Jason. Development and implementation of a clinical pathway programme in an acute care general hospital in Singapore. *International Journal for Quality in Health Care*. 2000; 1 (5):403-412.

Determinants of the Pornography Exposure Effects on Junior and Senior High School Adolescence in Sanggau District, West Kalimantan

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ABSTRACT

Technological advances make it easier to access pornography. The pornography exposure effects are very serious problem among adolescence. It could have negative impact to reproductive health and mental health development. This research was a quantitative research with cross sectional design approach which main purposes to know the determinant of the pornography exposure effect that was conducted on 171 junior on junior and senior high school adolescence in Sanggau District. The results of this research indicated that most respondents had access pornography through photos (images) of 62.0%, including through the internet (78.4%). The pornography exposure effect of respondents was obtained in light level (addiction, escalation, and desensitization stage) was 29.2%, and weight level (act-out stage) was 70.8%. The significant determinants of the pornography exposure effect were the time of access (p value = 0.039, PR = 5.765), gender (p value = 0.0001; PR = 3.600), Duration access (p value = 0.037, PR = 3.730), and media type (p value = 0.001; PR = 2.268). While the status of dating, residence status, marital status of parents were not a significant determinant factor, but showed a positive trend toward the pornography exposure effect. It is suggested to provide information about the danger of pornography on early adolescence as a primary prevention toward accessing pornography. In addition, the collaboration of family and schools are needed to provide assistance in early adolescents to be wise in using the media, and for the adolescents who are in act-out stage need the intensive therapy to behave healthy.

Keywords: *Pornography, Exposure Effects, Adolescence, Reproductive Health, School*

INTRODUCTION

The proliferation of pornography over the last two decades, particularly via the Internet, has influenced youth culture and adolescent development in diverse and unprecedented ways¹, including in Indonesia. Based on the survey, in 12 major Indonesian cities of adolescent's behavior get as many as 83% of teens once admitted to watch porn videos, 93.7% had sexual intercourse, and 21% or one among five adolescents in Indonesia has had an abortion².

The initiation of adolescent's premarital sexual starting from 82.7% hand touching, 60.7% hugging, 66% kissing, 19.3% touching sensitive areas, 7% oral sex, 4% anal sex, and 14.7% intercourse³. This is associated with increasingly accessible pornographic exposure. The literature review showed that the compulsive adolescent's sexual behavior related to pornography^{4,5,6,7,8}. The most dominant factors influence the effect of exposure effect was frequency of exposure (often) (Odds Ratio 5,02)⁹.

Consequently, the impact of Internet pornography on adolescents, including compulsive, addictive, and even criminal behavior, is a global trend. They are considered one of the most susceptible audiences to sexually explicit content¹. Some evidence that exposure to pornography can increase the likelihood of earlier first-time sexual experience, particularly for those adolescents who consumed pornography more frequently¹⁰.

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There are stages of the effects of exposure that occur on those who exposed to pornography and experience the effects of exposure including addiction, escalation, desensitization and act out. Addiction is an addictive effect. Once a person likes pornographic material then he will have desire to see and regain the material. Escalation is an increase the need for heavier, more sex material explicit, more sensational and more deviant than previously consumed. Desensitization is stage when sex material that was taboo, no moral and demeaning/demeaning dignity humans are gradually now considered to be something the ordinary even the bus becomes insensitive as well against victims of sexual violence. Act out bound when there is an increasing tendency to do sexual behavior of pornography that has been only he sees to be applied to real life¹¹.

As well as in Sanggau District, West Kalimantan, pornography exposure is widespread among junior high and high school adolescents. This research aims to know the determinant of the pornography exposure effects on Junior and Senior High School Adolescence in Sanggau District, West Kalimantan.

METHOD

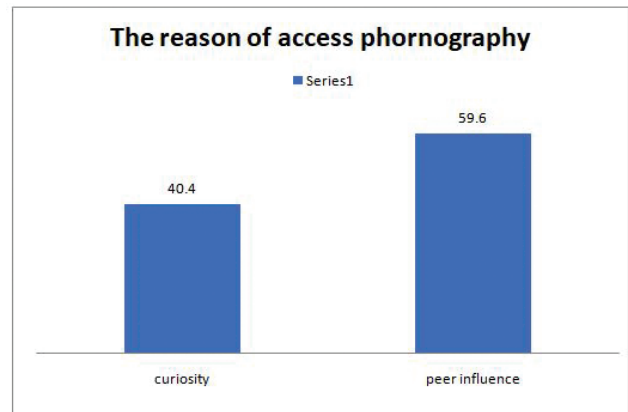
This research was a quantitative research with cross sectional design approach which main purposes to know the determinant of the pornography exposure effect. The population of this study were all of the junior and senior high school students who had been exposed the phornograpy in Sanggau District, West Kalimantan. This study was conducted on 171 junior and senior high school adolescence in July – December 2017.

Self administered questionnaire was used. To maintain data quality, we did the standardization questionnaires and interviewer training, are conducted informed consents as a sign of approval of respondents, and check the completeness of the contents of the questionnaire. Respondents also must submit the questionnaire in the closed envelope that has been provided. The research assistant presented the study, explaining that the questionnaires were anonymous and self-administered; privacy was guaranteed, and the right not to participate was underlined. Chi-Square test was used to know the significantly determinant variables.

RESULTS AND DISCUSSIONS

The respondents were highly exposed to pornographic images found in magazines, videos,

television, computers and internet. The Sexually Explicit Materials (SEM) were used to: satisfy curiosity (40.4%), and peer influence (59.6%). These findings was supported by the existing literature that shows that the reason of access phornograpy was out of curiosity^{11,12}. The pointed out of pornography exposure shapes sexual knowledge¹³. Graphic 1 shows the distribution of the reason access phornograpy.



The univariate analyses could be seen below:

Table 1: Univariate Analyses

Variable	N	Percentage (%)
Media Type		
Printed Mass Media	22	12.9
Electronic	59	34.5
Printed Mass Media And Electronic	90	52.6
Sexual Behavior		
Masturbation		
Yes	81	47.4
No	90	52.6
Kissing		
Yes	108	63.2
No	63	36.8
Necking		
Yes	101	59.1
No	70	40.9
Petting		
Yes	57	33.3
No	114	66.7
Intercourse		
Yes	33	19.3
No	138	80.7

Conted...

Oral sex		
Yes	22	12.9
No	149	87.1
Anal sex		
Yes	17	9.9
No	154	90.1
Level of Addiction		
Addiction	1	0.6
Escalation	3	1,8
Desensitization	46	26.9
Act Out	121	70.8
The reason of phonographic viewing		
Curiosity	69	40.4
Peer influence	102	59.6

Table 1 show the most of respondents access the printed mass media and electronic (52.6%). Adolescent's sexual behavior who had accessed pornography were masturbate (47.4%), kissing (63.2%), Necking (59.1%), petting (33.3%), intercourse (19.3%), oral sex (12.9%), anal sex (9.9%). Furthermore, most of the adolescent's act out level (70.8%).

Table 2: Bivariate Analyses

Variables	Pornography Exposure Effects	
	p value	PR
Time of access	0.039*	5.765
Gender	0.0001*	3.600
Duration Access	0.037*	3.730
Media Type	0.001*	2.268
Status of dating	0.437	-
Residence Status	0.085	-
Parents Marital status	0.532	-

*Significantly at 0.05

Chi-square analysis was performed to examine the relationships between respondents' characteristics (i.e., gender, parent's marital status, residence status, status of dating, media type, duration access and time to access) and pornography exposure effects. Significant relationships were found for gender, time to access, media type, and duration access (p value < 0.05), but not for status of dating, residence status, and parent's marital status (p value > 0.05). Although there are no

significantly related, but its showed a positive trend. Participants who had dating partner, stayed in family house, and divorce parent's were more likely to get a heavy pornography exposure effects.

There was a strong influence of pornography exposure against teenage sexual behavior. The teenagers who had been exposed the pornography will affect his attitude about the sex picture on him, then will be realized in the form intimacy behavior with her partner¹⁴. The teenagers who exposed media pornographic tend to have more sexual partners (OR = 1,8; CI = 1,2 - 2,9), have sex partners more than 1 in the period Last 3 months (OR = 1,8; CI = 1,1 - 3,1), and perform anal sex (OR = 2.0; CI = 1,2 - 3,4). In addition, adolescents are exposed to the media pornography has a distant sexual attitude more permissive than unexposed¹⁵. This research found that most of participants who had exposure pornography, did kissing, petting, necking, intercourse, oral sex, and anal sex. In line with previous research which showed that pornography exposure influences adolescent's sexual behavior^{16,17}.

Some studies showed that there was significantly association between gender and pornography exposure^{9,18}. Boys were 5 times more likely to currently watch pornography than were girls (Adjusted OR 5.09, CI 2.69-9.63, p < 0.001). They also found male adolescents started earlier and more frequently on their own initiative, found pornography more sexually exciting, and reacted less often with fear or disgust¹⁸. This research found that male participants is more likely to get a heavy pornography exposure effects. The high prevalence of Internet use among males suggests that males are more inclined to technology than females a trend that needs to be reversed¹⁶.

There is a significantly association between frequency of pornography exposure to teenage sexual behavior^{19,20}, as well as this research. The participants who had accessed pornography more than 3 hours, is more likely tend to get a a heavy pornography exposure effects. They tend to have act out level of premarital sexual behavior. Likewise, approximately 85.11% respondents who had exposed to erotic information with heavy frequency, tend to have risky sexual behavior²¹. The teens who had often frequency of pornography exposure (more from once a week) at risk 5.0 times experienced exposure effects compared with adolescents whose frequency of exposure is rare (approximately one

time a week)⁹. Male's adolescence (95% CI OR = -1.245 - 6.465) were more likely to visit pornographic sites compared with other respondents. Duration of Internet use was also significantly associated with practice of content of sexually explicit sites. This corroborates earlier findings that sexual behaviour can be acquired through exposure to pornography and sexual models on the Internet through imitating and copying of such acts^{22,23,24}. Main source of information about the Internet was friends (63.3%), and the frequency of use showed that 29.5% access the Internet every day. Duration of time spent online ranged from 30 minutes to three hours¹⁶.

Time to access pornography had a significantly relationship with pornography exposure effects. This research found that the participants who accessed pornography in the morning or afternoon is more likely to get a heavy pornography exposure effects than in the night. This is because when accessing pornography during the day, they tend to meet with more people. The pornography viewing by adolescents is harmful to their development, both physically and emotionally. Group and individual therapy, as well as more parental control over what is viewed on the Internet, will be suggested as a way of overcoming or preventing pornography addiction in adolescence²⁵.

Electronic media of pornography had a significantly influence to pornography exposure effect. This finding research, respondents who exposed electronic and printed media together, has a chance of 2.27 times to get act out level of addiction. The respondents exposed to pornography through electronic media has a chance of 3.06 times for risky sexual behavior if compared with teenagers who do not exposed to electronic media. Trend teenage sexual behavior is increasing because of the dissemination of information and sexual stimulation through electronic media which is very accessible to teenagers²⁶.

CONCLUSIONS

From the findings of this study, it was shown that the reason of students get exposed to pornography were curiosity (40.4%) and peer influence (59.6). The significant factors contribute to pornography exposure effect are gender, time to access, duration access, and media type. Therefore, the recommendations of this study in education sector management should come up with curriculum and programs that addresses age appropriate sexuality education at all levels. This is

to provide sexuality information from balanced and objective sources where the adolescent and young adults are free to engage and to seek for clarification on sexuality issues, and for parents, educators, policy makers, health professional, and law enforcement be equipped with knowledge on sexuality that can enable them foster a supportive environment that can facilitate health development of youth sexuality, while minimizing the risk potential for negative effects related to pornography.

ACKNOWLEDGEMENTS

I would like to thank all of the participants in the study for the time and help given throughout. Without their participation, this research would not have been possible.

Conflict of Interest: The authors declare no conflict of interest

Ethical Clearance: All procedures performed in studies involving human participants were in accordance with the ethical standards and have been approved by the appropriate institutional research ethics committee.

Source of Funding: Independently.

REFERENCES

1. Owens EW, Behun RJ, Manning, JC, Reid RC. The impact of internet pornography on adolescents: a review of the research. *Sexual Addiction & Compulsivity*. 2012; 19(1-2), 99-122.
2. Shintami. *Reproductive Health of Adolescence*. Jakarta: Trans Info Media. 2012.
3. Suwarni L, Selviana S. Adolescent's Premarital Sexual initiation and the influence factors. *Journal of Public Health*. 2015; 10(2): 169-177. <http://journal.unnes.ac.id/nju/index.php/kemas>
4. Fu KW, Chan WSC, Wong, PWC, Yip PSF. Internet addiction: Prevalence, discriminant validity and correlates among adolescents in Hong Kong. *The British Journal of Psychiatry*. 2010; 196: 486-492.
5. Van den Eijnden RJJM, Spijkerman R, Vermulst AA, van Rooij TJ, Engels RCME. Compulsive Internet use among adolescents: Bidirectional parent-child relationships. *Journal of Abnormal Child Psychology*. 2010; 38: 77-89.

6. Gillespie AA. Adolescents accessing indecent images of children. *Journal of Sexual Aggression*. 2008; 14(2): 111–122.
7. Sussman S. Sexual addiction among teens: A review. *Sexual Addiction & Compulsivity*. 2007; 14: 257–278.
8. Yen CF, Ko CH, Yen JY, Chang YP, Cheng CP. Multi-dimensional discriminative factors for Internet addiction among adolescents regarding gender and age. *Psychiatry Clinical Neurosciences*. 2009; 63(3): 357–364.
9. Supriati E, Fikawati S. Effect of pornography exposure on junior high school adolescence in Pontianak City. *Makara Journal, Social Humanities*. 2009; 13(1): 48-56.
10. Quadara A, El-Murr A, Latham J. The effects of pornography on children and young people: An evidence scan. (Research Report). Melbourne: Australian Institute of Family Studies. 2017.
11. Emmers-Sommer TM. The Relationship between exposure to pornography and sexual attitudes towards women. *Journal on online behavior*. 2005; 4: 104-112.
12. Wallmyr G, Welin C. Young people, pornography, and sexuality: sources and attitudes. *Journal of school nursing*. 2006; 22: 290–95.
13. Flood M. The Harms of Pornography exposure among Children and Young people. *Child Abuse Review*. 2009; 18: 384-400.
14. Stulhofer A, Busko V, Schmidt G. Adolescent exposure to pornography and relationship intimacy in young adulthood. *Psychology and Sexuality*. 2012; 3 (2): 95-107.
15. Braun-Courville DK, Rojas M. Exposure to Sexually web sites and adolescent sexual attitudes and behaviors. *Journal of Adolescent Health*. 2009; 45: 156-162.
16. Arulogun OS, Ogbu IA, Dipeolu IO. Influence of internet exposure on sexual behaviour of young persons in an urban district of Southwest Nigeria. *The Pan African Medical Journal*. 2016; 25: 261. <http://doi.org/10.11604/pamj.2016.25.261.2630>
17. Pujiati E, Handayani DS. The influence of pornographic media exposure and peer on adolescent's sexual behavior in Kudus District. *Journal of Nursing Professions*. 2018; 5(1): 57-68.
18. Romito P, Beltramini L. Watching Pornography: Gender Differences, Violence and Victimization. An Exploratory Study in Italy. *Violence Against Women*, 2011; 17(10): 1313-1326.
19. Kurniawan WP. Relationship Between Accessing The Porno Site Through Media Internet With Sexual Behavior. [Thesis]. Universitas Muhammadiyah Malang. 2014.
20. Yutifa H, Priastiana A, Dewi, Misrawati. Relationship between exposure to pornography through electronics to adolescent's sexual behavior. *JOM*. 2015; 2(2): 6-17.
21. Furwasyih. The relationship between the frequency of erotic television and internet exposure and adolescent's sexual behavior in dating. [Thesis]. Sekolah Tinggi Ilmu Kesehatan Mercubaktijaya. Padang. 2011.
22. Flood M. The Harms of Pornography exposure among Children and Young people. *Child Abuse Review*. 2009; 18: 384-400.
23. Inyang M. The role of mass media in predicting the sexual behaviour of female secondary school adolescents in Port Harcourt metropolis, Rivers State, Nigeria. *Sexologies*. 2008; 17(Suppl1): S151.
24. Odeyemi K, Onajole A, Ogunowo B. Sexual behavior and the influencing factors among out of school female adolescents in Mushin market, Lagos, Nigeria. *Int J Adolesc Med Health*. 2009; 21(1):101–9.
25. Nufer R. A Brief Background of Pornography and its Effects on Physical, Psychological, and Emotional Health in Youth, *Intuition: The BYU Undergraduate Journal in Psychology*: Vol. 12 : Iss. 1, Article 2. 2017. Available at: <https://scholarsarchive.byu.edu/intuition/vol12/iss1/2>
26. Jannah RM. Relationship between Pornography Media Access and Adolescent's Perception About Premarital Sexual Behavior In SMPN 01 Kasihan Bantul. Publication Script. 2017. UNIVERSITAS 'AISYIYAH.

Psychoeducation *Dzikr* Reduces Perceived Stress and Postpartum Depression Syndromes on Primiparous Women

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ABSTRACT

Background: Unstable emotions are common in primiparous women who fail to adapt to changes during perinatal period could not be resolved fundamentally, so research of psychoeducation *dhikr* is crucial to be conducted to reduce perceived stress in an effort to prevent postpartum depression syndromes.

Purposes: to prove routine midwifery care plus psychoeducation *dhikr* has more influential on decreasing perceived stress and postpartum depression syndromes among primiparous women.

Method: This study was an experimental study. A number of 24 participants as intervention group and a number of 23 participants as control group. All participants completed the Perceived Stress Scale and the Edinburgh Postnatal Depression Scale, in the third trimester of pregnancy, one week before due date of birth, the three days and tenth days after birth. Statistical test using General Linear Model and independent t-test to compare mean difference.

Results: At the end of the intervention, the difference of of the PSS score between groups 3.73, CI 95% (-6.14 – (-1.32)) and p value is 0.003. The difference of the EPDS scores between groups 2.34, CI 95% (-4.44 – (-0.24)) and p value is 0.030.

Conclusions: The routine midwifery care plus psychoeducation *dhikr* has more decrease perceived stress and postpartum depression syndromes in primiparous women.

Keywords: *Dzikr; Perceived Stress; Syndrome Depression*

INTRODUCTION

Unstable emotions are common in primiparous women who fail to adapt to changes during perinatal period could not be resolved fundamentally. The period of pregnancy and postpartum put the mother in a vulnerable condition of emotional changes that adversely affect the health of mother and baby¹. The difficulty and failure to adapt the perinatal period are stress transitions and become the initial manifestation of postpartum depression syndrome (PDS)²⁻⁴. The incidence of PDS in the world is 10% - 15%⁵, and mothers with PDS have an impact on reduced self-care and infant abilities, exclusive breastfeeding failure⁶ and impaired first-year growth⁷.

Previous studies of non-pharmaca interventions⁸⁻¹⁵ have not been able to prevent PDS completely. The period of pregnancy, childbirth and motherhood are conditions to be closer to the God and make life more meaningful with the use of religious beliefs as a strong coping

mechanism¹⁶, thereby requiring necessary services to enhance maternal spirituality during pregnancy and postpartum period.

The results of previous studies have shown that the activity of spirituality during pregnancy is a protective factor against postpartum depression symptoms and helps to overcome early stress of motherhood and up to a year later¹⁷. Taking into account the condition of Indonesian that based on religions, it is the necessary research on routine midwifery care (RMC) plus psychoeducation *dhikr* (PD). The RMC is a care provided by midwives for mothers during pregnancy, childbirth and postpartum in order to prevent any complications. Psychoeducation is relatively short and can be included in routine care. *Dhikr* is a practice of Islam in order to get closer to Him, remembering, mentioning, understanding, expressed in verbal speech, containing expressions of praise, prayer, gratitude, no specific time limit and reading. Psychoeducation *dhikr* has been chosen considering that the implementation is

not restricted to certain conditions, time and readings so that the sustainability of psychoeducation *dhikr* as an effort to achieve and improve mental health of perinatal mother becomes possible.

Some researches on *dhikr* have been done, but no one has been used as an effort to prevent postpartum depression syndrome. The RMC plus PD in primiparous mother in this research is expected to lead the emotional stability and decreases perceived stress so that is expected to prevent postpartum depression syndrome.

This study aims to prove routine midwifery care plus psychoeducation *dhikr* is more influential on decreasing perceived stress and postpartum depression syndrome on primiparous women. As our hypothesis was routine midwifery care plus psychoeducation *dhikr* is more influential on decreasing perceived stress and postpartum depression syndrome on primiparous women compared with routine midwifery care only.

METHOD

Study Design: This research has been an experimental research with randomized pre-test post-test control group design design, the intervention was the RMC plus PD, while the control group got the RMC only.

Sampling: Subjects in this research were primigravida mothers at six Community Health Centers, which fulfilled the inclusion criteria with consecutive sampling technique. A total of 47 subjects completed a series of research.

Measurements: Perceived stress and syndorm depression have been examined at the third trimester (TM III) of pregnancy, one week before due date of birth, day 3 and 11 after childbirth. The authors used the Perceived Scale Stress (PSS)¹⁸ as indicator of perceived stress that measures the extent to which situations in a person's life are rated as stress, and also to measure stress during the third trimester of pregnancy; comprised 10 items, each item was rated on a 5-point scale ranging from never (0) to almost (4).

Syndrome depression was measured by the EPDS¹⁹, that have been translated into Indonesian²⁰, comprised 10 items, choice answers should have one according to gradation of the mother's feelings felt at the time. Test results on PSS instruments showed that 10 items had value 0.702 and the EPDS had value 0.759 Cronbach Alpha.

Procedures: Interventions had been given totally five times; twice in the third trimester of pregnancy, on the 3rd, 7th and 10th postpartum days, for 45-60 minutes of each intervention, using modules in the same sequence of activities, beginning with deep breathing, followed by read the *surrah Al-Fatihah, Al-Falaaq, An-Nass, Al-Ikhlās, Al-Insyirah*, some *Asmaul Husna*, recitation of *tasbih, tahmid, tauhid* and *takbir*, sentences *hauqolah, Sholawat* of the Prophet Muhammad, recitations of *Istighfar* and recitations of *Hamdallah*, end with a deep breath.

The materials used in the study include the Psychoeducation *Dhikr* (PD) module, which has been compiled and reviewed by Islamic religious expert. The PD module was then tested and refined before testing is used. Interventions were conducted by researchers who were assisted by six midwife instructors, each of which was owned by a selected community health center that had been subjected to a perception equation and was given special training three times.

DATA ANALYSIS

Analysis of the variables of the perceived stress and postpartum depression syndrome in the intervention group and control group used General Linear Model test with post hoc Benferroni and Independent Sample t-Test.

RESULTS

Descriptive data in the intervention group showed women age in mean 23.96, secondary educational category (79%), not working (66.7%), household income below regional minimum wage (58.3%), all mothers give breast milk and always got family support (83.3%). In the control group obtained the characteristic of women age in mean 22.83, secondary educational category (82/6%), not working (73.9%), household income below regional minimum wage (65.2%), all mothers give milk and always got family support (73.9%). All data were obtained $p > 0.05$, so it can be concluded that the subject characteristic data in two groups was homogeneous.

Perceived stress: The results showed the mean score of PSS in RMC plus PD group (-0.04) was lower than the RMC group only (-2.17) (Figure 1). Perceived stress was categorized into mild stress level if the PSS score 0 - 13, moderate stress if PSS score 14 - 26 and severe stress if score 27 - 40. The results showed that at end of

intervention in the RMC plus PD group there were 15 (62%) subjects in moderate stress categories and 9 (38%) in mild stress categories, whereas in the RMC group only there were 1 (4%) subjects in the category of heavy stress, 22 (96%) in moderate stress category and none in the mild stress category. It can be concluded that the subjects in the RMC plus PD group were on moderate and mild stress categories, whereas subjects in the RMC group only in moderate and heavy stress categories.

Table 1 showed that there was a difference of PSS score at each measurement time (p value <0,05), so it can be concluded that there was a difference of mean score of PSS between TM III with three days after delivery and with eleven days after delivery between groups, so it is concluded that there is no difference of mean difference of PSS score before and after intervention between the RMC plus PD group compared with the RMC group only.

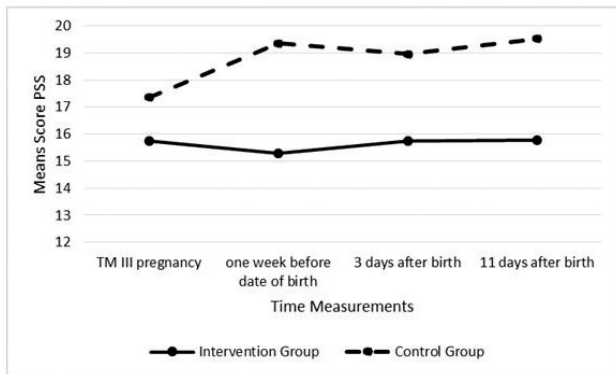


Figure 1: The PSS Score pre and post intervention between groups

Syndrom Depression: The results showed that the RMC plus PD group has tended to have decreased EPDS scores, while the RMC group only has a tendency of increased EPDS score (figure 2). Difference (Δ) EPDS score measurements in TM III and eleven days of Post Partum (PP) in the RMC plus PD group (0.96) were greater than the RMC group only (-1.35).

The depression syndrome was measured using an EPDS score of the category: normal if the EPDS score is <10, mild depression if the EPDS score is 10-12, moderate depression if EPDS score of 13-15 and severe depression if the EPDS score >15. The results show that at the end of the intervention in group who got additional PD were in the normal category of 16 (66%), mild depression 4 (17%), moderate depression 4 (17%) and none in severe depression categories, whereas in the RMC group alone the normal category as many as 11 (48%), mild depression 5 (22%), moderate depression 6 (26%) and major depression 1 (4%). It can be concluded the percentage of subjects in moderate and severe depression category in the RMC plus PD group is lower than the percentage of subjects in the RMC group only.

The test results on three EPDS score measurements followed by post hoc analysis obtained p value = 0.216 (table 1), meaning there was no interaction between measurement time and group. In the third posttest measurement, p = 0,030, it can be assumed that there was a difference of mean score of EPDS between the RMC plus PD group with the RMC group only on eleven days PP.

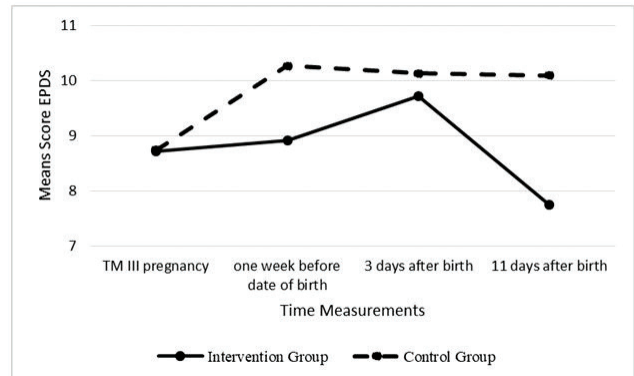


Figure 2: The EPDS Score pre and post intervention between groups

Table 1: Differences of The PSS and the EPDS scores between Intervention and Control Groups

Variable	Measurement time	RMC + PD	RMC	Difference (Δ) (CI95%)	p value
		Mean ± SD	Mean ± SD		
Perceived stress	TM III of pregnancy	15,75 ± 3,84	17,35 ± 3,07	-	-
	1 week before due date	15,29 ± 4,06	19,35 ± 3,58	-4,06 (-6,31 - [-1,81])	0,001*
	3 days after chidbirth	15,75 ± 2,83	18,96 ± 2,93	-3,21 (-4,90 - [-1,51])	<0,001*
	11 days after chidbirth	15,79 ± 4,71	19,52 ± 3,37	-3,73 (-6,14 - [-1,32])	0,003*
Syndrome depression	TM III of pregnancy	8,71 ± 4,56	8,74 ± 3,74	-	-
	1 week before due date	8,92 ± 4,58	10,26 ± 3,09	-1,34 (-3,65 - 0,96)	0,246*
	3 days after chidbirth	9,71 ± 4,94	10,13 ± 3,48	-0,42 (-2,94 - 2,10)	0,737*
	11 days after chidbirth	7,75 ± 3,77	10,09 ± 3,36	-2,34 (-4,44 - [-0,24])	0,030*

* General Linear Model test, post hoc analysis : perceived stress : p=0,686, Syndrome depression: p=0,216.

DISCUSSION

The results were proved that the prevalence of perceived stress in the RMC plus PD group was in the category of moderate and mild stress, whereas the RMC group only was in the category of moderate and severe stress. Although both groups did not experience a decrease in mean PSS scores, however, the mean PSS scores in the RMC plus group were smaller than the RMC group alone. This is in accordance with previous research results that interventions based on religious beliefs that are owned can help improve mental health^{21,22}.

Provision RMC plus PD is important for women during pregnancy and after childbirth as concerns about physical, emotional and social changes in that period are as stressors for the mother. In this study, the mother described the psychological responses experienced in relation to pregnancy, labor and childbirth; such as sometimes anxious, afraid of mixed happy, early feel tired and have a feeling of not being able to accept the presence of the baby, often waking up at night to breastfeed and feel less attention and lack confidence. This is consistent with the results of previous studies which suggest that maternal concerns include physical changes, appearance, interpersonal relationships, delivery, health and infant care, risks and complications due to medical conditions and distress conditions²³.

The first changes experienced by primiparous women make them more sensitive to emotional changes and trigger stress²³⁻²⁵, but the effects of stressors are moderated by coping resources such as social, spiritual and self-efficacy support²⁶. Thus the RMC plus is intended to reduce the effects of stress and change the distress into eustress (stress-controlled), so it does not continue to be psychological distress.

Pregnancy, childbirth and postpartum are physiological processes and as a woman's nature, although the process places the perinatal mother at risk for psychological distress of stress and anxiety. The results of this study adds the fact that the RMC plus PD from the third trimester to postpartum is proven to decrease perceived stress by improving maternal perception by converting distress into eustress.

The PD was interpreted differently that seen from there are still some subjects with high EPDS score after intervention. Due to the rapid adaptation demand in

the perinatal period, so subjects perceive the physical, psychological, and social adaptation processes in that phase as stress. This study showed that subjects in both groups experienced an increase in the mean EPDS score from one week before childbirth to the 1-3 day postpartum, however the RMC plus PD group had lower the mean EPDS score than the RMC group only. In addition, subjects in the RMC plus PD group showed the average EPDS score on the 11th day of postpartum decreased compared to the previous measurement time, whereas in the subjects in the RMC group only did not decrease on average.

Decreasing of the mean EPDS scores may be related to improving the ability of mothers to adapt to postpartum changes, however, the results of this study reveal the fact that the decrease in SDP is accelerated or corrected by the addition of PD in RMC. It was proven that the RMC plus PD group showed a lower mean EPDS score compared with the RMC group only, so it can be concluded there is difference of mean score of EPDS from every measurement time. A person with anxiety becomes anxious and agitated, triggers a negative perception of stressor and is associated with an increased risk of postpartum depression syndrome, but the mother who is able to adapt to changes from the prenatal stage to the postpartum stage becomes less risk for postpartum depression²⁷.

Some risk factors for postpartum depression syndromes are physical health problems, parental transition, social relationships, personality and psychological history, child health, lack of social support, living stress conditions and the accumulation of problems or difficulties of pregnancy, childbirth and childbirth²⁸⁻³².

In this study, external factors affecting postpartum depression syndromes such as single parent and maternal or infant complications in pregnancy, labor and childbirth have been controlled by determining inclusion, exclusion and drop out criteria and homogeneity in both groups. In addition, the EPDS score as the postpartum depression syndrome indicator of both groups was declared homogeneous before the intervention began. Thus, the decrease of postpartum depression syndromes in the intervention group was more influenced by additional PD, as evidenced by the mean score of EPDS in the RMC plus PD group lower than the mean in the RMC group only (figure 2).

Postpartum depression syndrome may be prevented by PD as part of holistic midwifery care; by optimizing the spiritual element and developing the resources already owned by the subjects. Thus the results of this study prove that RMC plus PD further decreases postpartum depression syndrome compared with routine midwifery care only, with indicators of EPDS score.

The PD begins with a few deep breaths to make the subjects relaxed. This situation is necessary for the subjects to alpha brainwaves that is when it is in relaxation and makes it easy to absorb information and live quickly reading *dzikir* along with and its meaning. Approaches using belief and spirituality are identified as relevant sources during pregnancy and childbirth in dealing with stress, difficult situations and insecurities³³ and are important feelings in creating positive inner feelings along with self-actualization as a woman, as a phase of spiritual transition in the natural life cycle, which plays an important role in the development of the emotional, spiritual and psychological aspects of women³⁴.

The limitations of this study were the PSS and EPDS questionnaires have not been tested psychometrically and in this study used Indonesian version.

CONCLUSION

The routine midwifery care plus psychoeducation *dhikr* on further reduce perceived stress and postpartum depression syndrome compared with the routine midwifery care only.

The authors would like to thank to the pregnant women as participants and the midwives as facilitators in this research. There is no conflict of interest. The study was funded by self.

Ethical Clearance: Ethical permission was obtained from Research Ethics Committee at Faculty of Medicine Diponegoro University. All subjects signed Informed Consent in Bahasa Indonesia.

REFERENCES

1. Schetter CD, Tanner L, Angeles L. Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. *Curr Opin Psychiatry*. 2015;25(2):141–8.
2. O’Keane V, Lightman S, Patrick K, Marsh M, Papadopoulos AS, Pawlby S, et al. Changes in

the maternal hypothalamic-pituitary-adrenal axis during the early puerperium may be related to the postpartum “blues.” *J Neuroendocrinol*. 2011;23(11):1149–55.

3. Sharma V, Sharma P. Postpartum Depression: Diagnostic and Treatment Issues. *J Obstet Gynaecol Canada*. 2012;34(5):436–42.
4. Watanabe M, Wada K, Sakata Y, Aratake Y, Kato N, Ohta H, et al. Maternity blues as predictor of postpartum depression: a prospective cohort study among Japanese women. *J Psychosom Obstet Gynaecol*. 2008;29(3):206–12.
5. Anderson G, Maes M. Postpartum depression: psychoneuroimmunological underpinnings and treatment. *Neuropsychiatr Dis Treat*. 2013;9:277–87.
6. Nam JY, Choi Y, Kim J, Cho KH, Park EC. The synergistic effect of breastfeeding discontinuation and cesarean section delivery on postpartum depression: A nationwide population-based cohort study in Korea. *J Affect Disord*. 2017;218(March):53–8.
7. Farías-Antúnez S, Xavier MO, Santos IS. Effect of maternal postpartum depression on offspring’s growth. *J Affect Disord*. 2018;228(November 2017):143–52.
8. Zlotnick C, Tzilos G, Miller I, Seifer R, Stout R. Randomized controlled trial to prevent Postpartum depression in mothers on public assistance. *J Affect Disord*. 2015;189:263–8.
9. Cho HJ, Kwon JH, Lee JJ. Antenatal cognitive-behavioral therapy for prevention of postpartum depression: a pilot study. *Yonsei Med J*. 2008;49(4):553–62.
10. Tandon S., Leis JA, Mendelson T, Perry D., Kemp K. Six-month outcomes from a randomized controlled trial to prevent perinatal depression in low-income home visiting clients. *Matern Child Heal J*. 2014;18(4):873–81.
11. Shorey S, Chan S, Seng C, Hong-Gu H. The effectiveness of a postnatal psychoeducation program on self-efficacy, social support and postnatal depression among primiparas: A randomised controlled trial. *J Chem Inf Model*. 2013;53(9):1689–99.

12. Toohill J, Fenwick J, Gamble J, Creedy DK, Buist A, Turkstra E, et al. A Randomized Controlled Trial of a Psycho-Education Intervention by Midwives in Reducing Childbirth Fear in Pregnant Women. *Birth*. 2014;41(4):384–94.
13. Top ED, Karaçam Z. Effectiveness of Structured Education in Reduction of Postpartum Depression Scores : A Quasi-Experimental Study. *Arch Psychiatr Nurs*. 2016;30(3):356–62.
14. Fenwick J, Toohill J, Gamble J, Creedy DK, Buist A, Turkstra E, et al. Effects of a midwife psycho-education intervention to reduce childbirth fear on women's birth outcomes and postpartum psychological wellbeing. *BMC Pregnancy Childbirth*. 2015;15(1):284.
15. Rowe HJ, Fisher JRW. Development of a universal psycho-educational intervention to prevent common postpartum mental disorders in primiparous women: a multiple method approach. *BMC Public Health*. 2010;10(100968562):499–513.
16. Callister LC, Khalaf I. Spirituality in childbearing women. *J Perinat Educ*. 2010;19(2):16–24.
17. Mann JR, McKeown RE, Bacon J, Vesselinov R, Bush F. Do antenatal religious and spiritual factors impact the risk of postpartum depressive symptoms? *J Womens Health (Larchmt)*. 2008;17(5):745–55.
18. Cohen S, Kamarck T, Mermelstein R. A Global Measure of Perceived Stress. Vol. 24, *Journal of Health and Social Behavior*. 1983. p. 385–96.
19. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1987;150(6):782–6.
20. Department of Health Government of Western Australia. Using the Edinburgh Postnatal Depression Scale (EPDS), Translated into languages other than English. *Child Fam Emot well-being*. 2006;1–271.
21. Akbarzadeh M, Mokhtaryan T, Amooee S, Moshfeghy Z, Zare N. Investigation of the effect of religious doctrines on religious knowledge and attitude and postpartum blues in primiparous women. *Iran J Nurs Midwifery Res*. 2015;20(5):570–6.
22. Cheadle AC., Schetter CD, Lanzi RG, Vance MR, Sahadeo LS, Shalowitz M. Spiritual and Religious Resources in African American Women: Protection from Depressive Symptoms Following Birth. *Clin Psychol Sci*. 2015;3(2):283–91.
23. Lobel M, Dunkel Schetter C. Pregnancy and Prenatal Stress. *Encycl Ment Heal*. 2014;3(1):1–47.
24. Liou S, Wang P, Cheng C. Longitudinal study of perinatal maternal stress, depressive symptoms and anxiety. *Midwifery*. 2014;30(6):795–801.
25. Woods-Giscombé CL, Lobel M, Zimmer C, Wiley-Cené C, Corbie-Smith G. Whose Stress is Making Me Sick? Network Stress and Health in African American Women. 2014;
26. Christian LM. Psychoneuroimmunology in pregnancy: Immune pathways linking stress with maternal health, adverse birth outcomes, and fetal development. *Neurosci Biobehav Rev*. 2012;36(1):350–61.
27. Ritter C, Hobfoll SE, Lavin J, Cameron RP, Hulsizer MR. Stress, psychosocial resources, and depressive symptomatology during pregnancy in low-income, inner-city women. *Heal Psychol*. 2000;19(6):576–85.
28. Habel C, Feeley N, Hayton B, Bell L, Zekowitz P. Causes of women's postpartum depression symptoms: Men's and women's perceptions. *Midwifery*. 2015;31(7):728–34.
29. Lancaster CA, Gold KJ, Flynn HA, Yoo H, Marcus SM, Davis MM. Risk factors for depressive symptoms during pregnancy: a systematic review. *Am J Obstet Gynecol*. 2010;202(1):5–14.
30. Roomruangwong C, Withayavanitchai S, Maes M. Antenatal and postnatal risk factors of postpartum depression symptoms in Thai women: A case-control study. *Sex Reprod Healthc*. 2016;10:25–31.
31. Cheng CY, Pickler RH. Perinatal stress, fatigue, depressive symptoms, and immune modulation in late pregnancy and one month postpartum. *ScientificWorldJournal*. 2014;2014:652630.
32. Corwin E, Arbour M. Postpartum fatigue and evidence-based interventions. *MCN Am J Matern Child Nurs*. 2007;32(4):215–20.
33. Büssing A, Waßermann U, Christian N, Längler A, Thiel M. Spiritual needs of mothers with sick new born or premature infants — A cross sectional survey among German mothers. *Women and Birth*. 2017;
34. Taghizadeh Z, Ebadi A, Dehghani M, Gharacheh M, Yadollahi P. A time for psycho-spiritual transcendence: The experiences of Iranian women of pain during childbirth. *Women and Birth*. 2017;

Reduction Sugar of Tuber Paste Flour Additional α -Amylase from *Lc. mesenteroides* EN17-11 and *Fr. fructosus* EN17-20 to Protect People from Diabetes Mellitus

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ABSTRACT

Local tuber flour as wheat flour alternative can be used to produce food with low sugar which good to protect people from Diabetes Mellitus. To know that flour carbohydrate degradation in order to produce tuber flour with low sugar, reduction sugar of tuber paste flour additional α -amylase from *Leuconostoc mesenteroides* EN17-11 and *Fructobacillus fructosus* EN17-20 to protect people from Diabetes Mellitus were researched. Flour used were cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*) and yam taro (*Colocasia esculenta*) with wheat (*Triticum*) as comparison. The crude α -amylase was characterized. The detection of α -amylase activities and reduction sugar contents used 3,5-Dinitrosalicylic Acid (DNS) methods. Data were analyzed with three replicates. The research results showed that optimum activity of *Lc. mesenteroides* EN17-11 α -amylase was reached at 30°C, pH: 4.5; while that *Fr. fructosus* EN17-20. was 60°C, pH 7.0. In 60 minutes incubation time, *Lc. mesenteroides* EN17-11 α -amylase stability was reached at 25-40°C, pH: 4.5-5.0; while that *Fr. fructosus* EN17-20 was at 40-70°C, pH 5.0-7.0. Reduction sugar contents increase of cassava, sweet potato and yam taro paste flour additional *Lc. mesenteroides* EN17-11 α -amylase were sequently 1.27%, 40.35% and 3.90%; while that *Fr. fructosus* EN17-20 were 34.44%, 52.22% and 55.27%; with that wheat additional *Lc. mesenteroides* EN17-11 was 17.40% and *Fr. fructosus* EN17-20 was 44.53%. Based on the result, it is concluded that the treatment may reduce sugar on cassava and yam taro flour. The low sugar flour might be an alternative diet for diabetic persons.

Keywords: α -amylase, reduction sugar, *Lc. mesenteroides* EN17-11, *Fr. fructosus* EN17-20, local tuber paste flour

INTRODUCTION

Indonesia had high people with Diabetes Mellitus, ^[1] so low sugar food was needed to protect people from that disease. Low sugar food can be made from local tuber flour as wheat flour alternative. Tuber flour in powder can be used as low sugar food, such as tuber paste flour. Tuber paste flour additional α -amylase

improve quality of that flour and the flour are more to be digested. Tuber local flour, such as cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*) and yam taro (*Colocasia esculenta*) were made tuber pasta flour and the other tuber food products, mainly baby food, bread and snack.

Tuber pasre flour with low reduction sugar was good for people to protect from Diabetes Mellitus disease. Some species of lactic acid bacteria (LAB) produced α -amylase, such as *L. fermentum* and *L. plantarum*. Some species of LAB reported producing α -amylase were *L. manihotivorans* LMG 18010T, *L. plantarum*, and *L. fermentum*.^[2,3] The quality increase of flour was conducted by addition of α -amylase to the flour.^[4,5,6] Flour additional α -amylase produced glucose and

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maltose due to catalyzing amylose in the flour by the added α -amylase. [5,6,7] In human ulcer, flour additional α -amylase from LAB were more digestible due to hydrolyzing amylose to glucose and maltose. [4,6,7]

The flour type and the concentration of α -amylase used affected the glucose and maltose contents in the flour additional α -amylase. [4,5,6] The different amylose concentration between those flour depend on the tuber flour different type. [4,5,6] The different amylose hydrolysis by α -amylase to glucose and maltose was caused by the α -amylase different concentration. [4,6,7]

Glucose as one of reduction sugar was generally higher concentration produced than maltose in flour additional α -amylase. [5,6,7] Beside, LAB species of *Leuconostoc mesenteroides* and *Fructobacillus fructosus* producing α -amylase which have potency to produce reduction sugar in local tuber flour haven't been known yet. This research focused in reduction sugar of tuber paste flour additional α -amylase from *Leuconostoc mesenteroides* EN17-11 and *Fructobacillus fructosus* EN17-20 for people with Diabet Mellitus.

MATERIALS AND METHOD

Sub-culture *Lc. mesenteroides* EN17-11 and *Fr. fructosus* EN17-20: *Lc mesenteroides* EN17-11 and *Fr. fructosus* EN17-20 as indigenous lactic acid bacteria (LAB) identified molecularly and found from traditional fermented nira, Enggano Island, collected Research Center for Biology were sub-cultured in *MRS (de Mann Rogosa Sharpe)* media which consist of 0.8% beef extract (Himedia RM002-500G), 1% peptone (Bacto TM211677), 0.4% yeast extract (Bacto TM 212750), 1% glucose (Merck 1.08337.1000), 0.5% natrium acetate (Merck 1.06268.0250), 0.2% triamonium citrate (Sigma A1332-100G), 0.02% magnesium sulphate monohidrate (Merck 1.05886.0500), 0.005% mangan sulphate tetrahidrate (Merck 1.02786.1000), 0.2% dinatrium hydrogen phosphate dihydrate (Merck 1.06580.0500) 0.1%, and tween 80 (Merck 8.22187.0500). The LAB sub-cultured were then incubated at 37°C (Isuzu incubator Himawari).

Tube Paste Flour: Tube paste flour was made from tube flour of cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*) and yam taro (*Colocasia esculenta*) with wheat (*Triticum*) as comparison. The tube flour was heated at 70°C up to formed paste flour

Carbohydrate Degradation of Wheat and Local Tube Paste Flour Additional α -Amylase: The 5 gr of each tube flour (cassava, sweet potato, yam taro, and wheat) was soluted in 50 mL aquadest, heated, homogenized by thermomagnetic stirrer (Sibata MGH-320) up to 70°C up to formed paste flour, added 1U/mL each LAB crude amylase, and incubated by rotary shaker (V-Tech VTRS-1) at 37°C for 24 hours.

α -Amylase Production^[2]: Each of LAB suspension was inoculated into 50 mL MRSB media and incubated at 37°C for 24 hours in incubator (Isuzu incubator Himawari). Each of LAB crude α -amylase was found by growing 2% that bacteria into 25 mL sterilized MRSB media glucose (Merck 1.08337.1000) was changed by 2% soluble starch (Merck 1.01252.0100) with pH medium: 6, incubated for 24 hours at 37°C by incubator (Isuzu incubator Himawari), centrifuged at 9000 rpm for 10 minutes at 4 °C (Kubota 5910). Each crude α -amylase from those bacteria was then tested its α -amylase activity.

α -Amylase Activity^[8,9]: α -Amylase activity was measured by DNS method. The 50 μ l crude α -amylase from each of those bacteria was added into 50 μ l 1% soluble starch (Merck 1.01252.0100) in pH 5.0-8.0, homogenized by vortex (Sibata MGH-320), incubated in waterbath (Memmert) at 35°C-65°C for 10 minutes, added 100 μ l DNS (Sigma D0550-100G), vortexed, heated at 100°C for 5 minutes, added 800 μ l aquades, and revortexed. After cooling solution, the absorbance was read at λ 540 by spectrophotometer UV-Vis (Shimadzu UV-1700 Pharmaspec). One unit activity of amylase from each of those bacteria was defined as the amount of enzyme in which its reaction resulted product which equal 1 μ mol glucose per minute at measured condition.

Optimization of α -Amylase Activity in Various pH and Temperature^[10]: Optimization of α -amylase from both LAB in various pH detected by pH meter (Horiba pH 1100 Scientific), at 10 minutes" incubation times were conducted at pH: 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, and 7.5. The highest α -amylase activity at certain pH indicated α -amylase optimum activity. Optimization of α -amylase from those bacteria in various temperatures at 10 minutes" incubation times were conducted at 25, 30, 35, 40, 45, 50, 55, 60, 65 and 70°C. The highest α -amylase activity of each from those bacteria at certain temperature indicated α -amylase optimum activity.

α -Amylase Stability in Various pH and Temperature^[11]: α -Amylase stability from both LAB were conducted

by measuring α-amylase relative activities at pH: 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, and 7.5 with 60 minutes” incubation times. The ≥ 50% α-amylase relative activity was defined as the α-amylase stability at certain pH range. Those α-amylase stabilities were conducted by measuring α-amylase relative activities at 25, 30, 35, 40, 45, 50, 55, 60, 65 and 70°C. The ≥ 50% α-amylase relative activity was defined as α-amylase stability at certain temperature range.

Reduction Sugar ^[12,13]: Reduction sugar was measured by DNS method. Reduction sugar (%) was measured by standard curve equation of glucose solution. Carbohydrate degradation in tuber flour of cassava, sweet potato, yam taro and wheat (with and without addition of each LAB crude α-amylase) was centrifuged at 9000 rpm for 10 minutes at 4°C. Then, 100 µl the treated tuber flour was added 100 µl DNS, vortexed, heated at 100°C for 5 minutes, added 800 µl aquadest, and revortexed. The solution was then leaved at a minute, and absorbance was read at λ540 by spectrophotometer UV-Vis (Shimadzu UV-1700 Pharmaspec).

Reduction Sugar Concentration (%) = [glucose concentration (mg/mL)/sample weight (mg)] × Volume of reaction total (mL) × 100%(1)

DATA ANALYSIS

Data were analyzed by three replicates every treatments. Mean data were shown in every Table of the treatments results” Tables.

RESULTS AND DISCUSSION

The research results show that *Lc. mesenteroides* EN17-11 α-amylase activities in pH: 4.0-7.5 were in the range 0.101-2.325 U/mL with the optimum activity was reached at pH: 4.5 (2.325 U/mL), and in temperature: 25-70°C were 0.166-1.098 U/mL with the optimum activity was at 30°C (1.098 U/mL) (Table 1-2); while that of *Fr. fructosus* EN17-20 α-amylase in pH: 4.0-7.5 were in the range 0.336-0.0929 U/mL with optimum activity was at pH 7.0 (0.0929 U/mL), and in temperature: 25-70°C were 0.0192- 0.2381 (U/mL) with optimum activity was 60°C (0.2381 U/mL) (Table 1-2).

The different optimum α-amylase activity at a certain pH and temperature between α-amylase from *Lc. mesenteroides* EN17-11 and *Fr. fructosus* EN17-20

was caused the different species of bacteria producing α-amylase between those bacteria. It has been reported that the different optimum α-amylase activity from two lactic acid bacteria may have resulted from the different species of lactic acid bacteria producing α-amylase. ^[2,3,14]

Table 1: α-Amylase Activities of *Lc. mesenteroides* EN 17-11 and *Fr. fructosis* EN 17-20 in Various pH

pH	α-Amylase Activity (U/mL)	
	<i>Lc. mesenteroides</i> EN 17-11	<i>Fr. fructosis</i> EN 17-20
4.0	2.000	0.0336
4.5	2.325	0.0405
5.0	2.222	0.0447
5.5	0.555	0.0489
6.0	0.526	0.0558
6.5	0.147	0.0753
7.0	0.118	0.0929
7.5	0.101	0.0750

Note: *: mean data in three replicates

Table 2: α-Amylase Activities of *Lc. mesenteroides* EN 17-11 and *Fr. fructosis* EN 17-20 in Various Temperature

Temperatures	α-Amylase Activity (U/mL)	
	<i>Lc. mesenteroides</i> EN 17-11	<i>Fr. fructosis</i> EN 17-20
25	0.819	0.0192
30	1.098	0.0209
40	0781	0.0226
45	0.685	0.1192
50	0.588	0.1605
55	0.491	0.1925
60	0.395	0.2381
65	0.236	0.1704
70	0.166	0.1026

Note: *: mean data in three replicates

The *Lc mesenteroides* EN17-11 α-amylase activities in 60 minutes” incubation times in pH: 4.0-7.5 were in range 0.327-2.000 U/mL and the α-amylase relative activities were in range 16.35-100% (Table 3); while that temperature: 25-70°C were 0.210-1.000 U/mL and relative activities were in 16.35-100% (Table 4). The *Lc mesenteroides* EN17-11 α-amylase stabilities with ≥ 50% α-amylase relative activities in 60 minutes”

incubation times were reached at pH in range of 4.5-5.0 (1.111-2.000 U/mL) with relative activities were 55.55-100% (Table 3), while that at temperature in 25-40°C (0.500-1.000 U/mL) with relative activities were 50.00-100.00% (Table 4).

The *Fr. fructosus* EN17-20 α -amylase activities at pH: 4.0-7.5 in 60 minutes” incubation time were in range 0.0055-0.0133 U/mL with relative activities were 41.35-100% (Tabel 3), while that at temperature: 25-

70°C were 0.0027-0.0151 U/mL with the activities were 17.88-100% (Table 4).

The *Fr. fructosus* EN17-20 α -amylase stabilities with relative activity \geq 50% in 60 minutes” incubation times were reached at pH in range of 5.0-7.0 (0.0071-0.0133 U/mL) with relative activities were 53.38-100% (Table 3), while that at temperature in 40-70°C were 0.0087-0.0151U/mL with relative activities were 57.62-100% (Table 4)

Table 3: *Lc. mesenteroides* EN 17-11 and *Fr. fructosus* EN 17-20 α -Amylase Relative Activities in Various pH in 60 Minutes Incubation

pH	<i>Lc. mesenteroides</i> EN 17-11		<i>Fr. fructosus</i> EN 17-20	
	α -Amylase activities (U/mL)	Relative activities (%)	α -Amylase activities (U/mL)	Relative activities (%)
4.0	0.769	38.45	0.0055	41.35
4.5	2.000	100.00	0.0063	47.37
5.0	1.111	55.55	0.0071	53.38
5.5	0.769	38.45	0.0074	55.64
6.0	0.588	29.40	0.0076	57.14
6.5	0.400	20.00	0.0115	86.47
7.0	0.383	19.15	0.0133	100.00
7.5	0.327	16.35	0.0121	90.98

Note: *: mean data in three replicates

Table 4: *Lc. mesenteroides* EN 17-11 and *Fr. fructosus* EN 17-20 α -Amylase Relative Activities in Various Temperatures in 60 Minutes Incubation

Temperatures	<i>Lc. mesenteroides</i> EN 17-11		<i>Fr. fructosus</i> EN 17-20	
	α -Amylase activities (U/mL)	Relative activities (%)	α -Amylase activities (U/mL)	Relative activities (%)
25	0.714	71.40	0.0027	17.88
30	1.000	100.00	0.0040	26.49
35	0.750	75.00	0.0063	41.72
40	0.500	50.00	0.0087	57.62
45	-	-	0.0111	73.51
50	0.454	45.40	0.0116	76.82
55	0.408	40.80	0.0138	91.39
60	0.362	36.20	0.0151	100.00
65	0.237	23.70	0.0117	77.48
70	0.210	21.00	0.0098	64.90

Note: *: mean data in three replicates

The different α -amylase stabilities in certain pH and temperature range between α -amylase from *Lc. mesenteroides* EN17-11 and *Fr. fructosus* EN17-20 were caused the different optimum α -amylase activity from

two species of those bacteria. It has been reported that the different optimum α -amylase activity from two lactic acid bacteria species may have resulted from the different species of lactic acid bacteria producing α -amylase.^[3,7,9]

The reduction sugar contents“ increases of the cassava, sweet potato, and yam taro paste flour additional *Lc. mesenteroides* EN17-11 α -amylase were sequently 1.27%, 40.35% and 3.90% (Table 5), while that *Fr. fructosus* EN17-20 α -amylase were 34.44%, 52.22% and 55.27%; (Table 6). The reduction sugar content increase of wheat paste flour additional *Lc. mesenteroides* EN17-11 was 17.40% (Table 5), while that *Fr. fructosus* EN17-20 α -amylase was 44.53% (Table 6).

The reduction sugar contents” increases of the tuber paste flour additional *Lc mesenteroides* EN17-11 α -amylase of cassava (1.27%) and yam taro (3.90%) were lower than that wheat paste flour (40.35%) (Table 9), and the reduction sugar contents increases of the cassava paste flour additional *Fr. fructosus* EN17-20 α -amylase (34.44%) were lower than that wheat paste flour (44.53%).

The lower reduction sugar contents” increases from the cassava and yam taro paste flour additional *Lc mesenteroides* EN17-11 α -amylase and that from the cassava additional *Fr. fructosus* EN17-20 than that wheat paste flour were because the carbohydrate degradation of the cassava and yam taro flour (additional *Lc mesenteroides* EN17-11 α -amylase) and that of cassava flour (additional *Fr. fructosus* EN17-20 α -amylase) were lower than that of wheat flour. It has been reported that the tuber flour reduction sugar resulted due to carbohydrate degradation of tuber flour.was affected by lactic acid bacteria amylase activities in that carbohydrate. [4,5,7]

Table 5: Reduction Sugar Contents of Tuber Pasta Flour With and Without Addition of *Lc. mesenteroides* EN 17-11 α -Amylase

Paste flour type	Reduction sugar (%)	Reduction sugar increase (%)
Cassava	0.130	1.27
Control	0.128	
Sweet potato	0.587	40.35
Control	0.350	
Yam Taro	0.437	3.90
Control	0.420	
Wheat	0.440	17.40
Control	0.363	

Note: *: mean data in three replicates

Table 6: Reduction Sugar Contents of Tuber Pasta Flour With and Without Addition of *Fr. fructosus* EN17-20 α -Amylase

Paste flour type	Reduction sugar (%)	Reduction sugar increase (%)
Cassava	0.241	34.44
Control	0.158	
Sweet potato	0.722	52.22
Control	0.345	
Yam Taro	0.237	55.27
Control	0.106	
Wheat	0.256	44.53
Control	0.142	

Note: *: mean data in three replicates

Based on those reduction sugar contents increase in the treated tuber paste flour, it is concluded that cassava and yam taro paste flour additional *Lc. mesenteroides* EN17-11 α -amylase with the 1.27% and 3.90% reduction sugar increase, respectively, and cassava paste flour additional *Fr. fructosus* EN17-20 α -amylase with the 34.44% reduction sugar increase were the tuber paste flour with low reduction sugar.

It is recommended that this low reduction sugar tuber paste flour can be consumed as one of low sugar food, in order to the society were protected from Diabetes Mellitus Diseases.

CONCLUSION

The research showed the addition of α -amilase EN17-11 and EN17-20 resulted in sugar reduction. There was difference in optimum condition between both treatment to reduce sugar in term of pH and temperature. However, based on the reduction of sugar content in the treated tuber paste flour, it is suggested that cassava and yam taro with low sugar might be used as an alternative diet for diabetic persons. In the long term goal, the use of low sugar tuber paste flour is also expected to protect people from diabetes mellitus.

ACKNOWLEDGMENT

The Authors thank DIPA Priority Project of Aplied Bioresources, Research Center for Biology, Deputy of Life Sciences, Indonesian Institute of Sciences for funding this research, and to Desy Septiani for her assistance in Laboratory during this research.

Ethical Clearance: This study was conducted according to the guidelines laid down in the Declaration of Helsinki

Conflict of Interest: This research wasn't have conflict of interest

REFERENCES

1. Fitrullah, Rousdy A. Effectiveness of Acupressure at the Zusanli (ST-36) Acupoint as a Comfortable Treatment for Diabetes Mellitus: A Pilot Study in Indonesia. *J Acupunct Meridian Stud.* 2017;10: 96-103.
2. Tallapragada P, Bhargavi R, Priyanka PR, Niranjana NR, Pavitra PV. Screening of potential probiotic lactic acid bacteria and production of amylase and its partial purification. *J Gen Eng and Biotech*, 2018, 16(2018):357-63. <https://doi.org/10.1016/j.jgeb.2018.03.005>.
3. do Esperito-Santo AP, Mouquet-Rivier C, Humblot C, Cazevieuille C, Icard Verniere C, Socrol C, et al. Influence of cofermentation by amylolytic *Lactobacillus* strains and probiotic bacteria on the fermentation process, viscosity and microstructure of gruels made of rice, soy milk and passion fruit fiber. *Food Res Int*, 2014; 57:104-113.
4. Savitri T, Bhalla C. Characterization of bhatooru, a traditional fermented food of Himachal Pradesh: microbiological and biochemical aspects. *Biotech*, 2013;3:247-54.
5. Songré-Ouattara LT, Mouquet-Rivier C, Icard-Vernière C, Rochette L, Diawara B, Guyot JP. Potential of amylolytic lactic acid bacteria to replace the use of malt for partial starch hydrolysis to produce African fermented pearl millet gruel fortified with groundnut. *Int J Food Microb*, 2009;130(3): 258-64.
6. Songré-Ouattara LT, Mouquet-Rivier C, Icard-Vernière C, Humblot C, Diawara H, Guyot JP. Enzyme activities of lactic acid bacteria from a pearl millet fermented gruel (ben-saalga) of functional interest in nutrition. *Int J Food Microb*, 2008;128(2):395-400.
7. Sharma A, Satyanarayana T. Microbial acid-stable-amylases: Characteristics, genetic engineering and applications. *Proc Biochem*, 2013;48: 201–11.
8. Bernfeld P. *Methods in Enzymology*. Scientific Research 1955;1:149-158.
9. Kanpiengjai A, Lumyong S, Nguyen HT, Haltrich D. Microorganisms and α -amylase: a concise review. *J Mol Cat B-Enzym*, 2015;120:1-8.
10. Singh K, Srivastava G, Talat M, Srivastava ON, Kayastha AM. α -Amylase immobilization onto functionalized graphene nanosheets as scaffolds: Its characterization, kinetics and potential applications in starch based industries. *Biochem. and Bioph Reports*, 2015;3:18–25.
11. Wang J, Li J, Lu F. Molecular cloning and biochemical characterization of an α -amylase family from *Aspergillus niger*. *Electr J Biotech*, 2018;32:56-62.
12. Miller GL. Use of Dinitrosalicylic Acid Reagent for Determination of Reducing Sugar. *J Analyt. Chem*, 1959;31:426-8.
13. Moradi M, Shariati P, Tabandeh F, Yakhcali B, Khaniki GB. Screening and isolation of powerful amylolytic bacterial strains. *Int J Curr Microbiol Appl Sci*, 2014;3(2):758-68.
14. Santoyo MC, Loiseau G, Sanoja RR, Guyot JP. Study of starch fermentation at low pH by *Lactobacillus fermentum* Ogi E1 reveals uncoupling between growth and α -amylase production at pH 4.0. *Int J Food Microb*, 2013;80:77– 87.

The Impact of Counseling on the Improvement of Nutritional Knowledge and Physical Activities on Women Prisoners (A Study at Women Penitentiary Institution Class II A Semarang)

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ABSTRACT

One of the factors that cause health problems is the lack of information about nutrition and physical activity. The study aims to determine the effect of counseling on changes in nutritional knowledge and physical activity on women prisoners in the Women Penitentiary Institution Class II A Semarang. This study used quasi-experimental with one group pre-test and post-test design. Intervention in the form of one-time counseling. Pre test and post test are done in one day. The sampling technique was using simple random sampling. The subjects were 50 women prisoners from common criminal offence cases. Data was analyzed by using Wilcoxon Signed Ranks Test. The results showed that most of the subjects had high school education level (80%). The mean of age, body weight, body height and body fat percentage were 34.5 ± 8.4 years old, 61.3 ± 9.0 kg, 154.4 ± 4.5 cm and $33.7 \pm 4.7\%$. Body Mass Index of 44% subjects were type I obesity. Mid Upper Arm Circumference (MUAC) of 94% subjects were normal. The median of knowledge score before counseling were 19 (15-21) and knowledge score after counseling were 20 (15-25). There was an average difference of knowledge of the subjects before and after intervention ($p = 0.003$). There was a correlation between education and knowledge of the subjects ($p = 0.017$). It is recommended for the penitentiary administrators to give education about nutrition and physical activity for the prisoners to increase their knowledge.

Keywords: *Counseling, Nutritional Knowledge, Physical Activities Knowledge, Women Prisoner*

INTRODUCTION

Factors that cause health problems are one's ignorance as well as the lack of information about nutrition and physical activity. Education concerning on nutrition and physical activity are planned efforts to influence others either individuals, groups, or communities so that they do what is expected by educational behavior.¹ the provision of education in the form of certain material

will provide new knowledge for someone. It is expected that if someone has knowledge related to good nutrition and physical activity, it will have an impact on good behavior as well.²

One of the educational media related to nutrition and physical activity for inmates is giving counseling by using *powerpoint* medium, this is according to the reason that oral communication can change one's practice to be better. Providing counseling can also speed up the level of one's understanding, so it is easier to change one's attitude since comprehension or knowledge is an important point in changing one's attitude and actions.³

Correctional Facility is a technical service unit that is responsible for looking after and educate the prisoners under the Directorate General of Correctional Institutions of the Ministry of Justice and Human Rights. Prisoners are individuals who commit crime and have

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carried out the trial and have been convicted of criminal penalty.⁴ Women Penitentiary Institution Class II A is a particular prison for women prisoners located in Mgr. Sugiyopranoto Street Number 59.

Based on the background above, the researchers are interested to find out the impact of education provision with counseling method on changes of nutritional knowledge and physical activity of women prisoners in the Women Penitentiary Institution Class II A Semarang.

MATERIALS AND METHOD

The type of this research is *quasi-experimental* with *one group pre-test and post-test design*. The sampling technique used was simple random sampling. Population size was 370 women prisoners. The subjects of the study were 50 women prisoners from the cases of domestic violence, murder, theft, torture, embezzlement, *trafficking*, banking, child protection law, corruption, fraud, taxation, and employment. The independent variables in this research were the provision of nutrition-related education and physical activity with counseling methods, while the dependent variable was the change in prisoner's knowledge.

Data analysis was conducted univariately to know the characteristics of respondents including education level, age, body weight, body height, Body Mass Index (BMI), Mid Upper Arm Circumference (MUAC) and body fat

percentage. The data normality test used *Kolmogorov-Smirnov* and relationship test used *Wilcoxon Signed Ranks Test*. The instruments used for the research were:

1. **Education level:** Direct interviews using questionnaires.
2. **Anthropometrics**
 - a. Body weight was measured using a digital weight scale with the accuracy of 0.001 kg.
 - b. Body height was measured by *microtoise* with the accuracy of 0.1 cm.
 - c. Mid Upper Arm Circumference (MUAC) was measured using MUAC tape with the accuracy of 0.1 cm.
 - d. Body fat percentage was measured using *Bioelectrical Impedance Analysis* (BIA) with the accuracy of 0.1%.
3. **Knowledge:** Structured questionnaires that have been piloted and viewed through *pre-test* and *post-test*.

RESULTS

Frequency distribution of respondents' characteristics based on education level, age, body weight, body height, Body Mass Index (BMI), Mid Upper Arm Circumference (MUAC) and body fat percentage can be seen in Table 1.

Table 1: Frequency Distribution of Respondents' Characteristics

Variable	%	Mean	SD	Min	Max
Education level					
Elementary	12	-	-	-	-
Junior High School	4	-	-	-	-
High School	80	-	-	-	-
Diploma	4	-	-	-	-
Age (years)	-	34,5	8,4	15	51
Body weight (kg)	-	61,3	9,0	44,8	85,4
Body height (cm)	-	154,4	4,5	145,4	166,1
BMI (kg/m ²)					
Thin	2	-	-	-	-
Normal	22	25,7	3,6	18,3	36,0
Fat	22				
Type I obesity	44	-	-	-	-
Type II obesity	10	-	-	-	-
MUAC (cm)					
<23,5	6	29,7	3,0	21,5	37,5
≥ 23,5	94				
Body fat (%)	-	33,7	4,7	20,5	46,2

Table 1 shows that 80% of respondents have Senior High School education level. The average age of respondents was 34.5 ± 8.4 years. The average weight of respondents was 61.3 ± 9.0 kg. The average height of respondents was 154.4 ± 4.5 cm. 44% of respondents have Body Mass Index (BMI) classified as obesity type I. The average of Body Mass Index by age was classified as obesity type I by 25.7 ± 3.6 kg/m². 94% of respondents have Mid Upper Arm Circumference (MUAC) ≥ 23.5 cm. The average Mid Upper Arm Circumference (MUAC) as normal at 29.7 ± 3.0 . The average of body fat percentage of the respondents classified as obese of $33.7 \pm 47\%$.

Table 2: Distribution of Respondents' Knowledge Responses

No.	Question	Pre-test		Post-test	
		n	%	n	%
1.	Fried foods/fritters cause disease.	50	100	50	100
2.	Meat, fish, tofu are sources of fiber	6	12	11	22
3.	Eating a variety of foods can fulfill energy needs	36	72	39	78
4.	Cassava, taro, spinach are sources of energy	42	84	42	84
5.	Vegetables, fruits included in fiber sources	41	82	42	84
6.	Healthy food is fast food	38	76	41	82
7.	Vegetables, fruit can boost immunity	49	98	49	98
8.	Colorful vegetables are good for anemia	38	76	45	90
9.	Lack of calcium can cause bone loss so it is needed to drink milk	49	98	50	100
10.	Nutrients the body needs are only carbohydrates and fats	34	68	36	72
11.	The use of salt, salted fish needs to be reduced	45	90	44	88
12.	Drink at least 8 glasses of water per day	49	98	50	100
13.	The benefit of doing exercise is for physical fitness	49	98	50	100
14.	Excessive water consumption can cause dehydration	37	74	44	88
15.	Before doing exercise, you should warm up first	49	98	48	96
16.	Exercise at least 2 hours after eating	31	62	31	62
17.	Nighttime is a good time for sports	41	82	47	94
18.	Vegetables include sources of fat	45	90	46	92
19.	The function of nutrients is for the healthy body	41	82	40	80
20.	Sugar is functioned for bone loss	15	30	23	46
21.	The benefits of exercise are for attitude and movement	25	50	29	58
22.	Exercises should be liked or desirable	42	84	43	86
24.	The lack of vitamin K can cause blood hard to freeze	16	32	25	50
25.	Fruit is a source of vitamins	40	80	39	78

Measurement of knowledge on the questionnaire has a total of 25 questions related to nutrition and physical activity. Each correctly answered question is given a score of 1, while the wrong question is scored 0. Table 2 shows that most of the answers to the questions asked to measure the respondents' knowledge increased after the intervention.

Table 3: Knowledge Differences of Respondents Before and After The Counseling

	Median (min-max)		p
	Before	After	
Knowledge	19 (15-21)	20 (15-25)	0,003 ^a

a. Wilcoxon Signed Ranks Test

Table 3 shows that there are differences in knowledge before and after the counseling related to nutrition and physical activity ($p = 0.003$).

Table 4: Relationship between Education and Knowledge of Respondent

Education level	Knowledge		Total	p
	Less	Good		
Elementary	7	1	8	0,017 ^a
Secondary	16	26	42	
Total	23	27	50	

a. Fisher Exact Test

Table 4 shows that as many as 7 respondents with elementary education have less knowledge and 1 respondent has good knowledge. A total of 16 respondents with secondary education have less knowledge and 26 respondents have good knowledge. There is a relationship between education and knowledge ($p = 0,017$).

DISCUSSIONS

A. Knowledge of Respondents Before and After

Intervention: Provision of intervention in this research is an education in the form of counseling by using the *powerpoint* medium. Materials delivered are related to nutrition and physical activity.

There is a difference of knowledge before and after the provision of intervention, this means that there is an influence of education in the form of counseling at the level of respondent knowledge related to nutrition and physical activity. The difference in knowledge can be known from the median change before the counseling amounted to 19 and increased after education provision of 20.

Education provision in the form of counseling by using *powerpoint* medium is considered quite effective in increasing the knowledge of respondents. This research is in line with the research on "Knowledge increment assessed for three methodologies of teaching physiology" and it states that there is an increase in the mean value of both the knowledge based on the *pre-test* and *post-test* results. Provision of education in the form of audiovisual media resulted in a 26% increase in knowledge compared to didactic methods of 7%.⁵

Knowledge is the result of human sensing or the result of knowing by a person to the object through his or her senses (eyes, ears, nose and so on), but most of it is received through the sense of sight and hearing. The senses that transmit knowledge to the brain are the eyes (approximately 75% - 87%).⁶

The improvement of knowledge scores may cause of various factors such as selection of media. Counseling starts with the interaction with the person to be counseled. Before the actual interaction, it is helpful to determine the information needed and then the formulate question. During the interaction, it is essential to introduce and openly talk in order to get

the confidence of the person to be counseled. Counseling is more effective if information is imparted in a very friendly way avoiding superiority and authority.⁷

The selection to use *powerpoint* medium in counseling is quite effective because it is received through the sense of sight (eyes) of the *powerpoint slides* that are displayed and received through the sense of hearing (ears) of the delivered material. In addition, the question and answer session at the end of the counseling can be used as a recall of knowledge that has been obtained. The level of knowledge can be changed by a combination of various methods. Another factor that may affect knowledge is interest that can be improved through the educational method used. Counseling using *powerpoint* medium can provide interest from the slide shown in the form of images, video, writing, and interesting designs.⁸

B. Relationship between Education and Knowledge:

There is a relationship between education and knowledge ($p=0,017$). This research is in line with the research on "Demographic Variation in Nutrition Knowledge in England".⁹

The level of formal education of the respondent can affect the person's ability to receive information. The higher level of a person's education, the easier one can absorb new information so that knowledge insight will be wider.¹⁰ Therefore, a person with a higher level of education will have better knowledge than someone with a low level of education.

Nutrition education is a significant factor in improving nutrition knowledge, attitudes and practices. It is important to note however, that though nutrition education is an important entry point to teaching nutrition, it is not the only source of nutrition knowledge. Nutrition education is the process by which people gain knowledge, attitudes and skills necessary for developing appropriate dietary habit.¹¹

CONCLUSIONS AND SUGGESTIONS

There is a difference between respondents' knowledge before and after the intervention. There is a relationship between education and knowledge of respondents.

It is expected that penitentiary administrators to provide education about nutrition and physical activity for the prisoners to increase their knowledge.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Ethical clearance was issued by faculty of Public Health, Diponegoro University no. 131/EC/FKM/2018

REFERENCES

1. Contento IR. Nutrition education: linking research, theory, and practice. Jones & Bartlett Publishers; 2010.
2. Shah P, Misra A, Gupta N, Hazra DK, Gupta R, Seth P, et al. Improvement in nutrition-related knowledge and behaviour of urban Asian Indian school children: findings from the 'Medical education for children/Adolescents for Realistic prevention of obesity and diabetes and for healthy ageing' (MARG) intervention study. *British Journal of Nutrition*. 2010; 104(3): 427-36.
3. Wardle J, Parmenter K, Waller J. Nutrition knowledge and food intake. *Appetite*. 2000; 34(3): 269-75.
4. Bureau of International Narcotics and Law Enforcement Affairs (INL). INL guide to corrections assistance. United States: United States Department of State; 2013.
5. Grieve C. Knowledge increment assessed for three methodologies of teaching physiology. *Medical teacher*. 1992; 14(1): 27-32.
6. Maslen, Sarah. Researching in the senses as knowledge. *The Senses and Society Journal*. 2015; 10(1): 52-70.
7. Alimuddin, Ardi M, Rauf B, Dirawan GD. The effect of the counseling method to improvement of knowledge and preserve the environment attitude in the coastal area of Makassar. *International Journal of Applied Environmental Sciences*. 2016; 11(2): 613-22.
8. Bartsch RA, Cobern KM. Effectiveness of PowerPoint presentations in lectures. *Computers & education*. 2003; 41(1): 77-86.
9. Parmenter K, Waller J, Wardle J. Demographic variation in nutrition knowledge in England. *Health education research*. 2000; 15(2): 163-174.
10. Lindau ST, Tomori C, Lyons T, Langseth L, Bennett CL, Garcia P. The association of health literacy with cervical cancer prevention knowledge and health behaviors in a multiethnic cohort of women. *American Journal of Obstetrics & Gynecology*. 2002; 186(5): 938-943.
11. Mbithe D. Promoting nutrition education intervention in rural and urban Primary Schools in Machakos District, Kenya: Focus on school gardens. Unpublished Doctoral Dissertation, Kenyatta University, Nairobi, Kenya; 2008.

Challenges of Universal Access: Health Promotion Strategy on Pillar of Open Defecation Free in Tirto Village, Pekalongan, Central Java, Indonesia

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ABSTRACT

The monitoring data on Community-Based Total Sanitation (CBTS) Indonesia in 2017 shows that 14,322,858 heads of households are still doing the Open Defecation (OD) and in Tirto Village itself, it is registered that there are 49 heads of households who are still doing the Open Defecation. The research was conducted in the coastal areas, Tirto Village, Pekalongan, Central Java, Indonesia from January to March 2016. Qualitative research with case study design aims to explore how advocacy, environmental formation, community empowerment and partnership on pillar of Open Defecation Free (ODF). The study used in-depth interview techniques to the key informants consisting of a manager of public health agency, a staff of public welfare, a public figure, a member of community empowerment institution and a healthcare worker. Triangulation of resources were carried out to sanitation officer and residents. The results of the research are: there is no strict regulation from the village because the regulation is still limited to planning documents, there is already coordination with related sectors, but the scope is not yet broad enough, motivations have not succeeded in changing the behavior of the community and no specific finding about the partnership. Thus, a suitable strategy for achieving universal access is conducting a health promotion strategy reinforced by sustainable partnership and insightful innovation through strict regulation, expanding coordination with relevant sectors, raising public awareness through potentials, and strengthening partnership through network expansion to integration.

Keywords: *Open Defecation, Health Promotion, Universal Access.*

INTRODUCTION

Eligible sanitation is the right of every human being living on earth, they contribute to the behavior of Open Defecation (OD) range the one billionth. In Indonesia, the OD is usually done in the river, and it is perceived as a culture. This issue is regulated in the Community-Based Total Sanitation (CBTS) regulation through the Regulation of the Minister of Health, Number 3, Year 2014. Open Defecation Free (ODF) is the first pillar of CBTS. The regulation is in line with the sixth goal of

Sustainable Development Goals (SDGs) on water and sanitation aspects in order to achieve universal access.

The monitoring data on CBTS in Indonesia in 2017 showed that 14,322,858 heads of households in Indonesia are still doing the OD. Indonesia Health Profile in 2016 showed that the total achievement of a village in Central Java that organized CBTS activities was 60.88%. In 2016, Pekalongan City Health Office stated that out of 47 villages in Pekalongan, there were only 10 urban villages with ODF status, excluding Tirto village. Tirto village is located in Pekalongan, Central Java, Indonesia. The monitoring data of CBTS Indonesia, in 2017 showed that there were 49 heads of households who were still doing the OD in Tirto Village. The phenomenon of OD was dominated by those living by the river. They had latrines, but disposed human waste into the river or without a septic tank. Even the OD done directly in the river and in the garden were still encountered.

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The findings of previous researchers on the behavior of OD became the basis of researchers to continue and prove the condition.¹ Research on the financial program of the Community-Led Total Sanitation (CLTS) in Ghana and Ethiopia shows the cost of each household in CLTS activities reaches \$ 30.34 - \$ 81.56 (Ghana) and \$ 14.15 - \$ 19.2 (Ethiopia). The highest cost allocation refers to training activities. This finding can be useful for considering a policy. Thus, some studies both on the effectiveness and cost efficiency are needed to support the sustainability of the sanitation program.² The costly expense causes the behavior of OD problems are still found in areas with people in the middle and low economic status, like in some areas in Indonesia.³ The OD problems are found in poor households, so special attention is critical.⁴ Globally, governments in some regions allocate funds for public services in sanitation are very limited.⁵ A total of 31 municipalities located in sub-Saharan Africa is allocating more costs for improved water purification than to reduce the behavior of OD. Whereas the water consumed has been contaminated by bacteria.⁶ The behavior of OD exacerbates water and sanitation conditions through the fecal-oral cycle.⁷ Some areas show the amount of children who use the toilet is still very small because they feel more comfortable with the OD.⁸ The failure of CLTS to change, the behavior of OD in Mawuko has resulted in increased prevalence of hookworm infection cases such as *Ascaris lumbricoides*.⁹ Research in the southeastern part of Ethiopia describes personal hygiene as one of the factors that strengthens diarrheal disease, so the prevalence of diarrhea in children under five years old is increasing.¹⁰ *Escherichia coli* contaminates the foods and beverages consumed by children under five years old.¹¹ Environment-based diseases such as diarrhea are very familiar in sub-Saharan Africa. The prevalence of diarrheal disease increases with the increasing of OD habit.¹² Transmission of infectious diseases such as diarrhea can be exacerbated by population density.¹³

Social manipulation during the mobilization of CLTS is essential to raise awareness within a community.¹⁴ By presenting influential actors such as youths, teachers or students can increase high participation in society. The community empowerment strategy for youth is the utilization of local potentials for sustainability of sanitation in a certain area.¹⁵ This study uses the concept of health promotion strategy to explore the condition of ODF in Tirto Village. The implementation of the ODF pillar

should strive for the strategic action of health promotion consisting of advocacy, environmental formation, and community empowerment which are strengthened by partnerships. Researchers have outlined the action into nine research focuses on regulation, commitment, funding, public disposition, facilities, coordination, socialization, training, motivations, and partnerships. Thus, the purpose of the research is to explore this strategic action in Tirto village. These findings are expected to develop the implementation into more robust result in a form of a health promotion strategy reinforced in a sustainable and innovative-minded partnerships to face the challenges of universal access.

METHOD

Location of research is the Tirto Village, Pekalongan, Central Java, and is conducted from January to March 2016. Qualitative research was used by applying the draft case studies. Research informants were seven people in total; key informants consist of a manager of public health agency, a staff of public welfare, a public figure, a member of community empowerment institution and a healthcare worker, as well as the triangulation of sources by a sanitation officer and a citizen. Triangulation of sources was done to keep the quality of the data provided by the key informants during the first stage remain valid. The collection of qualitative data is done through in-depth interviews to the informants. The interview covered the open-questions, the question which researchers composed led to some descriptive answers based on examples or evidences. The main questions included advocacy, environmental formation, community empowerment and partnership. The main questions in term of advocacy included regulation, commitment, funding, public disposition and facilities. The main questions in term of environmental formation included coordination and socialization. While the question about community empowerment included training and motivation as well as the question of partnership. Before doing the interviews with the prospective informants, the research team gave them a letter of willingness in a form of an informed consent. During the interview process, we used guidelines for interviews, recording and documentation tools as well as booknotes for field work. The interviews were conducted more than once, each interview took around 60-90 minutes.

Research analysis was based on content analysis. Researchers transcribed the information from the audio

recordings into a written form based on the order of interview process. Transcribed interviews were also distinguished between key informants and triangulation sources for the sake of quality control of the data. It was conducted by comparing the two answers. After comprehending the audio recording of the interviews, researchers interpreted the meaning of the answer by applying pattern matching format in form of a table containing columns to determine the pattern of answers given by the informant. Those patterns became references in research results, then the patterns were developed and supported by theories, results of the previous researches.

RESULTS AND DISCUSSIONS

Public Profile of Research Location: Pekalongan is located in the coastal areas of the northern island of Java. Tirto is one of the villages located in the Pekalongan, Central Java, with an area around 141.7 kilometers. In addition, Tirto village consists of 8 hamlets and 40 neighborhoods. Generally, people of Tirto work as employees, entrepreneurs, farmers, merchants, and civil servants. The Tirto village has a large river running from south to north. The majority of people in Tirto village defecate in toilet, however, a certain community group, either children, teenagers, adults or elderly people still defecate in the river.

Table 1: Characteristics of The Informant

No.	Jenis Informan Type of Informants	Jenis Kelamin Gender	Kode Informan Informants' Code
1.	Informan Utama 1 Key Informant 1	Laki-laki Man	IU01 IU01
2.	Informan Utama 2 Key Informant 2	Perempuan Woman	IU02 IU02
3.	Informan Utama 3 Key Informant 3	Laki-laki Man	IU03 IU03
4.	Informan Utama 4 Key Informant 4	Laki-laki Man	IU04 IU04
5.	Informan Utama 5 Key Informant 5	Perempuan Woman	IU05 IU05
6.	Informan Triangulasi Triangulation Informant 1	Laki-laki Man	IT01 IT01
7.	Informan Triangulasi 2 Triangulation Informant 2	Perempuan Woman	IT02 IT02

Advocacy: The advocacy actions in Tirto Village showed varying findings regarding the condition of ODF. It includes regulation, commitment, funding, public disposition and facilities. First, there is no strict regulation yet, the Government of Tirto Village only made regulation to support the pillar of ODF in a form of planning documents.¹⁶ Second, the Government of Tirto Village committed to ODF, they showed enthusiasm by establishing coordination with the team who took charge of drinking water and sanitation providers in Tirto Village.¹⁷ Third, CLTS in a form of motivation was funded through Health Operational Assistance (HOA). Other funds come from drinking water and sanitation providers, but they allocated more funds for clean water improvement than to reduce the behavior of OD.¹⁸ Fourth, public dispositions related to motivation to change the behavior of ODF were not fully accepted by the public.¹⁹ They admitted that they have some commitment to the ODF, but practically, there were some people in a certain society are still behaving in an unhealthy way or doing the OD because for them, it feels more comfortable. In fact, when the research took place, we found physical evidence of an unrealistic chamber on a river with a wooden pedestal and a cover made of a used old sack. People often call the chamber with the term “helicopter”.

“..... Currently the CBTS achievement in Tirto Village is already good because there are almost no helicopter anymore above the river or the percentage is around 80-90%. Only a few who need assistance, especially newcomers and rented houses near the river.... (IU02, woman & IT02, woman)”

Fifth, the programs of clean water supply and community sanitation produced a physical form that could give some benefit for the people of Tirto village. Evidence of finding was in a form of public toilet facilities similar to box chambers for the community, but the hygiene was not maintained.²⁰ The pillar of ODF focused in the aspect of behavioral change of people to use healthy toilets equipped with safe disposal of septic tanks.²¹ This means that the availability of public toilet did not guarantee people to change their behavior, they still preferred doing the OD in the river.

“.... A big problem for us is about the citizen’s perceptions. They feel better when defecating in the river. (IU03, male)”

Environmental Formation: Environmental formation in the Tirto Village showed varying findings related to the condition of ODF. This formation included coordination and socialization. To actualize its mission in order to reach the ODF, first, the Government of Tirto village had multi-sectoral coordination.²² Coordination was addressed to community health center, community actor, health cadres, water and sanitation teams and other activists.

“.... Coordination that is built is a cross-program and a cross-sector. For the cross-program, we work with doctors and health promotion officers. While for the cross-sector, we usually coordinate with village health forum.... (IT01, male)”

Second, the socialization of CLTS was in a form of motivation to the people in order to reach the area of stop OD. This socialization was informed at the village meeting or forum. Socialization with other innovations had never been done.

Community Empowerment: The actualization of community empowerment in Tirto village showed various findings related to the condition of ODF. Community empowerment included training and motivation. CLTS training attempts were directed to the teams of water supply and sanitation. Meanwhile, there is no CLTS training for public figure. CLTS training interviewee is a facilitator of CBTS from Central Health Department and Health Department of Pekalongan.

“.... At hamlet level, there have never been any CLTS training, but the Non Governmental Organization (NGO) and the Community Self-Help Agency in Tirto village often received the training. Both the NGO and the Community Self-Help Agency are teams of water supply and sanitation at Tirto. (IU03, male & IT01, male)”

Motivation is part of CLTS. CLTS is a sanitation program, motivation attempt aims to change the behavior of OD in the community to use healthy toilets by bringing out a sense of disgust to the people.²³ This sense of disgust would be seen when simulated water treated with feces were demonstrated in front of them. This kind of manipulation is used to provide a stimulus for public perception to stop the OD.²⁴ This activity is carried out by sanitation officers accompanied by healthcare workers.

“... The obstacles of the motivation attempt occurred when it was confronted with the laggard group. This group is a group that rejects or refuses to accept the ODF behavior. While the chance we have is that some people accept the defecation behavior in the toilet. The key is being patient, doing the process gradually and understanding the society. (IU02, female)”

For the post-motivation, the community was monitored for the progress of their attitude and behavior. The motivation attempt was not a powerful weapon to change people’s behavior because the effects vary. Some responded well or provided feedback by changing their old habit and starting to use the healthy toilets. However, some people were still remain doing the OD in the river, they did not respond well.²³ Thus, such a condition is a difficult challenge to lead people to stop the OD.^{8,25}

“.... Some people live on the edge of the river, they have latrines but still use the river, even their garden. (IU05, female)”

Partnership: Tirto Village has been implementing Advocacy, Community Development and Community Empowerment to reach the pillar of ODF. However, there are no specific findings related to the partnership made by Tirto Village in actualizing the pillar of ODF.

“.... The village strongly supports the ODF program, but since Tirto Village was in a developing condition, the village can only provide limited and general support and has not yet established a partnership. Hopefully in 2019 we will be able to achieve success (IU01, male)”

Health Promotion Strategy towards Universal Access: ODF is one of the major project of the sanitation in Indonesia. Total heads of households that were still doing the OD were as much as 14,322,858. This number showed that the achievement made in 2017 was still far from target to actualize 100% ODF target in the upcoming 2019.²⁶ So, research conducted in Tirto Village was expected to explore obstacles that occurred. The regulation was crucial to support the health program because it can amplify the success in achieving the objectives. Research findings in Tirto Village pointed out that there was already regulation of ODF in a form of written planning-document. Unfortunately, this regulation was still not implemented. A regulation had to lead to a real action. The strict regulations was very

necessary to reach the ODF target.²⁷ The consequences which were set for those who violates the strict rules were by giving the subjects some penalties or fines and social sanctions. The implementation of the regulation is an attempt of Government if Tirto village in fulfilling people's rights to get healthy environment.²⁸

The strict regulation could bring up commitment from various circle of community. The high enthusiasm to achieve ODF together would appear by itself. The principle of the mutual cooperation in achieving a goal can build a network with various sectors.²⁹ The society would move to use the potential that had been already had. It includes an attempt to optimize public toilet facilities by taking care of it and keeping it clean. When the society felt that a healthy toilet was a primary need, then gradually they would be able to provide the facilities independently. This is due to the perception that poor sanitation is a necessity. The public perception about sanitation or decent toilets which was increasingly stronger can reduce the rejection towards the pillar of ODF. As for the health operational support, drinking water and sanitation providers were just initial facilitation activities before the society could manage it independently.

Subsequent finding showed that the CBTS facilitator provided training to the team of the of drinking water and sanitation providers. A facilitator from the main office only trained the CLTS only once. The received effect was not that satisfying. The one-time training could not accommodate the needs of the teams to carry out the CLTS in real life. Even training CLTS did not involve any public figures who were the role model for the community because they had their own charisma. An intensive and ongoing accompaniment of facilitators was urgently needed in the area of OD. Ideally, one village haf one facilitator. So, the facilitator could accompany the team and the public figure whenever the CLTS was held.³⁰ The pillar of ODF did not provide physical help, but the main goal was to make a society able to stop their OD habit through CLTS.

The execution of CLTS which is accompanied by facilitator can be more optimal because the facilitators can understand the strategy of success much better. The facilitator will influence people with questions about the profile of sanitation in the community, unwittingly, their answers lead to the long-term effect of the OD habit so

that people feel the need to get a decent sanitation. The key is that people must be aware of the need of healthy toilets and sanitation.²⁹ Thus, the feedback from the community will reach the expectations. Gradually they will behave 100% ODF. No less important, the society should be empowered to understand the potential that they have. Potential can be directed to multiple choice. First, by empowering village leader to allocate the village's funds to meet the society's need in a form of healthy toilets. Second, by empowering the society to start doing the toilet savings and sanitation credit action.³¹ The information on toilet savings and sanitary credit can be disseminated through a forum that is already formed.³² When in a certain village or in a neighbourhood there are sanitation entrepreneurs, then this potential can be empowered. Sanitation entrepreneurs can make a simple, healthy, and affordable model of toilets.³³ So that the needs of sanitation in Tirto village can be fulfilled.

The river in Tirto village can serve as alternative to finish up the OD issues. Government of Tirto village along the local people must be able to innovate. Alternatives refer to cultural and tourism aspects such as creating a Javanese cultural stage action or cultural art performances near the river. This can support the regulation of OD prohibition, thus preventing the community from behaving the OD.³⁴ Gradually, the village leader should be bold in conditioning the river to become clean again. Clean river and aesthetic value of nature is a regional asset. Thus, the public will try to keep the asset. These aspects are the sustainability and innovation of health promotion strategies that need to be applied.

The Power of Partnerships towards Universal Access:

Implementation of a health promotion strategy needs to be strengthened by partnerships. The partnerships that are built include various components to achieve the objectives of ODF, in which to stop OD is the initial target towards universal access. The role of leaders greatly influences the sustainability of a program as well as the support of funds contributes to the partnership process.³⁵ Thus, leaders from Tirto village can determine in advance who will partner with them. The first partnership step is to expand the network. Networking is informal and limited to exchange information or experience. Government of Tirto village can build network with those who have reached ODF, for example the neighbourhood village. In this context, the one to be achieved is the information from those which may be adopted in Tirto village.³⁶

Necessarily, the village can create cooperation. In Pekalongan, there are areas that have reached the ODF and some other have not yet. The government of the village can cooperate with the other villages that have not stopped the OD. The cooperation is created based on common goals. The alternative of this cooperation can be continued at the next level, which is to coordinate. The coordination aims to ask for support from top-level governments. It can also be made to relevant sectors that can be expected to contribute. The coordination in question is with sub-district, prominent religious figures, sub-district police and military regimental command at the sub-district level. To coordinate with the sector it is necessary the originator. In this context is the leader of Tirto village. The last is the integration among sectors embodied in real action to the community.¹⁰ This context can be called action by involving the above sectors to reach the pillar of ODF. Concrete forms of implementation or output of partnerships include ODF campaigns by religious leaders, CLTS together with police and military regiment command and firm policy on ODF from sub-district leaders. Even subdistrict leaders have the authority to make regulations in the form of fines or penalties.³⁷ To reach the goal of ODF, there are times when people need a little coercive element through the regulation. Partnerships actually look for relationships that can facilitate a goal. Thus, more and more parties that support will feel undemanding and easy to achieve. However, opportunities like this have not been adopted. Therefore, a sustainable, innovative health promotion strategy reinforced by partnerships can result in strategies to address the universal access challenge of sanitation.³⁸ Universal access is a target of sustainable development to be achieved by 2030.

CONCLUSIONS

The conclusion of this research is that generally, universal access becomes a public challenge. To achieve universal access, ODF must be achieved by the smallest unit of a country, that is village. Thus, a country can fulfill the right of every citizen to obtain a healthy environment. A suitable strategy is a health promotion strategy reinforced by partnerships in a sustainable and innovative way. The strategies can be done through: advocacy, that is by making strict regulation with consequences; environmental formation, it can be done through expanding coordination with related sectors; community empowerment, it can be done by raising awareness through the potential of

the society; the last is to strengthen partnerships through networking, collaboration, coordination and integration. Thus, the sustainability and innovation of health promotion strategies on the pillar of OD are opportunities that need to be applied to address the challenges of universal access.

ACKNOWLEDGMENTS

We thank all the informants. Thank you also to the party who gave permission of this research is to the Office of National Unity and Politics of Pekalongan City; Office of Research, Technology and Research of Pekalongan City; City Health Office of Pekalongan; Tirto Public Health Center and Tirto Village.

Conflict of Interest: The authors inform that they have no conflict of interest.

Source of Funding: All funds used to support this research comes from the researchers themselves.

Ethical Clearance: Appropriate license of ethics published by the University of Pekalongan was used as the basis for official license to the Office of the National and Political Unity of Pekalongan.

REFERENCES

1. Galan DI, Kim S, Graham JP. Exploring changes in open defecation prevalence in sub-Saharan Africa based on national level indices. *BMC Public Health* [Internet]. 2013;13(1):1. Available from: BMC Public Health
2. Crocker J, Saywell D, Shields KF, Kolsky P, Bartram J. The true costs of participatory sanitation: Evidence from community-led total sanitation studies in Ghana and Ethiopia. *Sci Total Environ* [Internet]. 2017;601–602:1075–83. Available from: <http://dx.doi.org/10.1016/j.scitotenv.2017.05.279>
3. Li X, Miao Y, Chen W. China ' s three-year health reform program and equity in sanitation improvement: a panel analysis. *BMC Public Health*. 2015;1–8.
4. Cronin AA, Odagiri M, Arsyad B, Tetty M, Amannullah G, Santoso H, et al. Piloting water quality testing coupled with a national socioeconomic survey in Yogyakarta province, Indonesia, towards tracking of Sustainable Development Goal 6. *Int J Hyg Environ Health*

- [Internet]. 2017;220(7):1141–51. Available from: <http://dx.doi.org/10.1016/j.ijheh.2017.07.001>
5. Winters MS, Karim AG. Public Service Provision under Conditions of Insufficient Citizen Demand: Insights from the Urban Sanitation Sector in Indonesia. *World Dev* [Internet]. 2014;60:31–42. Available from: <http://dx.doi.org/10.1016/j.worlddev.2014.03.017>
 6. Hopewell MR, Graham JP. Trends in access to water supply and sanitation in 31 major sub-Saharan African cities: an analysis of DHS data from 2000 to 2012. *BMC Public Health* [Internet]. 2014; Available from: <http://www.biomedcentral.com/1471-2458/14/208>
 7. Luh J, Royster S, Sebastian D, Ojomo E, Bartram J. Expert assessment of the resilience of drinking water and sanitation systems to climate-related hazards. *Sci Total Environ* [Internet]. 2017;592:334–44. Available from: <http://dx.doi.org/10.1016/j.scitotenv.2017.03.084>
 8. Freeman MC, Majorin F, Boisson S, Routray P. The impact of a rural sanitation programme on safe disposal of child faeces: a cluster randomised trial in Odisha, India. *Trans R Soc Trop Med Hyg*. 2017;(September):386–92.
 9. Taiwo OT, Sam-wobo SO, Idowu OA, Talabi AO, Taiwo AM. Comparative assessment of intestinal helminths prevalence in Water, Sanitation and Hygiene (WASH) intervention and non-intervention communities in Abeokuta, Nigeria. *Asian Pac J Trop Biomed* [Internet]. 2017;7(6):524–32. Available from: <http://dx.doi.org/10.1016/j.apjtb.2017.05.006>
 10. Johnston EA, Teague J, Graham JP. Challenges and opportunities associated with neglected tropical disease and water, sanitation and hygiene intersectoral integration programs. *BMC Public Health*. 2015;1–14.
 11. Gebru T, Taha M, Kassahun W. Risk factors of diarrhoeal disease in under-five children among health extension model and non-model families in Sheko district rural community, Southwest Ethiopia: comparative cross-sectional study. *BMC Public Health* [Internet]. 2014;14:1–6. Available from: <http://www.biomedcentral.com/1471-2458/14/395%0ARESEARCH>
 12. Clasen T, Boisson S, Routray P, Torondel B, Bell M, Cumming O, et al. Effectiveness of a rural sanitation programme on diarrhoea, soil-transmitted helminth infection, and child malnutrition in Odisha, India: a cluster-randomised trial. *Lancet Glob Heal* [Internet]. 2014;2(11):e645–53. Available from: [http://dx.doi.org/10.1016/S2214-109X\(14\)70307-9](http://dx.doi.org/10.1016/S2214-109X(14)70307-9)
 13. Hathi P, Haque S, Pant L. Place and Child Health : The Interaction of Population Density and Sanitation in Developing Countries. *Demography* [Internet]. 2017;54:337–60. Available from: <http://dx.doi.org/10.1007/s13524-016-0538-y>
 14. Boisson S, Sosai P, Ray S, Routray P, Torondel B, Schmidt W, et al. Promoting latrine construction and use in rural villages practicing open defecation: process evaluation in connection with a randomised controlled trial in Orissa, India. *BMC Res Notes* [Internet]. 2014;7:1–12. Available from: <http://www.biomedcentral.com/1756-0500/7/486%0APage>
 15. Hetherington E, Eggers M, Wamoyi J, Hatfield J, Manyama M, Kutz S, et al. Participatory science and innovation for improved sanitation and hygiene: process and outcome evaluation of project SHINE, a school-based intervention in Rural Tanzania. *BMC Public Health*. 2017;1–15.
 16. Martel JC. Agenda Setting and Political Control in India 's Sanitation Policy Subsystem. *SAGE Publ*. 2017;8(2):188–200.
 17. Banana E, Chikoti P, Harawa C, Mcgranahan G, Mitlin D, Stephen S, et al. Sharing reflections on inclusive sanitation. *SAGE Publ*. 2015;27(1):19–34.
 18. Teague J, Johnston EA, Graham JP. Water, sanitation, hygiene, and nutrition: successes, challenges, and implications for integration. *Int J Public Health*. 2014;59:913–21.
 19. Showkat N. Coverage of Sanitation Issues in India. *SAGE Publ*. 2016;1–6.
 20. Simiyu S, Swilling M, Cairncross S, Rheingans R. Determinants of quality of shared sanitation facilities in informal settlements: case study of Kisumu, Kenya. *BMC Public Health* [Internet]. 2017;1–13. Available from: <http://dx.doi.org/10.1186/s12889-016-4009-6>

21. Russel K, Tilmans S, Kramer S, Sklar R, Tillias D, Davis J. User perceptions of and willingness to pay for household container-based sanitation services: experience from Cap Haitien, Haiti. *SAGE Publ.* 2015;27(3):525–40.
22. Cole DC, Levin C, Loechl C, Thiele G, Grant F, Webb A, et al. Planning an integrated agriculture and health program and designing its evaluation : Experience from Western Kenya. *Eval Program Plann* [Internet]. 2016;56:11–22. Available from: <http://dx.doi.org/10.1016/j.evalprogplan.2016.03.001>
23. Pickering AJ, Djebbari H, Lopez C, Coulibaly M, Alzua ML, Bill F, et al. Effect of a community-led sanitation intervention on child diarrhoea and child growth in rural Mali: a cluster-randomised controlled trial. *Lancet Glob Heal.* 2015;3:e701-711.
24. Crocker J, Geremew A, Atalie F, Yetie M, Bartram J. Teachers and Sanitation Promotion: An Assessment of Community- Led Total Sanitation in Ethiopia. *Environ Sci Technol.* 2016;50:6517–25.
25. Freeman MC, Garn J V, Sclar GD, Boisson S, Medlicott K, Alexander KT, et al. The impact of sanitation on infectious disease and nutritional status: A systematic review and meta-analysis. *Int J Hyg Environ Health* [Internet]. 2017;220(6):928–49. Available from: <http://dx.doi.org/10.1016/j.ijheh.2017.05.007>
26. Acharya A, Liu L, Li Q, Friberg IK. Estimating the child health equity potential of improved sanitation in Nepal. *BMC Public Health.* 2013;13(Suppl 3).
27. Guo C, Zhang Z. Understanding Nonprofit Advocacy in Non-Western Settings : A Framework and Empirical Evidence. *Int J Volunt Nonprofit Organ.* 2014;25:1151–74.
28. Mason B, Georgia M, Kayser L, Dalcanale F, Bartram J. Translating the Human Right to Water and Sanitation into Public Policy Reform. *Springer.* 2014;833–48.
29. Mariwah S. Sanitation : the neglected Siamese twin of water in achieving the millennium development goals (MDGs) in Ghana. *GeoJournal.* 2017;
30. Nesbit R. Advocacy Recruits: Demographic Predictors of Volunteering for Advocacy-Related Organizations. *Int J Volunt Nonprofit Organ.* 2017;28(3):958–87.
31. Shier ML, Handy F. From Advocacy to Social Innovation : A Typology of Social Change Efforts by Nonprofits. *Int J Volunt Nonprofit Organ* [Internet]. 2015;26:2581–603. Available from: <http://dx.doi.org/10.1007/s11266-014-9535-1>
32. Checchi F, Warsame A, Treacy-wong V, Polonsky J, Ommeren M Van, Prudhon C. Public health information in crisis-affected populations : a review of methods and their use for advocacy and action. *Lancet* [Internet]. 2017;390(10109):2297–313. Available from: [http://dx.doi.org/10.1016/S0140-6736\(17\)30702-X](http://dx.doi.org/10.1016/S0140-6736(17)30702-X)
33. Catalao J, Murta D, Rebecca J, Willetts M. Sanitation entrepreneurship in rural Indonesia: a closer look. *Environ Dev Sustain.* 2016;
34. Staebler S, Campbell J, Cornelius P, Fallin-bennett A, Fry-bowers E, Mai Y, et al. Policy and political advocacy : Comparison study of nursing faculty to determine current practices, perceptions, and barriers to teaching health policy. *J Prof Nurs* [Internet]. 2017;33(5):350–5. Available from: <http://dx.doi.org/10.1016/j.profnurs.2017.04.001>
35. Stolp S, Bottorff JL, Seaton CL, Jones-bricker M, Oliffe JL, Johnson ST, et al. Measurement and evaluation practices of factors that contribute to effective health promotion collaboration functioning : Ascopingreview. *Eval Program Plann* [Internet]. 2017;61:38–44. Available from: <http://dx.doi.org/10.1016/j.evalprogplan.2016.11.013>
36. Jao I, Kombe F, Mwalukore S, Bull S, Parker M, Kamuya D, et al. Involving Research Stakeholders in Developing Policy on Sharing Public Health Research Data in Kenya : Views on Fair Process for Informed Consent, Access Oversight, and Community Engagement. *SAGE Publ.* 2015;10(3):264–77.
37. Bhatia K. Community health worker programs in India: a rights-based review. *SAGE Publ.* 2014;134(5):276–82.
38. Mcgranahan G, Schensul D. Inclusive urbanization: Can the 2030 Agenda be delivered without it? *SAGE Publ.* 2016;28(1):13–34.

Understanding HIV/AIDS Perception Using Health Belief Model of Female Sex Workers with HIV/AIDS

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ABSTRACT

Background: The way of transmitting HIV/AIDS through sexual behavior with multiple partners. Female sex workers (FSWs) risky to transmitted HIV/AIDS and stigmatized by the community. There are still some sex worker women who do not use condoms to prevent transmission. The study aims to explore the perspectives of FSWs to HIV/AIDS about the disease.

Method: A qualitative study using in-depth interviews was conducted to seven female sex workers (FSWs) who are transmitted HIV/AIDS from April to May 2018. The in-depth interview guidelines explored about the FSWs perceptions on HIV/AIDS, the experiences of getting stigma and discrimination in the health services and their prevention behavior to their partners using Health Belief Model.

Results: HIV/AIDS is not a dangerous disease. The assumption that people living with HIV/AIDS can still work made a thought that the disease is not dangerous. Giving of health education has been done regularly to women sex workers, but there are still women sex workers who do not use condoms at work. Stigma and discrimination in health services are still being felt. The female sex workers perceptions and stigmatization of them are essential. Strengthening the role of peer educator in educating FSWs, educating the health workers, and also the local regulation or *Peraturan Daerah* about HIV/AIDS prevention should be implemented.

Conclusion: A comprehensive strategy to increase knowledge, understanding, and life skill should be considered in this setting. Health education is required to increase FSWs and health workers knowledge about HIV/AIDS. Public health strategies need to be strengthened in localization where health access is highly utilized.

Keywords: *Female Sex Workers, HIV/AIDS, Health Belief Model*

INTRODUCTION

HIV/AIDS is one a very global health problem, this is because Acquired Immune Deficiency Syndrome (AIDS) is a threat of life and there is no cure for this yet¹ World Health Organizations estimates 0.8% communities around the world aged 15-49 years living with HIV. In Indonesia estimated that there were 142,950 people infected HIV and 55,623 people in the

stage AIDS. Cumulative percentage of AIDS highest in the 20-29 age group year is 32.9%¹. The latest data from the AIDS Commission (KPA) of Yogyakarta province shows that number of HIV is 3334 people and AIDS as many as 1314 people.

Percentage of HIV/AIDS cases based on how the transmission is divided become heterosexual (78%), IDUs (9.3%), male sex with men (4.3%), and from HIV positive mothers to his son (2.6%).²Female sex workers are one of the most vulnerable groups to HIV infection in the world today. HIV epidemics are rapidly attacking female sex workers populations with prevalence above 65% in some countries among others: India, Indonesia, Cambodia and the Russian Federation. in Semarang the level of awareness of female sex workers in using condoms is only 1%, whereas the use of condoms is

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one of the efforts to prevent transmission of HIV/AIDS infection. In addition, from 0.8% of female sex workers the highest percentage of HIV infections at the age of 18-21 years is 31.3% (n = 258).³

Female sex workers sometimes are aware of medical checkup into a health worker, but there are also waiting for it to come health workers who survey to localization to see female sex workers health status, some even still believe that STIs can be prevented only by take initial antibiotics with buy it at the pharmacy.⁴ Some commercial sex workers find it difficult when seeking health services when they are infected with STIs or HIV/AIDS because they do not get permission from pimps. In addition, there are still many myths that develop among commercial sex workers that cause commercial sex workers to do their own treatment of illness.⁵

Problem Statement

1.1 Purpose and Objective of the Study: The purpose of the study was to identify the perspective of female sex workers with HIV positive about the severe, vulnerability, the benefits to get HIV/AIDS treatment, and the barriers to get HIV/AIDS treatment. The objective of the study was to explore and describe the perspective of female sex workers with HIV/AIDS in order to understand their health seeking behavior to get HIV/AIDS treatment.

1.2 Definition of key concepts

1.2.1 Perceived Severity: In this context the term perceived severity defining the expectation of female sex workers about the severe of HIV/AIDS.

1.2.2 Perceived Vulnerability: In this context the term perceived vulnerability defining how the female sex workers with HIV/AIDS expecting the vulnerability of HIV/AIDS to them.

1.2.3 Perceived Benefits: In this context the term perceived benefits refers to the benefits that female sex workers with HIV/AIDS get from HIV/AIDS treatment in term of getting ARV in health services.

1.2.4 Perceived Barriers: The term perceived barriers refers to the barriers who are faced by female sex workers to get health facilities including the experience of getting stigma and discrimination in health services.

RESEARCH DESIGN AND METHOD

Research Design: This study is a qualitative, descriptive, and explorative in order to gain depth information about the perception of female sex workers who are HIV positive to the HIV its self. In order to complete the number of informants, researcher collaborated with the NGO who are concern on the empowerment of the people who are living with HIV.

Sampling methods and study sites: The population of the study all the female sex workers who are infected by HIV/AIDS. The informants were selected by purposive sampling method. The inclusion criteria were applied : female sex workers (18 years and older), HIV positive, working as female sex worker minimum a year, agree to be interviewed.⁶

DATA COLLECTION

The data collected from April to May 2018 by indepth interviews and used guideline questionnaire which assisted the researcher to gain the depth information of the female sex workers with HIV/AIDS perception about HIV/AIDS itself. All the interviews were conducted different settings such as cafe and primary health care where the informants got the ARV depends on the appointment with the informants.

The data collection was finished in a week. The researcher interviewed one informant each day. Interviews were audio recorded in 60 minutes each. Informants were interviewed in Bahasa Indonesia or Javanese language depend on their proficiency. The reflective field notes also conducted to observe the informants' gestures and tone of voice.

DATA ANALYSIS

All of the audio interviews recorded were transcribed by research assistants using qualitative content analysis. The data analysis involved seven female sex workers with HIV/AIDS as the key informants. The interviews were analysed individually to identify the relating theme with the aims of the study. For each transcription, the issues related to the aims of the study were identified and coded without predefined themes. After all of the coding process finished then classified the theme based on the theorithical framework using health belief model (HBM) theory. Perceived susceptibility, perceived severity, perceived benefits, and perceived barriers were classified as the theme.

Ethical Consideration: Female sex workers are groups that are vulnerable to get disease risk, gender issues, and stigma also discrimination. It was very important that the researcher have to protect the rights. The study was approved by the research ethical committee of Universitas Ahmad Dahlan with Number 011801013

Findings: Our data tell the perspective about HIV/AIDS among seven female sex workers aged from 18-28 years old. Six of them are working in the brothel and the other one as the karaoke server. All of the informants in anti retroviral treatment and the know their HIV/AIDS status more than a year by the HIV/AIDS testing.

Perceived Susceptibility

Sub theme : Fee of services From the findings, the average number of guests served by each informant varied from 2-3 guests per night, but did not rule out not getting guests at all. There is a difference in the duration of in-room service between WPS located in Sarkem and Bong Suwung. If in Sarkem duration spent for one guest about 1 hour outside accompany karaoke with an average cost of Rp. 500.000, -. As for the Bong Suwung because there is no karaokenya place and the room used cannot be used long because there are still others waiting to use the same room, the same mattress, and the same bedspread, then the duration is usually short maximum of 10-15 minutes with cost IDR 80.000, - to IDR 100.000,.

“... so who has a room just provide only room so female sex workers bring tissue or what else like soap should be provide by ourselves sometimes we have to bring bed cover because the bed cover already used to more than one people.” (I-2). “(I-2)

Sub theme: Sexual services Based on several types of services provided to guests, the majority of informants only served the type of vaginal sex and do not accept requests outside of vaginal sex. Related competition among female sex workers,

According to informants there is competition among WPS in getting customers.

“... there is competition. Sometimes there is a friend who tells my weaknesses. When the client ask me about the truth so I answered you want to use me or her, but if you believe me the same let's go “I'm so.” (I-3)

Informants have diverse perceptions of the risks faced by a female sex worker. One informant admitted embarrassed to work as a female sex worker, but it was forced to do to meet the needs of his son. Informants are also aware that the work is not spared from the risk of getting sick, pregnant, and exposed to raids. The next informant explained that working as a female sex worker is risky and sinful but the informant is very pressured to do this work due to economic reasons. Informants do not know that the job is at risk for STIs. Other informants explained that working as female sex worker is not at risk of contracting venereal disease if female sex worker can prevent disease transmission well.

Based on findings about condom use when serving guests, there are two informants who suggested that always use condoms with reasons for the prevention of venereal disease and unwanted pregnancy. While other informants expressed that not always use condoms, condom use depends on guest demand. HIV positive female sex workers are still receiving guests.

“Sometimes I do not use condom, it depends on the request of my clients. They do not satisfied with my service if use condom.” (I-1)

Sub Theme: Perceived Severity The majority of informants perceived that Sexually Transmitted Infections (STIs) including HIV/AIDS are a dangerous disease. But there were two informants who thought that STIs including HIV/AIDS were not a dangerous disease because there were already drugs that could be taken regularly.

“It is not a dangerous disease. There is a drug for it, we just have to consume it regularly..every day..every time for the rest of our life.” (I-2)

Sub Theme: Perceived Barriers Based on the findings, the majority of informants did not feel any obstacles in accessing health services. But there was one informant who explained that he had experienced discrimination stigma from health workers at a government health care facility.

“She was a new doctor who gave treatment for me, she was treat me without any smile at her face, she was rude..and I reported her to her boss in the office.” (I-1)

Based on the findings, according to the informants the reason why not all the female sex workers want to check their health is due to the following factors: 1) low self-awareness, 2) female sex workers already know

their health status so ashamed to check their health, 3) if the partner knows his health status, 4) health checks are considered not yet a necessity.

DISCUSSION

Female sex workers in this study realized that the work undertaken is very vulnerable to contracting HIV/AIDS. However, not all informants we interviewed used condoms during sexual intercourse with their clients. This happens because the bargaining power between informants and clients has not been strong. The informant will fulfill the client's desire not to use condoms with the requirement to add the cost of sexual services.⁷

Stigma and discrimination are still a problem for female sex workers. This was evidenced by the results of interviews that explained that informants had experienced "patient friendly" treatment from health workers because they knew the health status of an HIV positive patient.⁸ The same situation also happened to female sex workers in Zambia. Stigma and discrimination cause a female sex worker to be reluctant to check health conditions, including VCT. In this case, the role of peer educator is very important to provide education, spirit, and intensive assistance to the female sex workers who become assisted and increase social network capacity to health care workers. In addition, couples female sex worker should also give encouragement to perform regular health checks.⁹

Stigma is influenced by several factors, namely knowledge, money, power, prestige to prevent access to health services to patients and access to disease prevention services.¹⁰ Consistent use of condoms in female sex workers has not been done by all informants in this study. In this study there were still informants who did not use condoms while having sexual relations with clients. This is influenced by the reason that clients feel uncomfortable when having sex without using condoms and the addition of the cost of sexual services provided by the client to the informant.

According to the health belief model (HBM) as one of the most reliable behavioral theories explaining the pathway of behavioral change in high-risk populations, The way to change in people's attitude would lead to change in their behavior through influencing the components including: perceived susceptibility, perceived severity, perceived benefit, and perceived

barriers.¹¹ Most of Iranian PLWHA acquired their knowledge of unsafe sex consequences might have influenced the "perceived severity" of the disease and it would be lead to consistent of condom use among them.

Some studies explained that women are more vulnerable to HIV/AIDS than men.¹² Other study mentioned that "partner's condom refusal" was the main point of condom non-use among women living with HIV/AIDS. "My partner did not want to use a condom" is a common self-reported reason for condom non-use among PLWHA.¹³ Based on the facts it seems that more interventions are needed to empower Iranian women on condom use bargaining, especially to explain them about their reproductive health rights (such as refusing sex without condom) in their sexual relationships.^{14,15}

Limitations of the Study: The study did not explore about the experience of the informants about stigma and discrimination to get health services, myths of the female sex workers to prevent and also cure the sexually transmitted infections (STIs) and HIV/AIDS.

ACKNOWLEDGMENTS

This study was funded by Ministry of Research, Technology and Higher Education in year 2017/2018.

Conflict of Interest: We declare that there is no conflict of interest in this research

REFERENCES

1. Mahmudah N, Dasuki D, Kurniawati HF. Female commercial sex worker perspective on susceptibility of HIV-AIDS in Yogyakarta. AIP Conf Proc. 2017;1868(August).
2. Halatoko WA, Landoh DE, Saka B, Akolly K, Layibo Y, Yaya I, et al. Prevalence of syphilis among female sex workers and their clients in Togo in 2011. BMC Public Health. 2017;17(1):1-5.
3. Musyoki H, Kellogg TA, Geibel S, Muraguri N, Okal J, Tun W, et al. Prevalence of HIV, Sexually Transmitted Infections, and Risk Behaviours Among Female Sex Workers in Nairobi, Kenya: Results of a Respondent Driven Sampling Study. AIDS Behav. 2015;19(1):46-58.
4. Freire de Araújo Patrício AC, Peixoto Bezerra V, Vizeu Camargo B, de Almeida Nogueira J,

- Silva Paredes Moreira MA, de Lima Alves K. Knowledge Of Women Sex Workers About HIV/AIDS. *Int Arch Med* [Internet]. 2016;1–10. Available from: <http://imed.pub/ojs/index.php/iam/article/view/1479>
5. Chanda MM, Perez-Brumer AG, Ortblad KF, Mwale M, Chongo S, Kamungoma N, et al. Barriers and Facilitators to HIV Testing Among Zambian Female Sex Workers in Three Transit Hubs. *AIDS Patient Care STDS* [Internet]. 2017;31(7):290–6. Available from: <http://online.liebertpub.com/doi/10.1089/apc.2017.0016>
 6. Hossain MA, Begum MM, Hossain MA, Habib SA, Siddique AB, Sarker AS. Awareness on prevention and control of HIV/AIDS among the adults attending an urban hospital in Dhaka. *J Dhaka Med Coll* [Internet]. 2015;23(1):78–83. Available from: <https://www.banglajol.info/index.php/JDMC/article/view/22699>
 7. Exavery A, Kanté AM, Jackson E, Noronha J, Sikustahili G, Tani K, et al. Role of condom negotiation on condom use among women of reproductive age in three districts in Tanzania. *BMC Public Health*. 2012;12(1).
 8. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health inequalities. *Am J Public Health*. 2013;103(5):813–21.
 9. Yang Y, Wang J, Lin F, Zhang T, Yu F, Zhao Y, et al. Stigma against HIV/AIDS among female sex workers and general migrant women in eastern China. *BMC Womens Health*. 2015;15(1):1–9.
 10. Chanda MM, Perez-Brumer AG, Ortblad KF, Mwale M, Chongo S, Kamungoma N, et al. Barriers and Facilitators to HIV Testing Among Zambian Female Sex Workers in Three Transit Hubs. *AIDS Patient Care STDS* [Internet]. 2017;31(7):290–6. Available from: <http://online.liebertpub.com/doi/10.1089/apc.2017.0016>
 11. Lauver D. A Theory of Care-seeking Behavior. *Image J Nurs Scholarsh*. 1992;24(4):281–8.
 12. Cassidy R, Janssens W. CSAE Working Paper WPS/2018-08 The Power to Protect : Household Bargaining and Female Condom Use □. 2018;44(0).
 13. Fehrenbacher AE, Chowdhury D, Ghose T, Swendeman D. Consistent Condom Use by Female Sex Workers in Kolkata, India: Testing Theories of Economic Insecurity, Behavior Change, Life Course Vulnerability and Empowerment. *AIDS Behav* [Internet]. 2016;20(10):2332–45. Available from: <http://link.springer.com/10.1007/s10461-016-1412-z>
 14. Kerrigan D, Kennedy CE, Morgan-Thomas R, Reza-Paul S, Mwangi P, Win KT, et al. A community empowerment approach to the HIV response among sex workers: Effectiveness, challenges, and considerations for implementation and scale-up. *Lancet* [Internet]. 2015;385(9963):172–85. Available from: [http://dx.doi.org/10.1016/S0140-6736\(14\)60973-9](http://dx.doi.org/10.1016/S0140-6736(14)60973-9)
 15. Karamouzian M, Sadeghirad B, Sharifi H, Sedaghat A, Haghdoost AA, Mirzazadeh A. Consistent Condom Use with Paying and Nonpaying Partners among Female Sex Workers in Iran: Findings of a National Biobehavioral Survey. *J Int Assoc Provid AIDS Care*. 2017;16(6):572–8.

The Characteristic of Several Infant Mortality Risk Factors in Batang District

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ABSTRACT

Background: Sustainable Development Goals (SDGs) contain a set of transformative goals which is agreed and applicable to all nations without exception containing 17 goals, which carrying 14 indicators are not achieved. Some of the indicators that are not reached include Infant Mortality Rate, IMR in Batang Regency is ranked as the sixth highest in Central Java with 13.42 per 1000 births. The purpose of this study was to investigate the characteristics of several risk factors for infant mortality in Batang Regency. The research method was descriptive analytic design, using questioner to 19 public health centers with 266 respondents. The research results showed that 106 (39.8%) respondents had poor knowledge about pregnancy and labour, 49 (18.4%) respondents had history of maternal diseases, 42 (15.8%) respondents are ≤ 20 years old when labour, 44 (16.5%) respondents had medical history in previous pregnancies, and 83 (31.3%) respondents had current medical history of pregnancies. There are 59 (22.2%) respondents were found labour with risky conditions, such as asphyxia and LBW (Low Birth Weight), and the age of the baby at preterm birth. 51 (19.2%) respondents chose non-health services maternity place with a birth attendant.

Conclusion: Maternal knowledge about pregnancy and healthy labour, labour obstacle conditions, neonatal health status, and birth attendant are risk factors for infant mortality. **Suggestions** are needed for massive EIC on MCH (Maternal and Child Health) material on primary target, pregnancy screening high risk in pregnant mother class, and massive education for health personnel as birth attendant.

Keywords: characteristics, risk factors, infant mortality

INTRODUCTION

Starting in 2016, sustainable development goals (SDGs) 2015-2030 replace formally the Millennium Development Goals (MDGs) 2000-2015. SDGs contain a set of transformative goals that are agreed upon and applicable to all nations without exception. SDGs contain 17 Goals. The 17 goals are ⁽¹⁾ :

1. Eliminating poverty,
2. Ending hunger,
3. Health and wellbeing,

4. Good education quality,
5. Gender equality,
6. Clean water and sanitation,
7. Access to affordable energy,
8. Economic growth,
9. Innovation and infrastructure,
10. Reducing inequality,
11. Sustainable development,
12. Sustainable consumption and production,
13. Preventing the impacts of climate change,
14. Maintaining marine resources,
15. Maintaining terrestrial ecosystems,
16. Justice,
17. Revitalization and global partnership which have 169 targets with approximately 300 indicators.

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Sustainable development (SDGs) 2015-2030 replace formally the Millennium Development Goals (MDGs) 2000-2015 (2). However, in 8 Millennium Development Goals that have 63 MDGs indicators, 13 indicators have been achieved, 36 indicators are in the process of achievement, while 14 indicators are not achieved. Some of the indicators that are not achieved on MDGs related to health namely the reduction of maternal mortality rate (MMR), infant mortality rate (IMR), neonates mortality rate (NMR), HIV / AIDS, TB and malaria, access to reproductive health services, family planning, and scope of drinking water and sanitation.

The infant mortality rate (IMR) in Batang regency was ranked the sixth highest in Central Java with an IMR of 13.42 per 1000 births. Both maternal mortality and infant mortality rates in Batang regency indicate that an in-depth study of these two mortality indicators is needed since these two indicators are a benchmark for the good quality or not of health services in an area. The higher degree of maternal and child health, the higher degree of public health in the area.

There are two causes of infant mortality namely endogenous and exogenous. Endogenous infant mortality or neonatal mortality is caused by factors brought by the child at birth, obtained from the parents at the time of conception (3,4). According to (5) infant mortality caused by the condition of her own baby that is LBW (Low Birth Weight), premature baby, and congenital abnormalities. (3) said, infant mortality brought by baby from birth is asphyxia. While exogenous infant mortality or post-neonatal mortality is caused by factors related to the influences of external environment (4)

METHOD

The design of this study is descriptive analytic, using questionnaires in 19 public health centre in Batang Regency (6) with 266 respondents in 19 public health center, those were :

- | | |
|----------------|-----------------|
| 1. Wonotunggal | 2. Tersono |
| 3. Bandar I | 4. Gringsing I |
| 5. Bandar II | 6. Gringsing II |
| 7. Blado I | 8. Limpung |
| 9. Blado II | 10. Banyuputih |
| 11. Reban | 12. Subah |

- | | |
|----------------|----------------|
| 13. Bawang | 14. Pecalungan |
| 15. Batang I | 16. Warungasem |
| 17. Batang II | 18. Batang IV |
| 19. Batang III | |

Research ethics is guaranteed by filling in informed consent by respondents. The study variables included maternal factors, neonatal factors, and health services. Maternal factors consist of maternal knowledge about pregnancy and childbirth, history of maternal diseases, maternal age at labour, medical history in previous pregnancy, and current medical history of pregnancy. Neonatal factors include the condition of the baby born, such as asphyxia and LBW (Low Birth Weight), and the baby's age at birth.

RESULT

Characteristics of respondents involve the age, occupation, income, number of family members, based on the results of data collection are described below.

Table 1: Respondents' characteristics

Variable	Category	Total
The average age		29,53 ± 7,23 (15-45)
Occupation	Unemployment	226 (85%)
	Employment	40 (15%)
Income	≥ UMR	151 (56,8%)
	< UMR	115 (43,2%)
The average number of family member		4 ± 1,5 (2-9)

The study of the determinants of IMR in this study included maternal factors, neonatal factors, and intermediate factors. Maternal factors studied include: maternal knowledge and condition at labour. Neonatal factors studied were the condition and age of the baby at birth. Intermediate factors studied were maternity and birth attendant.

1. Maternal factors: Maternal factors of infant mortality studied in this study are shown in Table 2 below.

Table 2: IMR maternal factors

Variable	Category	Total
Mother's knowledge	Bad	106 (39,8%)
	Good	160 (60,2%)

Conted...

Complication at labour	Negative	217 (81,6%)
	Positive	49 (18,4%)
Maternal age at labour	≥ 20	224 (84,2%)
	< 20	42 (15,8%)
Pre-pregnancy medical history	Not at risk	222 (83,5%)
	at risk	44 (16,5%)
Current pregnancy medical history	Not at risk	182 (68,7%)
	at risk	83 (31,3%)

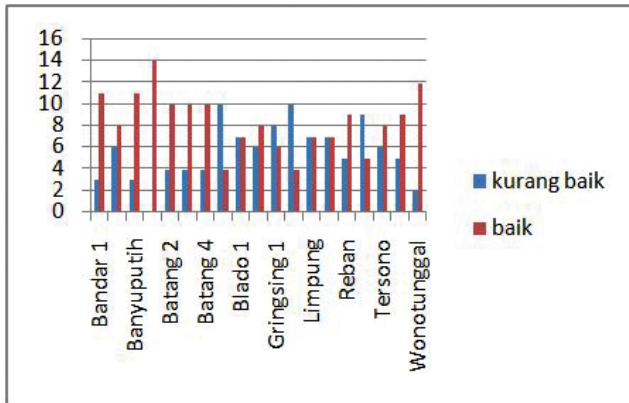


Figure 1: Distribution of respondents' knowledge in 19 public health centers in Batang District

A total of 49 (18.4%) of respondents had history of maternal diseases, 42 (15.8%) of respondents were less than 20 years old when labour, 44 (16.5%) had medical history in previous pregnancies, and 83 (31, 3%) of respondents had current pregnancy medical histories. The maternal complications studied include labour obstacles, fetal distress, breech, and bleeding. Medical histories at previous pregnancies studied were abortion, premature, cesarean, and preeclampsia. Current medical histories of pregnancy include hypertension, anemia, diabetes, and obesity.

2. Neonatal & intermediate factors: Neonatal and intermediate factors of infant mortality rates studied in this study are shown in Table 3 below.

Table 3: Neonatal & Intermediate factors

Variable	Category	Total
Neonatal factors	Not at risk	207 (77,8%)
	at risk (babies born at risk/less birth age)	59 (22,2%)
Intermediate factors	Not at risk	215 (80,8%)
	at risk (non health service place of birth/ birth attendant)	51 (19,2%)

A total of 59 (22.2%) of respondents were found to labour with risky conditions, such as asphyxia and LBW, and the baby's age at birth is less (premature). A total of 51 (19.2%) of respondents chose a non-health service maternity place and or use a birth attendant.

DISCUSSION

The determinant research of IMR was done in 19 public health centers with the number of respondents as many as 266 women of childbearing age and fertile age couples. The average age of respondents when the study are mature, 29.53 ± 7.23 with the youngest respondent is 15 years old, and the oldest is 45 years old. There were 85% unemployment respondents, but 56.8% family income more than or equal to UMR. It was found that the average family of respondents is still ideal, ie 4 ± 1.5 although still found the most number of family members were 9 people.

The result of the study of maternal factors, the characteristics of PUS WUS respondents in the working area of 19 public health centers in Batang regency showed both the average knowledge, the history of maternal complications during labour, maternal age at labour, previous medical history of pregnancy, and current pregnancy history showed good or not at risk of IMR. Although it was good, still found that 39.8% of respondents were less knowledgeable, 18.4% had history of labour complications, 15.8% were under 20 years old when labour, 16.5% had at risk previous pregnancy history, and 31.3 % have risk current pregnancy history. This will likely reappear infant mortality if the program is not monitored properly. The maternal complications studied include labour obstacles, fetal distress, breech, and bleeding. Medical histories in previous pregnancies studied were abortion, premature, cesarean, and preeclampsia. Current medical histories in pregnancy include hypertension, anemia, diabetes, and obesity.

Referring the knowledge distribution of respondents in 19 public health centers, there are 4 public health centers those are actually respondents' knowledge are still not good, namely Bawang, Gringsing 1, Gringsing 2, and Subah public health centers. Meanwhile, there are also 100% of well-informed respondents, namely Batang 1 public health center.

In neonatal factors, there were 59 (22.2%) respondents found to have babies with risky conditions, such as asphyxia and LBW, and the age of infants at

birth is less (premature). Neonatal factors are included in endogenous factors. Endogenous infant mortality or neonatal mortality is caused by factors brought by the child at birth, obtained from the parents at the time of conception (4,7). The endogenous factors appear related to maternal health during pregnancy. Infant mortality caused by the condition of the baby itself is usually LBW, premature infant, congenital abnormalities and asphyxia (4).

According to (7-9) mother's knowledge is very important to guarantee the health of mother and baby, since as foundation of mother awareness to see midwife; planning a pregnancy; distance of pregnancy; nutritional intake for mother and baby; food hygiene consumed by mother; as well as adequate sanitation and hygiene facilities.

Besides maternal internal factors related to IMR, there are maternal factors that are difficult to identify which also have an opportunity for infant mortality, such as physical factors; psychological factors; environmental, social, and cultural factors. (3,5,10)

While the intermediate factors, there are still 51 (19.2%) of respondents chose a non-health services maternity place and or with a birth attendant.

CONCLUSION AND SUGGESTION

Several factors of IMR in Batang Regency include pregnant mother's knowledge about pregnancy and healthy labour, labour complication condition, neonatal health status, and birth attendant.

Massive KIE is required on MCH (Maternal and Child Health) materials on primary targets, pregnancy screening high risk in the class of pregnant women, and massive education health personnel as birth attendants.

Ethical Clearance: Ethical clearance was issued by Ethic Commission of Health Sciences, Pekalongan University

Source of Funding: This study was funded by District Government of Batang.

Conflict of Interest: The authors declare no conflict of interest

ACKNOWLEDGMENT

The authors thank the research enumerator, the head of the public health center throughout Batang, and the Director of Kalisari Hospital Batang District. The author also thank the Batang District Government for the financial support for operational research without intervention

REFERENCES

1. Johnson SA, Perspectives C. Challenges in Health and Development. Springer International Publishing; 2017.
2. Raffer K. Debt Management for Development, Protection of the Poor and the Millennium Development Goals. Cheltenham, UK: Edward Elgar Publishing Limited; 2010.
3. Senter L, Sackoff J, Landi K, Boyd L. Studying Sudden and Unexpected Infant Deaths in a Time of Changing Death Certification and Investigation Practices: Evaluating Sleep-Related Risk Factors for Infant Death in New York City. *Matern Child Health J* [Internet]. Springer US; 2011 Feb 23 [cited 2018 Oct 3];15(2):242–8. Available from: <http://link.springer.com/10.1007/s10995-010-0577-8>
4. Brown HL, Smith M, Beasley Y, Conard T, Musselman AL, Caine VA. Infant Mortality Lessons Learned from a Fetal and Infant Mortality Review Program. *Matern Child Health J* [Internet]. Springer US; 2017 Dec 11 [cited 2018 Oct 3];21(S1):107–13. Available from: <http://link.springer.com/10.1007/s10995-017-2384-y>
5. Paul DA, Mackley A, Locke RG, Stefano JL, Kroelinger C. State Infant Mortality: An Ecologic Study to Determine Modifiable Risks and Adjusted Infant Mortality Rates. *Matern Child Health J* [Internet]. Springer US; 2009 May 13 [cited 2018 Oct 3];13(3):343–8. Available from: <http://link.springer.com/10.1007/s10995-008-0358-9>
6. Salazar LF, Crosby RA, Diclemente RJ. Research methods in Health Promotion. 2nd ed. Salazar LF, editor. San Francisco: Jossey-Bass A Wiley Brand; 2015.

7. Alam N, van Ginneken JK, Timaeus I. Determinants of Perceived Morbidity and Use of Health Services by Children Less Than 15 Years Old in Rural Bangladesh. *Matern Child Health J* [Internet]. Springer US; 2009 Jan 20 [cited 2018 Oct 3];13(1):119–29. Available from: <http://link.springer.com/10.1007/s10995-008-0320-x>
8. Abdullah A, Hort K, Butu Y, Simpson L. Faktor Risiko Kematian Neonatal Di Provinsi Nusa Tenggara Timur: a Matched Case-Control Study. 2015;(April). Available from: http://www.aipmnh.org/web_id/images/reports/Book_Case_Control_Study_Risk_Factor_Neonatal_Deaths_FINAL_June_2015.pdf
9. WHO. MATERNAL MORTALITY IN 2000: Estimates Developed by WHO, UNICEF and UNFPA [Internet]. Geneva; 2004 [cited 2018 Oct 4]. Available from: <http://apps.who.int/iris/bitstream/handle/10665/68382/a81531.pdf;jsessionid=976F484A89C6C225B133F14EEEDC6502?sequence=1>
10. Malqvist M. Neonatal mortality: an invisible and marginalised trauma. *Glob Health Action* [Internet]. 2011 [cited 2018 Oct 4]; Available from: www.globalhealthaction.net/index.php/gha/article/view/6360

Selection of Birth Attendant of Labor in The Village Pelangiran Inhil District

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ABSTRACT

In 2013, the percentage of deliveries with health workers in Indonesia is 89%, Riau Province in 2013 reaches 78%, at Pelangiran Public Health Centers in 2013 which is 55%. This study aims to determine the relationship of knowledge, access to health facilities, attitudes, traditions, family income, education, with the selection of birth attendants in the Village Pelangiran Inhil District. The type of research used is quantitative with cross sectional design. The sample of all maternity mothers, both assisted by health workers, and non-health workers (Shaman giving birth) from January 2015-March 2016 amounted to 95 people, with a technique of sampling saturated/census. The analysis used chi square. The result of this research shows that there are correlation between Knowledge (p value 0,001), POR = 11,333, attitude (p value = 0,001), POR = 58, 767, family income (p value = 0,002), POR = 4,589, education (p value = 0,001), POR = 7.699, and access to health facility (p value = 0,05), POR = 2,338, with selection of birth attendant. The attitude of the give a positive response to traditional healers are influential in the selection of birth attendants. A positive mother's attitude to a shaman is at risk 59 times to choose non-health workers as a birth helper. Advised health care workers who are in primary Pelangiran to improve counseling on birth mothers about birthattendant selection that birth mothers choose health workers as helpers.

Keywords: selection of birth attendants, Pelangiran

INTRODUCTION

Childbirth is a process of spending the products of conception (fetus and uterine) which has been quite a month or can live outside the womb through the birth canal or through another birth canal, with or without the help of (its own strength).¹

World Health Organization (WHO) states that most maternal deaths occur from complications during pregnancy, childbirth and 42 days after childbirth. The WHO estimates that 585,000 women die every day from complications of pregnancy and childbirth that not safe, in south Asia woman likely 1:8 die as a result of

pregnancy or childbirth during life, in African countries 1:14, while in North America only 1:6366.^{2,3}

Maternal Mortality Rate (MMR) is one indicator that is closely linked to the quality and accessibility. Based on the Indonesian Demographic and Health Survey (IDHS) in 2012 related to pregnancy, childbirth, postpartum, MMR as much as 359 per 100,000 live births. Increase compared to 2007 amounted to 228 per 100,000 live births. This figure is still high when compared with other Asean countries.^{4,5}

Analysis of maternal mortality conducted in the Rector General of Maternal Health in 2010 proved that maternal mortality is closely related to the place or birth attendants and health care facilities, births attended proven health personnel contributed to the decline in the risk of maternal mortality.⁶

Scope of delivery assistance by health personnel in Indonesia has increased every year. Nationwide coverage

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in 2014 is equal to 88.68% where this number can't meet the target of the Ministry of Health in 2014 at about 90%. However, in Indonesia, namely the province with the lowest coverage is West Papua (44.73%), Maluku (46.90%) and Papua (63.15%) and Riau (77.39%).⁴

Higher proportion of women experiencing pregnancy wastage in any defined area is considered as a sensitive indicator of maternal health care services. It is a significant public health problem throughout the world especially in the developing countries.⁷ Pregnancy wastage mainly includes early pregnancy losses (abortions) and stillbirths. Actual incidence of abortions is not known. It is estimated that 30-55 million abortions take place worldwide annually which translates into an abortion ratio of 260-450 per 1000 live births. In India, it has been computed that about 6 million abortions take place every year, out of which 4 million are induced and 2 million are spontaneous. Still birth rate for developed countries is estimated to be much less i.e., 4.2- 6.8 per 1000 births whereas for developing world, the estimate ranges from 20-32 per 1000 live births⁸

Pregnancy outcome is influenced by hereditary, environmental and bio-social factors like maternal age, inter pregnancy interval, parity, socio-economic factors, Abstract To study the association of maternal risk factors with pregnancy wastage, a prospective study was conducted for a period of one year among 305 pregnant rural women registered with fifty Anganwadi centres in field practice area of Department of Community Medicine, GMC Jammu. All the potential participants were interviewed in person using semi-structured, pre-tested proformae and evaluated clinically. All pregnant women were then followed to study the outcome in terms of abortion, live birth or still birth. Various maternal risk factors like anaemia, Hypertension, Ante partum Haemorrhage, Albuminuria, Glucosuria were studied and their association with pregnancy wastage was analysed using chi-square test. Out of 305 pregnancies followed, 43(14.1%) ended in pregnancy loss i.e. 34 abortions and 9 still births. Pregnancy wastage was statistically significantly associated with anaemia, H.T., APH and Glucosuria. Anaemia was found to independently affect adverse pregnancy outcome on multivariate

analysis. Pregnancy wastage in our set up is mainly due to preventable and treatable risk factors which should be taken care of to prevent the wastage. Key Words Pregnancy wastage, Maternal Risk Factors, Prospective Introduction education, availability of health services, past obstetrics history etc. Besides that, maternal illnesses like diabetes, Hypertension, Ante partum haemorrhage, anaemia, infections etc. are common obstetric factors responsible for poor pregnancy outcome⁹

Based on research conducted that of the 31 respondents, 20 people (64.5%) who chose birth attended by TBAs, while 11 (35.5%) who chose mother giving birth by health workers, variable relating that knowledge, education, ancestry income, access to health facilities, the attitude, the selection of aid delivery.¹⁰

The percentage of births attended health personnel (health workers) in Riau Province in 2013 reached 78%. This figure does not meet the target of the Strategic Plan of Riau Provincial Health Office in 2013 amounted to 90%. The achievement of this indicator in the last 5 years shows a positive trend that is 88.4% in 2009. In Indragiri Hilir with performance of 77.2%. Subdistrict Pelangiran 50%. Pelangiranvillage is one of 16 villages in Puskesmas Pelangiran working area.¹¹

From the initial survey conducted by researchers 5 mothers who were helped by non-health workers (TBAs) in the village of Pelangiran stated that the reason they chose TBAs as a birth attendant is with consideration cheaper and easier summoned to the house, a tradition handed down from old, lack of knowledge, poor education, and access to health facilities.

METHOD

This research is a quantitative analytical research using cross sectional design conducted in Public health centre Pelangiran Inhil district in January-June 2016. The population in this study were all women giving birth in 2015 as many as 95 peoples. sample of 95 peoples. Sampling techniques are census or sample saturated. The analysis used the analysis of univariate and bivariate analysis.

RESULTS AND DISCUSSIONS

Result

Table 1: Results Bivariate Analysis of Each Variables

Variables	Selection of Childbirth				Total		P value	POR
	Non-health workers		health workers		n	%		
	n	%	n	%				
Knowledge								
Low	34	79,1	9	20,9	43	100	0,001	11,333 (4,312-29,787)
High	13	25	34	75	52	100		
	47	49,5	48	50,5	95	100		
Access								
Far	36	56,3	28	43,8	64	100	0,093	2,338 (964-5,670)
Close	11	35,5	20	64,5	31	100		
	47	49,5	48	50,5	95	100		
Attitude								
Negative	41	89,1	5	10,9	46	100	0,001	58,767 (16,643-207,503)
Positive	6	12,2	45	87,8	49	100		
	47	49,5	48	50,5	95	100		
Tradition								
Influence	31	52,5	28	47,5	59	100	0,579	1,384 (602-3,182)
No Influence	16	44,4	20	55,6	36	100		
	47	49,5	48	50,5	95	100		
Family's Incomes								
Low	38	62,3	23	37,7	61	100	0,002	4,589 (1,827-11,530)
High	9	26,5	25	73,5	34	100		
	47	49,4	48	50,5	95	100		
Education								
Low	38	69,1	17	30,9	55	100	0,001	7,699 (3,017-19,649)
High	9	22,5	31	77,1	45	100		
	47	49,5	48	50,5	95	100		

DISCUSSION

1. Knowledge: The higher the person's knowledge, the more easily receive informations. With a mindset that is relatively high, the level of knowledge not merely know (know) that recall but able to understand (comprehention), even at the application level (user application) is the ability to use materials that have been studied on the situation or the actual conditions.¹²

Knowledge a person has gained not only in school but also can be obtained from various sources, such as electronic media, mass media, even from

close relatives and personal experience. This knowledge can form a belief that this knowledge can shape a behavior that is in accordance with what are believed.¹³

This study was supported by research conducted, the test results showed statistically significant correlation between a low knowledge by choosing birth attendants. Many mothers who choose non-health workers as a childbirth'shelter do not know the risks that will occur for the safety of mother and child. In addition, people also do not know the sterility of equipment that is in use by TBAs

against infection during delivery and postpartum mothers and infants. Mother only learned of the family and neighbors that gave birth to the TBAs are safe and secure, people prefer the convenience at the time of delivery with TBAs where before and after childbirth TBAs performing rituals such as sequence and herbalists care of her until after the birth, not only that TBAs also caring baby until the umbilical cord off.¹⁴

2. Attitude: Attitude is a person's reaction or response to a stimulation or object that is emotional.¹⁵ The tendency to act or do in social activities with a certain feeling in the objects reach a situation or conditions in the surrounding environment. In addition, it also provides responses attitude that is positive or negative to the object or situation.¹⁶

Communities thought by choosing TBAs as birth attendants then childbirth more comfortable and salvation is guaranteed because it has closed response and hard to accept the assumptions of others so that mothers are more likely to choose non-health workers as childbirth's helper. This study was supported by research Wilson (2010) on factors related to birth attendants in the district election Cibungbulang Bogor regency, West Java. Statistical test results showed that no significant relationship between attitudes to the election birth attendants.

Maternal expected to have a positive response so easily accept the assumptions of others. Expected for health workers to be able to approach and improve communication to invite mother giving birth so that all mother giving birth choose childbirth helper to health care.¹⁷

3. Revenue: Socio-economic factors are still one of the obstacles people to give birth in health professionals (midwives). Communities with low or poor economy with low education seek help at the TBAs. They think that to give birth in health workers have to spend a huge cost, so they were reluctant to go to employment to health.¹⁸

Thus people who thought that TBAs is a hero, because bearing in cheaper TBAs, TBAs willing to be paid in goods (such as chickens or other agricultural produce), and payment can be in gradually. TBAs provide assistance in the form of massage in the mother, bathing the baby until the umbilical cord detached, and is seen in traditional

ceremonies, such as the tradition of salvation babies and postpartum mothers on day 7 - 40).¹⁹

The level of the economy is one of the factors that play a role in health for reasons not have money at the time to give birth, people prefer traditional treatment with a relatively low cost. For high-income people, regardless of health costs is often not a problem, but not the case for people who are not able to. Economic status of communities affected by several things: jobs, income and education.²⁰

For that delivering mothers are advised to have health insurance as, Jamkesda and JKN (National Health Insurance) is a government program that aims to provide assurance of health insurance for all Indonesian people to be able to live healthy, productive and prosperous, so that mothers prefer delivery by health workers. For health care workers in order to make the program Tabulin that delivering mothers do not feel expensive if childbirth with health workers.

4. Education: Education is an activity or process of learning and develop or enhance certain capabilities so that the educational goals that can stand on its own. The level of education also helped determine easily whether someone understands knowledge obtained, in general, the higher the education the higher the person's knowledge.¹²

Mother's education also influence the selection childbirth attendants, considering education can affect a person's intellectual power in deciding a case, including attending births.²¹ Mother's education were less likely to cause mother's intellectual power is also limited so that its behavior is still influenced by the surrounding circumstances or behavior of other relatives or people they consider more experienced.²² Mother's education here considered less if she only gained through junior high school diploma or other equivalent education to bottom, this study covers only 9 years of basic education. Whilst the new reproductive education is taught in more detail at the high school level and above.

Educational factors proven that mothers who had high school better attainment is above 80% health employment. While educated mothers elementary-

junior high school or do not choose births attended by non-health personnel (TBAs). That the higher the mother's education is expected able to accept new changes in the health sector which leads to improved health so that they can prepare themselves in pregnancy and childbirth than that education can affect a person's intellectual power in deciding the problem, including the determination of the birth attendant²³.

- 5. Access to health facilities:** Based on the results of the study, that there is no significant relationship between access to health facilities with the selection birth attendant.²⁴ access to health facilities or physical access may be a reason to get a place in health care delivery and birthing with healthcare professional.

Access to health services related to several things including the distance of residence and travel time to health facilities as well as socio-economic status and culture.²⁵ Physical access can be a reason to get a place in health care delivery and birthing with healthcare professional.²⁵ Physical access can be calculated from the travel time, mileage, type of transport and health care conditions such as type of service, health workers are available and hours of service. Location services are not strategies or difficult to reach causing the lack of access of pregnant women who give birth in health facilities. Travel time to the health service has a relationship with the delivery of health, said distance and time that must be taken to get the service delivery assistance, ratings are categorized as "Far" when distance is > 2 km and travel time > 30 minutes and "Close when distance ≤ 2 km and time mileage ≤ 30 minutes.

Based on the research results, there is no relationship between access to health facilities with the selection birth attendants, because the villagers Pelangiran just takes time approximately 60 minutes to go to the health facility. Other than that, besides distance mom's home with a TBAs's home very close, TBAs also ready to be called whenever the delivering mothers in need. For that is expected to mothers in order to birthing health facility. For health workers in order to stay in the village so that the delivering mothers easy to give birth to a health facility.

- 6. Tradition:** The tradition is still held by people in rural areas, and less implemented in urban areas. Confidence in the mystical, magical or spirit, often lead to destructive behavior. Villagers are still very strong against ceremonies or rituals. Trust as an element of culture is not easy to change. This element is difficult to be accepted by society, especially when it comes to ideology and philosophy of life. In addition to the difficult geographical, kinship factors are also influential in this regard. Close ties within the scope of its own family gives a sense of comfort for a mother to be birthing, so that a sense of comfort that appear when when their labor. Confidence in the customs and traditions that are passed down has been recognized by society also affect the mother's knowledge in terms of maternal and child health.²⁶

The tradition of prenatal care, childbirth and postpartum, is still very important to do. This was further compounded by the existence of TBAs are still in trust by the community²⁷

Based on the results of the study, there was no significant relationship between tradition and election birth attendants with value (p value = 0.579), because most of the Pelangiran's villagers prefer the convenience at the time of birthing with a TBAs because people learned from family traditions for generations, TBAs give ritual form of water that is considered to expedite delivery if obstructed labor and can reduce pain. In addition, TBAs also provide care during delivery such as massaging the waist of mother, postpartum care until the baby's umbilical cord off.

For it is expected that the birth mothers to not follow the hereditary tradition that could endanger the safety of the mother and fetus. For health care workers in order to provide counseling so that birth mothers are not affected to follow the tradition that could threaten the safety of the mother and fetus while choosing health workers as a helper labor.

CONCLUSIONS

1. There is a relationship between knowledge, attitudes, education and family income with the selection of village birth attendants in Pelangiran, Inhil District in 2016.

2. There was no relationship between access to health facilities and traditional birth attendants with the election in Pelangiran, Inhil District 2016

ACKNOWLEDGEMENTS

We would like to acknowledge to:

1. Chairperson of Hang Tuah STIKES Pekanbaru
2. Head of Pelangiran Public Health Centre in Inhil Regency
3. Head of Pelangiran Village, Inhil Regency

Ethical Clearance: Research must uphold research ethics which is an ethical standard in conducting research. There are also principles of research ethics:

- 1. The principle of respecting human dignity:** I as a researcher will respect the rights of respondents involved in the research, including: the right to make a decision to be involved or not involved in the research and the right to be kept confidential in relation to the data obtained during the study.
- 2. The principle of turning back (beneficence):** This research will not endanger the respondent because the research guarantees to maintain the confidentiality of respondents in filling out the questionnaire. This research is free from exploitation because researchers have considered the benefits of research and considered the risks and benefits of research that have been conducted by ethical testing by Stikes Hangtuah Pekanbaru.
- 3. Principles of Justice:** In this case the researcher will treat respondents fairly and not discriminate based on race, religion, or socioeconomic status. Researchers will treat respondents in accordance with the research design and research objectives, including the right to get the same treatment and the right to be protected by privacy. Ethics review by the Hangtuah STIKES ethics commission in Pekanbaru has been carried out, as evidenced by the ethical review letter with number : 090/KEPK/STIKes-HTP/X/2018

Sources of Funding: The Sources Of Funds In This Research Are DIPA Stikes Hang Tuah Pekanbaru

REFERENCES

1. Asrinah et al. Midwifery Care During Childbirth. Heal J. 2010;Vol 2(No 4).
2. Prawirohardjo S. Science of womb. Jakarta: Bina Library; 2009.
3. Benatar S, Garrett AB, Howell E. Midwifery Care at a Freestanding Birth Center: A Safe and Effective Alternative to Conventional Maternity Care. Health Serv Res. 2008;48(5):1750–69.
4. MoH RI. Data and Information Center. 2013.
5. Hutton EK, Bhsc AC, Rm AHR, Simioni J, Horne J, Mcgregor C, et al. CMAJ Outcomes associated with planned place of birth among women with low-risk pregnancies. CMAJ. 2016;188(5).
6. Degni F, Suominen SB, El W, Vehvila K. Reproductive and maternity health care services in Finland: perceptions and experiences of Somali-born immigrant women. Ethn Health. 2014;19(3):348–67.
7. Davies N, Fletcher S, Reeves S. Interprofessional education in maternity services: Is there evidence to support policy? J Interprof Care. 2016;30(6):812–5.
8. Smith GC FR. Still birth. In Lancet; 2007. hal. 370; 1715-25.
9. Kashmir AFJ and. provisional population, rural urban distribution. Census of India. 2001;series-2 Paper 2.
10. Suhartatik. Factors Associated With Use of Delivery Assistance. 2013;Vol 3(No 2).
11. Riau Provincial Health Office. Profile of Riau Province. 2013.
12. Notoatmodjo S. Promotion Obstetrics And Behavioral Sciences. Jakarta: Rineka Cipta; 2010.
13. Wilson KL, Sirois FM. Birth attendant choice and satisfaction with antenatal care: the role of birth philosophy, relational style, and health self-efficacy. J Reprod Infant Psychol. 2010;28(1):69–83.
14. Asriani. Factors Related to Selection of Childbirth Attendant By Mother Giving Birth. Heal J. 2009;Vol 2,(No 4).
15. Ribeiro CP, Milanez H. Knowledge, attitude and practice of women in Campinas, São Paulo, Brazil

- with respect to physical exercise in pregnancy : a descriptive study. *Reprod Health* [Internet]. 2011;8(1):31. Tersedia pada: <http://www.reproductive-health-journal.com/content/8/1/31>
16. Mubarak. et al. *Health Promotion*. Yogyakarta: Gaha Science.; 2007.
 17. Kumari R, Mengi V, Kumar D. Maternal Risk Factors & Pregnancy Wastage in a Rural Population of Jammu District. *JK Sci*. 2013;15(2):82–6.
 18. Metwally AM, Abdel-latif GA, Etreby L El, Taw A, Elsayed D, Mohsen AMA. Influence of sociodemographic factors and environmental conditions on husbands' behavior toward maternal healthcare. *Arab Soc Med Res*. 2015;18–26.
 19. Yulifah & Yuswanto. *Community of Midwifery Care*. Jakarta: Salemba Medika; 2009.
 20. Ahmadi. The relationship of knowledge of pregnant women Against Labor's help. *News of Medicine Society*. 2015;
 21. Dijk M Van, Ruiz MJ, Letona D, Garcia SG. Ensuring intercultural maternal health care for Mayan women in Guatemala : a qualitative assessment. *Cult Health Sex*. 2013;15(S3).
 22. Davies N. Interprofessional education in maternity services : Is there evidence to support policy ? 2016;30(6):812–5.
 23. Henny. Factors Affecting Pregnant Women Choosing TBAs In Doing Childbirth Assistance. *Ilmia J Heal*. 2015;Vol 7:No 1.
 24. Djama et al. Utilization of Health Workers By Delivery Assistance Program Participant Poor Health Delivery Guarantee. *News. Med Soc*. 2011;Vol 27(No 1).
 25. Griffiths PL, Balakrishna N, Rao SF, Johnson W. Do socio-economic inequalities in infant growth in rural India operate through maternal size and birth weight ? *J Soc Study Hum Biol*. 2016;4460(2):154–63.
 26. Withers M, Associate MHS, Kharazmi N, Student MPHMPH. Traditional beliefs and practices in pregnancy, childbirth and postpartum : A review of the evidence from Asian countries. *Midwifery* [Internet]. 2018;56(October 2017):158–70. Tersedia pada: <https://doi.org/10.1016/j.midw.2017.10.019>
 27. Dijk M Van. Ensuring intercultural maternal health care for Mayan women in Guatemala : a qualitative assessment. 2013;15.

Community Behavior towards Filariasis Mass Drug Administration in Tegaldowo Village, Pekalongan District, Indonesia

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ABSTRACT

Mass drug administration (MDA) is a strategy to reduce lymphatic filariasis (LF) transmission, and finally eliminate it. This study aimed to identify community behavior towards MDA and the role of elimination officer in MDA campaign. This was a descriptive cross-sectional study conducted in Tegaldowo village, Pekalongan District (an endemic area of LF). Study subject consisted of 100 persons. LF was detected by ICT filariasis using finger blood. The result most of the subjects were female, who did not go to school, worked as laborer, and married. Prevalence of filariasis was 7.0%. Most subjects had good knowledge toward MDA and received drugs during MDA. Among subjects who received drugs, only 8.6% refused to take the drugs due to breastfeeding. Adverse reaction was also the case in Tegaldowo, 40,0% subjects experienced adverse reaction after taking the drugs. Less than half cadres had good performance as elimination officers/drug distributors. Most of the subject gained information about MDA from health officers (34.4%). However, nearly half (43.0%) of subjects admitted they did not receive any information about MDA. This study concluded the prevalence of filariasis in Tegaldowo Village has not met WHO target. Factor that may be associated with the coverage of mass drug administration was lack of MDA campaign.

Keywords: mass drug administration, elimination officer, adherence, adverse reaction

INTRODUCTION

Lymphatic filariasis (LF) is a chronic disease in most of tropical countries. It caused by filarial worms *Wucheria bancrofti*, *Brugia malayi* and *Brugia timori*.^{1,2} Filariasis rarely caused death in human, but it caused permanent disability.³ The disease also affecting to the quality of life due to the loss of productivity, significant cost, and social stigma.⁴ More than 125 million people in Indonesia are at risk of LF infection living in 337

districts, which are endemic of LF.⁵ Pekalongan is an endemic area of LF in Central Java Province. The number of filariasis cases in Pekalongan (2016) were 108 cases, 38 of them were new cases.⁶

Lymphatic filariasis is targeted for elimination through mass drug administration (MDA). A micro-simulation model to determine the effect of MDA in the reduction of LF transmission demonstrated a number of MDA round is necessary to achieve elimination.⁷ The compliance of community during MDA is needed to achieve LF elimination. MDAs were mainly conducted by involved community volunteers as elimination officer, either from the community (cadres) or from public health center (health officers). But combination of different groups of people was reported to be more effective to achieve high coverage of the treatment.^{8,9}

Pekalongan District has been conducted MDA in 2011-2015. However, our previous study revealed

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there was ongoing transmission in the area. Most cases were found in Tegaldowo Village.¹⁰ This study aimed to describe the community behaviour toward MDA filariasis in Tegaldowo village, Pekalongam District, Central Java

METHOD

This research using a descriptive cross-sectional study design, conducted in June-August 2017. Study was located in Tegaldowo village, Pekalongam District, which is an endemic area of filariasis. This study involved 100 subjects, selected using consecutive sampling, i.e subject that came to the health checkpoint during study. Data collected using questionnaire. Study variables consisted of characteristic (sex, education level, occupation, marital status), LF infection (identified by immunochromatographic tesse/ICT), community behavior toward MDA (knowledge, receive drugs, reason not receive it, compliance, reason for non-compliance, time of taking the drug, side effect, action when side effect occurs), and source of information (from who, when, where, how many).

RESULTS AND DISCUSSION

Characteristics of subject are shown in Table 1.

Table 1: The characteristic of the subjects

Characteristic		n = 100	%
Sex	Male	20	20.0
	Female	80	80.0
Education Levels	No School	44	44.0
	Elementary School	39	39.0
	Junior High School	14	14.0
	Senior High School	3	3.0
Occupation	Farmer	1	1.0
	Labourer	47	47.0
	Non-government employee	3	3.0
	Entrepreneur	6	6.0
	Pedicab driver	2	2.0
	Unemployed	41	41.0
Marital status	Married	82	82.0
	Divorce	11	11.0
	Single	7	7.0
Filariasis status	Positive	7	7.0
	Negative	93	93.0

The result showed that most of the subjects were female (80.0%), do not go to school (44.0%), working as laborer (47.0%), and have been married (82.0%). The study also revealed prevalence of filariasis was 7.0%. It shows that Tegaldowo Village was considered as LF endemic area. The effectiveness of MDA in reducing the prevalence of LF in the community is directly related to coverage with treatment.¹¹ Therefore, MDA is still needed in the area.

Table 2: The community behaviour towards MDA

Variables	n	%
Knowledge toward MDA (n = 100)		
Good	65	65.0
Poor	35	35.0
Receive anti filariasis drugs during MDA (n = 100)		
Yes	93	93.0
No	7	7.0
Reason not receive anti filariasis drugs (n = 93)		
Currently move to the village	1	14.3
Outside the village during MDA	4	57.1
Others	2	28.6
Compliance (n = 93)		
Yes	85	91.4
No	8	8.6
The reason don't take anti filariasis drugs (n = 8)		
Pregnant	2	25.0
Forget	1	12.5
Breast feeding	3	37.5
Feeling healthy	2	25.0
When you take the filariasis drugs? (n = 93)		
Before eat	2	2,4
After eat	79	92,9
Before go to bed	4	4,7
Experience side effect (n = 85)		
Yes	34	40,0
No	51	60,0
What to do when experiencing side effect		
Report to elimination officer	1	2,9
Go to Community Health Center	2	5,9
Take another drug to relief the pain	1	2,9
Ignore side effect	30	88,2

Table 2 showed that most subjects had good knowledge toward MDA. Only 7.0% subjects admitted they did not receive anti filariasis drugs, mostly either

because they were out of town during MDA or currently moved to the village. Compliance in Tegaldowo village was high (91.4%). This result was in accordance with previous study that demonstrated effective coverage rate was significantly higher in rural areas compared to the urban areas.¹² Other study in Srilanka reported similar MDA coverage.¹³

Among subjects who received drugs in this study, 8.6% refused to take the drugs. Most of them mentioned breastfeeding as the reason for not taking anti filariasis drugs. This was on the contrary to Weerasooriya et al who reported the reason for not comply was because they did not receive the drugs (29.4%),¹³ which was not the case in this study. Other study revealed the most common reason quoted for not consuming drugs was that they simply do not want to, followed by the fear of adverse drug reactions.¹²

In this current study, nearly half (40.0%) of them experienced side effect after taking the drugs. From the interview, subjects mentioned nausea, dizzy, fever, and others. This results are similar with the a previous study that reported dizziness, nausea, fever, and other symptom such as scrotal or chest pain.¹⁴ Surprisingly, most of subject of this study decided to ignore their side effect (88.2%) and only a few went to public health center to seek treatment or reported the adverse reactions to the elimination officer. Although the adverse event of MDA was not severe, the previous study showed that the adverse event affected the compliance of the community toward MDA.¹⁵

Several previous studies mentioned the similar factors regarding to compliance during MDA. In total, 29 of the 36 reviewed studies reported factors associated with low compliance, the most common being fear of side effects, lack of perceived need for the drugs and being away from home when the drugs were delivered to relatives. These are similar to those found in a global review of compliance, whose five recommendations included tailoring programs to local conditions, minimizing the impact of adverse events and promoting the broader benefits of the MDA program.¹⁶

Almost all of the subjects took the drugs after eating (93.0%). Hal ini menunjukkan mereka tidak minum obat di hadapan petugas seperti yang dianjurkan dalam program. Hasil ini sesuai dengan penelitian sebelumnya, bahwa among those who had consumed the tablets, only

35 (8.0%) did that in front of the drug distributors. The most common reason for not consuming the tablets in front of drug distributors was that they had not taken food at the time of distribution.¹²

Table 3: The source of information and role of elimination officers towards MDA

Variables	n	%
The role of elimination officer		
Poor	52	52.0
Good	48	48.0
Do you know there is MDA in your village?		
Yes	93	93.0
No	7	7.0
Who give information about MDA?		
Cadres	21	22.6
Health officers	32	34.4
None	40	43.0
Where you receive the information about MDA?		
Home	3	3.2
Community Health Center	24	25.8
Public building	26	28.0
Others	40	43.0
How many times subjects receive the information of MDA		
1 times	31	33.3
2 times	32	34.4
3 times	13	14.0
More than 3 times	7	7.6
Forgot	10	10.7

Table 3 showed the study subjects mentioned less than half cadres had good performance as elimination officers/drug distributors. Most of the subject gained information about MDA from health officers (34.4%) during mass counselling such as in *posyandu* (integrated health service for under-five children). However, nearly half (43.0%) of subjects admitted they did not receive any information about MDA. From those who received information, subjects usually got the information from public health centre or other public buildings. A previous study found the related factors to the non-compliance of MDA mostly because of the health worker/drugs distributors has not visited their family (75.0%).¹⁷ Gosh et al found the reason of MDA non-compliance was fear of the side effect of the drugs.¹⁸

CONCLUSIONS

Prevalence of filariasis in Tegaldowo Village was 7.0%. This means MDA for filariasis in Tegaldowo village has not met WHO target. Factor that may be associated with the coverage of mass drug administration was lack of MDA campaign, either from health officers or cadres.

Conflict of Interest: The authors declare no conflicts of interest in this work.

ACKNOWLEDGEMENTS

The authors thank the study participants, District Health Office of Pekalongan and Public Health Centre of Tirto II for their cooperation in facilitating the study.

Ethical Clearance: Ethical clearance was issued by Ethic Commission of Health Research, Faculty of Public Health, Dipongoro University.

REFERENCES

1. World Health Organization. WHO | Global Programme to Eliminate Lymphatic Filariasis. WHO. 2016.
2. Col L, Agrawal VK, Cdr W, Sashindran VK. Lymphatic Filariasis in India: Problems, Challenges and. *Med J Armed Forces India*. 2006;62(4):359–62.
3. Ottesen EA, Hooper PJ, Bradley M, Biswas G. The global programme to eliminate lymphatic filariasis: health impact after 8 years. *PLoS Negl Trop Dis*. 2008;2(10):e317.
4. Gyapong JO, Gyapong M, Evans DB, Aikins MK, Adjei S. The economic burden of lymphatic filariasis in northern Ghana. *Ann Trop Med Parasitol*. 1996;90(1):39–48.
5. Subdirector of Filariasis and Schistosomiasis, Directorate of Vector Borne Disease Control M of H. National Plan Acceleration Program of Filariasis Elimination in Indonesia 2010-2014. 2010.
6. Province Health Office of Central Java. Health Profile of Central Java 2015. Semarang; PHO Central Java, 2016.
7. Stolk WA, Swaminathan S, van Oortmarssen GJ, Das PK, Habbema JDF. Prospects for elimination of bancroftian filariasis by mass drug treatment in Pondicherry, India: A simulation study. *The Journal of Infectious Diseases* 2003;188(9):1371–81.
8. Odhiambo GO, Musuva RM, Odiere MR, Mwinzi PN. Experiences and perspectives of community health workers from implementing treatment for schistosomiasis using the community directed intervention strategy in an informal settlement in Kisumu City, western Kenya. *BMC Public Health*. 2016;16(986):1-12
9. Omedo MO, Matey EJ, Awiti A, Ogutu M, Alaii J, Karanja DMS, et al. Community health workers' experiences and perspectives on mass drug administration for schistosomiasis control in Western Kenya: The SCORE project. *Am J Trop Med Hyg*. 2012;87(6):1065-72
10. Ginandjar P, Saraswati LD, Suparyanto D, Supali T. The prevalence of lymphatic filariasis in elementary school children living in endemic areas: A baseline survey prior to Mass Drug Administration in Pekalongan District-Indonesia. *Iran J Public Health*. 2018;47(10):1484–92.
11. World Health Organization. Global Programme to Eliminate Lymphatic Filariasis: A handbook for national elimination programme [Internet]. Rome, Italy: WHO Press; 2013 1-8 p.
12. Kulkarni P, Kumar R, Rajegowda RM, Channabasappa HG, Ashok NC. MDA Program against lymphatic filariasis: Are we on the path to success? Experience from Uttara Kannada District, Karnataka. *Int J Med Public Heal* [Internet]. 2014;4(3):243–6.
13. Weerasooriya M V., Yahathugoda CT, Wickramasinghe D, Gunawardena KN, Dharmadasa RA, Vidanapathirana KK, et al. Social mobilisation, drug coverage and compliance and adverse reactions in a Mass Drug Administration (MDA) Programme for the Elimination of Lymphatic Filariasis in Sri Lanka. *Filaria J*. 2007;6(11):1-10
14. Abd Elaziz KM, El-Setouhy M, Bradley MH, Ramzy RMR, Weil GJ. Knowledge and practice related to compliance with mass drug administration during the Egyptian national filariasis elimination program. *Am J Trop Med Hyg*. 2013;89(2):260–4.

15. Babu B V. A qualitative study on the adverse reactions of mass treatment for lymphatic filariasis in Orissa, India. *Asian Pac J Trop Med.* 2010;3(1):55–8.
16. Alexander NDE. Are we nearly there yet? Coverage and compliance of mass drug administration for lymphatic filariasis elimination. *Trans R Soc Trop Med Hyg.* 2015;109(3):173–4.
17. Ghosh S, Samanta A, Kole S. Mass drug administration for elimination of lymphatic filariasis: Recent experiences from a district of West Bengal, India. *Trop Parasitol.* 2013;
18. Babu B V, Kar SK. Coverage, compliance and some operational issues of mass drug administration during the programme to eliminate lymphatic filariasis in Orissa, India. *Trop Med Int Heal.* 2004;9(6):702–9.

MATES (Macaron Dates) as an Alternative Supplementary Food for Undernourished Toddler

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ABSTRACT

Undernutrition still becomes serious health problem in Indonesia. One of strategies in order to replace nutritional status to become normal is by giving supplementary feeding. Dates is high energy high iron food that now can be easily found in urban area of Indonesia. Macaron is a sweet dessert that is basically made from almond, eggwhite, and sugar. Children usually can accept sweet food more easily, so modification of macarons with dates and governance's supplementary feeding biscuit can be good alternative food that deliver nutrients which are needed to support catch up growth in undernourished children. This research was aimed to assess acceptance of modified macarons as alternative supplementary food for undernourished toddler. This is true experimental study with complete randomized design. The substitution of repeatedly 0%, 13%, and 16% governance's supplementary feeding biscuit were made in order to increase nutrition value of macarons. The formulas then were tried to 25 toddler to assess acceptability of each formula using organoleptic test. The result then was analyzed using friedman test. This research showed that F2 (16% governance's supplementary feeding biscuit) has highest acceptability based on flavour variables ($p < 0.05$). Also, this formula contains 8.9 g protein, which is close to protein value of governance's supplementary feeding biscuit. It can be concluded that modified macarons with 16% substitution of governance's supplementary feeding biscuit is a good alternative supplementary food for undernourished toddler

Keywords: macarons, supplementary feeding, undernutrition, toddler

INTRODUCTION

First thousand days of life is essential window period for growth and development of human. As another developing countries, Indonesia still have a high burden of undernutrition. Gained data from Indonesian Basic Health Survey (RISKESDAS) 2013 showed the magnitude of undernutrition prevalence was 19.6%, consist of 13.9% wasting and 5.7% severe wasting¹. This problem is happened everywhere, include urban area such as Surabaya City. Annual surveys showed that there are 282 cases of severe undernourished children in Surabaya².

Infant and younger children especially in first 6 and 18 month of life has bigger chance to suffer malnutrition³. To bring back the normal nutrition status in malnourished children, the typical nutrition intervention is needed. The nutritional requirement of malnourished children is differ from non-malnourished ones. They need higher energy and essential nutrient such as protein than non-malnourished children in order to catch up the growth rate⁴.

In order to solve undernutrition problem, the Indonesian government's has a several therapeutic nutrition care program for undernourished children, one of them is supplementary feeding program in a form of biscuit. This program is done by giving 90 packages of biscuit that must be consumed by undernourished toddler during 90 days. The packages contains of 10 pieces of biscuits or equivalent with 120 g of biscuit⁵.

The supplementary biscuit is enriched with macro and micro nutrient formula that is important to support the catch-up growth for undernourished children. This

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biscuit only have one flavor, so consuming the same biscuit everyday could lead to boredom.

Naturally, human genetics encourages people to accept more sweetness than bitterness. Dislike for bitterness occurs as a protective instinct to avoid toxic consumption that usually has a bitter taste. On the contrary, the fruits that are the source of human food have a tendency that tend to be sweet⁶. Therefore, sweet food tend to be more accepted even by the children with strong taste aversion⁷. Moreover, the development of product for children need the involvement of the targeted consumer to determine the successfully product⁶.

Macaron is a traditional European food origin from France. Macaron comes from Italian language makarone, maccarone, or maccharone, and in 1950 it called Les Origines de la Langue Franciois which mean pasta and cheese product. Macaron is made from white egg, sugar, and almond flour. It has two shell shapes which have creamy filling in the middle⁸. Macaron have a nutty sweet taste. The sweet taste carried by macaron might be easily accepted by the children, so formulation of the macaron as the nutrient delivery food can be potential. However, the substitution of macaron have not been published before. In this study, the researchers want to assess the acceptance and nutrient value of macaron substituted with government’s supplementary feeding biscuit as an alternative therapeutic feeding for undernourished children in Surabaya, Indonesia.

METHOD

This is true experimental study design with completely randomized design. The three formula was developed in this research with five times of replication for each formula.

The research was done in September to November. The development of formula was held in Nutrition Laboratory, Faculty of Public Health, Universitas Airlangga, Indonesia.

The main ingredient of macarons was egg white, sugar, and almond flour as a standard formula. In the developed formula, as much as respectively 13% and 16% government’s supplementary feeding biscuit (MP-ASI biscuit) to substitute the almond flour. Also, there was an addition of isolate protein to increase the nutrition value. The ingredient of each formula is describe in table

1. All the formulas filled with butter cream filling made from cream and dates. The composition and amount of added dates in butter cream were same for all formulas

The first step to process the formula was started by refining MP-ASI biscuit and almond flour. The flour then was mixed with sugar before was strained to smoothen the texture of the formula. The next step followed egg white stir for 5 minutes. The dry ingredient then was added to egg whites batter. The batter was poured onto baking sheet with diameter as big as 2.5 cm. The molded batter then was baked using oven in a 150°C for 20 minutes. The upper and lower temperature of the oven are the same. The macaron then was filled with butter cream with added dates.

The formulas then was tried to 25 pairs of toddlers (aged 12-36 months old) and the mothers as untrained panelists in order to assess organoleptic acceptance level of each formula including color, aroma, texture, and taste. The acceptance level for organoleptic indicators was measured using facial expression scale for the toddlers interpreted by the mothers. The best formula according to organoleptic parameters will be determined using friedman test ($\alpha = 0.05$). The best formula based on organoleptic test then would be analyzed with laboratory test for the protein content with khjedal method. This research has been approved by Ethical Committee of Health Research, Public Health Faculty, Universitas Airlangga.

Table 1: The formulation of developed product

Composition (%)	Formula		
	F0	F1	F2
Almond flour	23	9.7	6.4
Sugar	28	28	28
Egg white	16	16	16
Butter	16.3	16.3	16.3
Dates	16.3	16.3	16.3
MP ASI biscuit	0	13	16
Isolate protein	0	1.6	1.6
Total	100	100	100

RESULTS AND DISCUSSIONS

Supplementary feeding biscuit provided by Indonesia governance is a nutrition program which is given to low income family with severe underweight

children. Every children will get 90 packages of biscuit for 90 days. The nutrient content of the supplementary feeding biscuit can be seen in Table 2.

In order to create the alternative product that have the close nutrient value to product for government's supplementary feeding biscuit, the amount of 13% dan 16% substitution formula was made. This amount was arranged based on previous pre-eliminary study which found that minimal 10% of added biscuit didnot interfere the formula consistency and the result of the product. The addition of 1.6 protein isolate was used to increase the protein content of the macaron, because the heating process might reduce the protein content of food. The amount of added protein isolate was accorded to Indonesian National Standard (SNI) for supplementary feeding product, which is minimal 8 g of protein isolate per 100 kcal product⁹.

Table 2: Nutrient Content per 100 g of Supplementary Feeding Biscuit (MP-ASI Biscuit)

Nutrient Conten	Unit	MP-ASI Biscuit
Total energy	Kcal	450
Total fat	g	14
Protein	g	9
Total carbohydrate	g	71
Fiber	g	5
Sugar	g	13
Zinc	mg	2.57
Phospor	mg	5.36
Vitamin A	mcg	266.51
Vitamin D	mcg	4.71
Vitamin E	mg	5.62
Vitamin K	mcg	12.36
Vitamin B1	mg	0.47
Niacin	Mg	4.5

The acceptance measurement for this study was use hedonic test with likert scale based on facial expression. The toddler as well as the mother was given the formulas as much as 5 g per formula. The mothers then was asked to read the facial expresion of their kids and filled the questionnaire¹⁰.

Texture: One of crucial sensory parameter for the food product testing is texture perception. Even though, the factor that influence the texture preference are still least understood¹¹. The International Standard Organization

defined texture as “all the mechanical, geometrical, and surface attributes of a product perceptible by means of mechanical, tactile, and where appropriate, visual, and auditory receptor”¹².

The human body do not have specific receptor to define the texture of the food. The texture preferences is rated when the food is placed in the mouth. The chewing process is the most decisive process to define someone's texture contentment. The texture preference was also driven by the age. Babies and young children tend to refuse the food which are difficult to be manipulated in the mouth based on their stage of physical development and mouth behavior^{13,14}.

All the standard and modified macaron formula has a little crunchy texture and chewy texture. The center of the shell have a cavity that facilitate the chewing process. The hedonic test showed that among the formulas, there were no significant differences in texture acceptance ($p>0.05$). It indicated that the addition of 13% and 16% MP-ASI biscuit in macaron batter did not interfere the batter consistency, and at the end, the macaron texture acceptance.

Aroma: A study held by Monnery-Patris et al. showed that the food rejection in toddler might be influenced by the olfactory cues¹⁵. Another study described that the food liking in toddler was driven by the odor liking. This food liking correlated to odor liking was found stronger in 12 month olds and weaken after the toddler reach 22 month olds¹⁶.

Aroma of the F0 (basic formula) was dominated by almond flour and vanilla smell. The modified formula had sweet biscuit smell hint. The organoleptic and friedman test showed that there were no difference in aroma acceptance level among three formulas. The average score for aroma acceptance were 2 out of 3 points, so the aroma of the modified formula was quite acceptable.

Color: Visual exposure including color, appearance, and portion play important roles in stimulating the food preference. It is also influence the food choice, especially in children, so the appearance of the food is important in order to introduce the novel food to the children¹⁷.

Color is one of visual cues that play important role in the food acceptance. Color might affecting the expectation of appetizing of food, which could lead to

the food choice. The food color gave a perception of the food flavor¹⁸.

This research did not include the addition of the food coloring agent in order to keep the objectivity of the color acceptance among the formula. The Mates (Macaron Dates) have a cream-colored tone, and the substitution of the MP-ASI biscuit did not too much change the formula's color. Therefore the statistically analysis showed that there were no difference in food acceptance based on color variable ($p > 0.05$).

Flavor: Many research showed that flavor is a key factor which driven the human's food choice. Naturally, human genetics encourages people to accept more sweetness than bitterness. Dislike for bitterness occurs as a protective instinct to avoid toxic consumption that usually has a bitter taste. On the contrary, the fruits that are the source of human food have a tendency that tend to be sweet⁶. Therefore, sweet food tend to be more accepted even by the children with strong taste aversion⁷.

The flavor of the macaron were dominantly sweet. This sweetness level were increased by the addition of MP-ASI biscuit since the biscuit also contain sugar. The children tend to like the sweet food, in this research, the highest acceptance was notably found in F2 formula (16% MP ASI).

The acceptance of the formulas: Based on the organoleptic indicators, the most favorable formula were F2 (16% MP-ASI biscuit) (Fig 1.). This research reinforced that the most key factor which driven the food acceptance among toddler was the taste variable. The substitution of almond flour with MP-ASI biscuit enhance the acceptance of the macaron.

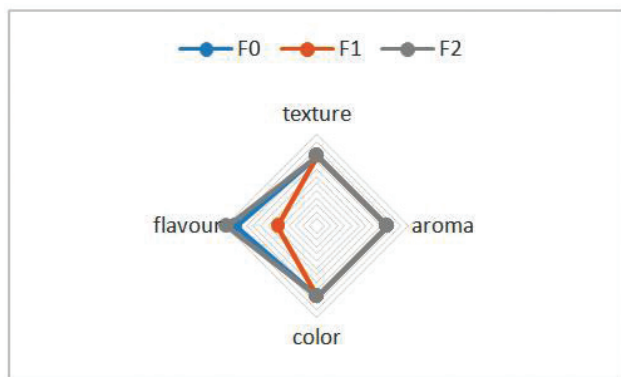


Figure 1: The acceptance of the formula

The F2 formula contain 16% MP-ASI biscuit have a better acceptance compared with the other formula.

It is indicated that the sweeter the food taste, the more acceptable the food. Since the texture acceptance did not show the significant differences in the acceptance level, the increase proportion of MP-ASI biscuit substitution in the future research is potentially to be done. Otherwise, the use of facial expression scale in order to measure the acceptance of the toddler toward the formulas might be the limitation of this study. Since the toddler have not do the verbal communication effectively, the mother's perception of the toddler expression could be misleading.

Nutrient content: Beside the acceptance of the food product, the nutrient content should be the first consideration in developing specialized formula for undernourished children. The laboratory test showed that the F2 formula contains 8.9 g protein per 100 g formula. The number of protein from the laboratory test declined compared to the indirect protein equation based on Indonesia Food Composition Table (DKBM). Indirect equation showed that protein content per 100 g macaron should be 18 g. This might due to the cooking process of the macarons which used high temperature. The high temperature and the length of the cooking time might break chemical boundaries of the protein and make the protein content decrease¹⁹.

The protein content were slightly below the WHO recommendation standard for supplementary feeding for moderate malnourished children which required the protein value as much as 20 g per 1000 Kcal. This formula contain 18.7 g protein per 1000 Kcal⁴. Although there were a decrease in protein content in the best formula, the protein content of the F2 were closed to government's MP-ASI biscuit (8.9 vs 9 g per 100 g). So, it can be conclude that F2 can be a good alternative supplementary feeding for undernourished children.

CONCLUSIONS

There were a differences in flavor indicator among the formula, but not in texture, aroma, and color acceptability. The most acceptable formula is F2 (16% MP-ASI biscuit). The F2 formula (16% MP-ASI biscuit) have a close protein content to government's MP-ASI biscuit (8.9 vs 9 g). Therefore, this value is still below the WHO recommendation for moderate undernutrition children.

The modification of macaron substituted with supplementary feeding biscuit can be a potential alternative for undernourished children in Indonesia, especially

in urban area where the ingredients of macaron can be easily found. Further research with higher proportion of MP-ASI biscuit can be potentially done to increase the nutrient value of snack for undernourished children.

Conflict of Interest: All of the listed author have no affiliation with or involvement in any organization or entity with any financial interest or non financial interest in the subjects matter or material discussed in this manuscript

ACKNOWLEDGEMENTS

We would like to give thanks to The Ministry of Health, Republic of Indonesia along with Faculty of Public Health Universitas Airlangga to give the financial support for this study. Also we thank to for Mojo Public Health Centre Surabaya. This study had presented in International Conference of Public Health for Tropical and Coastal Development at Semarang, Central Java Province, Republic of Indonesia in July, 2018.

Ethical Clearance: The protocol of the study was consider ethical issues based on Helsinky Agreement. This study had been reviewed and supervised by Institutional Review Board Faculty of Public Health Universitas Airlangga

REFERENCES

1. Ministry of Health, Republic of Indonesia. Basic Health Research 2013 [Internet]. 2014. Available from <http://www.depkes.go.id/resources/download/general/Hasil%20Riskasdas%202013.pdf> accessed in 11 September 2017.
2. Center of Statistic, East Java Province. East Java in Number 2015 [Internet]. 2016. Available from http://jatim.bps.go.id/4dm!n/pdf_publicasi/Jawa-Timur-Dalam-Angka-2015.pdf accessed in 20 September 2017.
3. Victora CG, de Onis M, Hallal PC, Blossner M, Shrimpton R. Worldwide Timing of Growth Faltering: Revisiting Implications for Interventions. *Pediatrics* [Internet]. 2010;125(3):e473–80. Available from: <http://pediatrics.aappublications.org/cgi/doi/10.1542/peds.2009-1519>
4. World Health Organization (WHO). Technical note: supplementary foods for the management of moderate acute malnutrition in infants and children 6–59 months of age [Technical note]. Geneva, World Health Organization [Internet]. 2012;20. Available from: http://apps.who.int/iris/bitstream/10665/75836/1/9789241504423_eng.pdf?ua=1&ua=1
5. Ministry of Health, Republic of Indonesia. Supplementary Feeding Guidelines [Internet]. 2011. Available from <http://gizi.depkes.go.id/wp-content/uploads/2011/11/Panduan-PMT-BOK.pdf> accessed in 10 September 2017.
6. Popper R, Kroll JJ. Consumer testing of food products using children [Internet]. *Developing Children's Food Products*. Woodhead Publishing Limited; 2011. 163-187 p. Available from: <http://dx.doi.org/10.1533/9780857091130.3.163>
7. Wardle J, Cooke L. Genetic and environmental determinants of children's food preferences. *Br J Nutr*. 2008;29(SUPPL.1):15–21.
8. Gordon, Kathryn and Anne E. Mc Bride. 2011. *Les Petite Macarons*. Pennsylvania : Running Press
9. National Agency of Drug and Food Control, Republic of Indonesia. The Regulation of The Head of The Food Regulatory Agency Number 31 in 2013 about Monitoring of Specialized Formula for Growth [Internet]. 2013 Available from <http://jdih.pom.go.id/showpdf.php?u=A28jMAnsQe71iIByMMO2%2BMXYOegf1Qa0z%2BS8xRSn%2BIY%3D> accessed in 12 September 2017
10. Guinard J-X. Sensory and Consumer Smiley Face Testing With Children. *Trends in Food Science & Technology* 11 (2001) 273–283.
11. Kravchuk O, Torley P, Stokes JR. Food Texture is Only Partly Rheology. *Food Mater Sci Eng*. 2012;349–72
12. International Organization for Standardization (ISO) ISO11036. Sensory Analysis – Methodology – Texture Profile [Internet]. 1994. Available at http://www.iso.org/iso/catalogue_detail.htm?csnumber=19016
13. Szczesniak AS. Texture is a sensory property. *Food Qual Prefer*. 2002;13(4):215–25
14. Jeltama M, Beckley J, Vahalik J. Food texture assessment and preference based on Mouth

- Behavior. *Food Qual Prefer* [Internet]. Elsevier Ltd; 2016;52:160–71. Available from: <http://dx.doi.org/10.1016/j.foodqual.2016.04.010>
15. Monnery-Patris S, Wagner S, Rigal N, Schwartz C, Chabanet C, Issanchou S, et al. Smell differential reactivity, but not taste differential reactivity, is related to food neophobia in toddlers. *Appetite*. 2015;95:303–9
 16. Wagner S, Issanchou S, Chabanet C, Lange C, Schaal B, Monnery-Patris S. Liking the odour, liking the food. Toddlers' liking of strongly flavoured foods correlates with liking of their odour. *Appetite*. 2014;81:60–6.
 17. Wadhwa D, Capaldi-Phillips ED. A review of visual cues associated with food on food acceptance and consumption. *Eat Behav*. 2014;15(1):132–43.
 18. Spence C, Levitan CA, Shankar MU, Zampini M. Does food color influence taste and flavor perception in humans? *Chemosens Percept*. 2010;3(1):68–84
 19. Sundari, D., Almasyhuri, & Lamid, A. Effect of Food Processing on Nutrient Composition of Protein Source Food. *Media Litbangkes*, Vol. 25, No. 4, December 2015, 235-242

Differences of Family Support and Iron Tablets Consumed Post Pregnant Women Classes and Midwives Counseling

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ABSTRACT

Year 2013, nutritional anemia prevalence in Indonesia pregnant women as 37,1%. Various efforts to handle it, obiter improving prenatal care by health personnel, involving families in pregnant women classes and midwives counseling. Research aims to know the difference of family support and amount iron tablets consumed between two intervention. Quasi experiments were performed with two groups, post test only. Population of all pregnant women in Sukasari Health Center who have received first prenatal care and 30 iron tablets for a month, regardless of gestational age and anemia status. First group intervention with 30 pregnant women attended pregnant women class with their families, the second with 30 pregnant women received midwife counseling with their families. Data collection one month later, through interview and see tablet compliance card. The results, 56,7% pregnant women received high category family support for checking pregnancy and 63,3% to consume iron tablets, same as two groups. As 60% pregnant women in first group consumed 30 iron tablets, in second group 93,3%. Mann Whitney different test of two groups showed no significant difference ($p>0,05$) family support for prenatal care and consume iron tablets, also based on husband educational and occupation. There's significant differences ($p0,003$) the number of iron tablets consumed. Counseling motivate based on individual conditions more effective to overcome the side effects and benefits felt after consumed tablets and forgot factor. Both interventions should be implemented to all pregnant women at least once involvement the family, so support is stronger and more adherent to consume iron tablets.

Keywords: *support, iron, counseling, pregnant, classes*

INTRODUCTION

As much 528.7 million women worldwide assumed anemia, as 32,4 million is pregnant women (15-49 years) as 11,5 million at south east asia region.¹ At least half of this anaemia burden is assumed to be due to iron deficiency.² Anaemia in pregnancy was a global health problem especially in developing countries and Indonesia among these.³ The basic health research in Indonesia year 2013, showed that the prevalence of nutritional anemia in pregnant women in Indonesia

is still high (37.1%) and requires serious attention.⁴ Anemia is one of the risk factors of maternal mortality, low birth weight as well as risk factors infections of the fetus and mother, abortion, and premature birth.⁵

Model of ante natal care developed by WHO in 2016 which is expected to provide care to pregnant women in a focused, individualized manner, centered on each contact and ensure each contact is given effective and integrated clinical practice (intervention and tests). More over providing relevant and timely information, offering psychosocial and emotional support by practitioners with good clinical and interpersonal skills worked in a well functioning health system. It turned out that the evidence shows that perinatal mortality increased if only with four ante natal care visits. WHO recommends a minimum of eight contacts, five contacts in the third trimester, one first trimester contact, and two second

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trimester contacts. WHO assumes that each country will adjust this new model in its ante natal service package and determine what care is given to each contact, who and where it is given.⁵ Pregnant women should be more frequently checked if they have problems, feel any signs of danger or worried. Pregnant women should get complete pregnancy services according to the standard.

As much 49 % pregnant women worldwide and 45 % at south east asia region who had anemia is amendable to iron supplementation. Anaemia is defined as blood haemoglobin concentration < 110 g/L for children and pregnant women.¹ A pregnant woman is called anemia when hemoglobin lower than 110 g/L, in the second trimester of pregnancy hemoglobin concentration usually decreases about 5 g/L. When anemia is accompanied by an indication of iron deficiency (low ferritin levels), is referred to as iron deficiency anemia. Low hemoglobin concentration indicates moderate or severe anemia which is at risk of preterm labor, maternal and child mortality, infectious diseases. Iron deficiency anemia can affect growth and development during the uterus and in the long run. Hemoglobin concentration of greater than 130 g/L also can be associated with negative pregnancy outcomes such as premature delivery and low birth weight.⁶

Given that it is estimated that at least half of anaemia cases will have causes other than iron deficiency, current strategies to control anaemia may need to be re-evaluated to ensure that the various factors contributing to anaemia have been identified and addressed properly in an integrated manner. In malariaendemic regions, malaria control can reduce anaemia and severe anaemia by over a quarter and by 60%, respectively. There is also an increased need for improved water and sanitation and deworming in populations affected by hookworms and schistosomiasis; these populations typically live in rural tropical regions with poor sanitation facilities, especially in areas of Asia and Africa.¹

Iron deficiency anaemia should ideally be addressed through dietary diversification and improved access to foods that have high levels of bioavailable iron, including animal products. Daily or intermittent iron supplementation, alone or together with folic acid and other micronutrients, can be used for high-risk groups (children, pregnant women and women of reproductive age), to improve iron intakes. However, supplementation programmes need to address challenges that have

limited their effectiveness, such as poor attendance at antenatal clinics, insufficient doses for supplementation, or insufficient emphasis on behavioural aspects of using supplements on a regular basis. Other foodbased approaches, such as fortification of staple foods and condiments, can also be used to improve iron intake in the general population. Fortification of wheat flour with iron and other vitamins and minerals is currently mandated in 80 countries but the extent of coverage varies.¹ During pregnancy, women need to consume iron supplements to make sure they have enough iron to prevent iron deficiency. Therefore, in most low- and middle-income countries, iron supplements are widely used by pregnant women to prevent and improve iron deficiency and anemia during pregnancy. If supplementation starts after the first trimester of pregnancy will not help prevent birth defects. Gastrointestinal distress is a common experience of women who consume large amounts of additional iron, especially on an empty stomach. So gastrointestinal effects are considered an important side effect for base the intake level in large quantities. The use of high doses of iron supplements is related to constipation and other gastrointestinal effects, including nausea, vomiting and diarrhea, with frequency and severity depending on the amount of iron released in the stomach.⁶

In Indonesia iron tablets can be obtained free of charge at public health center, village health post, integrated service post and purchased in pharmacies. Iron tablets must be taken for 90 consecutive days without interruption during pregnancy.⁷ Compliance of iron tablet consumption is the behavior in consuming iron tablets according to the rules both in amount consumed and how to consume properly. The supply of iron (Fe) tablet of 90 for each pregnant mother became the primary strategy to reduce the prevalence of anemia since the 1980s. The provision of iron tablets is not yet effective because of the lack of coverage of iron tablets as well as low maternal compliance in consuming iron tablets. Compliance one important factor that determines the success of giving full iron tablets, next contributes to the success of prevention and treatment of anemia in pregnancy. The results showed that majority of participants had a low compliance of iron tablet consumption as 33.7%.⁸ Iron supplementation coverage was 88.77%, however, the prevalence of anemia was high (21.88%).⁹ Routine daily iron supplementation during pregnancy resulted in a significant reduction of 20% in incidence of low birthweight in the intervention group compared with control.¹⁰

Adherence to consumption of iron tablets is still very low, which is largely due to low knowledge of iron tablets, have negative attitude so that poor practices thus requiring health education.¹¹ Another study indicated the lack of knowledge regarding iron rich foods and the importance of iron supplementation during pregnancy. Educating antenatal women about importance of consumption of iron tablets and implementing this into practice will help for prevention of anaemia.¹² Efforts to remind mothers to consume iron tablets among others done with mobil phone.⁸ Another effort is health education through maternal classes and counseling by the midwife, this has become a recommended activity carried out at the public health center by the Indonesian health ministry. Pregnant women need more attention from their spouse or family.¹³

More of pregnant women did not get support from their family/husband to consume iron tablets. The type of social support can be in the form of emotional support, instrumental support, information support and appraisal support. Social support is the feedback provided through contact with the same and valued colleagues. Forms of the emotional support are influence, self-esteem, and attention; the instrumental supports are manpower, money, time; the information supports are suggestions and information; the appraisal supports are input and affirmation.¹⁴

During pregnancy the mother needs significant support from the husband, should be prepared to give extra attention during pregnant, should remind and motivate the wife to consume nutrients. The role and support of husbands in the improvement of family health includes efforts to raise attention to health problems and is the greatest challenge aimed at helping families learn how to be healthy.¹⁵ Suggested the need to conduct education and training to build the knowledge and experience of pregnant women about the nutritional status and health behavior was good with involving the active participation of health workers, community, family, mother and husband.¹⁶ Pregnant mother class and midwife counseling give influence to pregnant mother and his family. Families are expected to participate in such efforts at least once.

Based on the above description, the researcher examines how the difference of family support for pregnant women to check pregnancy and consumed iron tablets and the amount of iron tablets consumed by

pregnant mother after pregnant women and their family follow pregnant mother class and midwife counseling?

METHOD

The research design is quasi experiment post test only with primary data source from pregnant mother. The population were all pregnant women in Sukasari community health center who have received first prenatal care and 30 iron tablets for a month, regardless of gestational age and anemia status. Sampling in this research using non probability sampling that is by purposive sampling. The number of samples is 30 pregnant women for pregnant class group and 30 for midwife counseling group.

There are two groups of intervention, the group that joined the pregnant mother's class and the group of pregnant women join the midwife counseling. In each group include family on one of its activities. Appropriate research design data collection is done a month after pregnant mother and midwife counseling, that is the time of pregnancy checked. Univariate analysis includes frequency distribution, test result of normality of distribution to all group of data obtained that data not normally distributed, then bivariate test to test the difference using non parametric statistic.

Pregnant women class is a group studying with maximum participants 10 people. In this class, they're will learn together, discuss and exchange experiences about maternal child health thoroughly and systematically and can be carried out on a scheduled and ongoing basis.¹⁹ Pregnant women class is facilitated by midwives / health workers by using the pregnant women class package includes maternal child health books, flip charts, pregnancy class guidelines, pregnant women facilitator's handbook and pregnant women's gymnastics book. The pregnant women class must be attended at least four meetings, preferably one meeting with husband or family. Pregnant women class participants should be 20 to 32 weeks of pregnancy, because at this strong condition, not afraid abortion occurs, effective to do gymnastics pregnant. The husband / family participates at least one meeting, they can follow important material, such as childbirth preparation or other materials.

Counseling during prenatal care includes about pregnancy care, prevention of congenital abnormalities, early initiation of breastfeeding, puerperium care,

newborn care, exclusive breastfeeding, family planning, immunization in infants; given in stages at each visit. Counseling is a two-way communication process, involving both the giver and the recipient of the message, occurs verbally and non-verbally, process to help others to be able to make choices and solve their own problems. Interpersonal communication skills of health workers affect the changing behavior of clients. Counseling steps are G - A - T - H - E - R stand for Great, Respectfully, Asses needs, Tell information, Help choose, Explain and demonstrate, Refer or return visit.

RESULTS AND DISCUSSIONS

Implementation of pregnant women class is done by involving families aimed at improve compliance of iron tablet consumption during pregnancy. Observation using a checklist of pregnant women class activities shows all the steps taken. Implementation of the midwife counseling is done by involving the family in at improve compliance of iron tablet consumption during pregnancy. Observation by using a checklist of pregnant midwife counseling activities indicates all the steps taken.

The following table about support family to pregnant women to check pregnancy post- pregnant women class and midwife counseling. Just a number of 56.70% of pregnant women get family support for pregnancy check in the high category, the percentage of the category is the same in two groups.

Table 1: The support family to pregnant women to check pregnancy post- pregnant women class and midwife counseling (n = 30 each group)

Statistical measures	Support family to check pregnancy		
	Group 1*	Group 2*	Total
Mean	38,73	41,17	39,95
Median	40,00	42,50	40,00
Minimal	21,00	35,00	21,00
Maksimal	45,00	45,00	45,00
Shafiro Wilk Test	0,000	0,000	0,007
Low Category	13,00 (43,30%)	13,00 (43,30%)	26,00 (43,30%)
High Category	17,00 (56,70%)	17,00 (56,70%)	34,00 (56,70%)

* Group 1 = pregnant women class

** Group 2 = midwives counseling group

The results above have not shown the success of pregnant women classes and midwife counseling to increase support from most families. It is hoped that the support of the whole family to pregnant women to check their pregnancy, the support is expected after the family get information about pregnancy care through its participation in pregnant women class and counseling. This expectation appears refer to the results of research that there is influence of pregnant class to pregnancy care significantly. Through the pregnant women class is expected to do maternal care well for the realization of optimal maternal and infant health. The optimal of family support through interventions needs further study, possibly because their participation only once or perhaps the implementation of intervention has not been optimal. It is worth reviewing even further research for how to increase family support for pregnant women to check their pregnancies.

Table 2: The support family to pregnant women to consume iron tablets post- pregnant women class and midwife counseling (n = 30 each group)

Statistical measures	Support family to consume iron tablets		
	Group 1	Group 2	Total
Mean	25,13	26,97	26,05
Median	25,00	27,00	25,00
Minimal	15,00	23,00	15,00
Maksimal	30,00	30,00	30,00
Shafiro Wilk Test	0,055	0,000	0,000
Low Category	11,00 (36,70%)	11,00 (36,70%)	22,00 (36,70%)
High Category	19,00 (63,30 %)	19,00 (63,30 %)	38,00 (63,30 %)

Just a number of 63.30% of pregnant women received family support to consume iron tablets in the high category, the percentage of the category is the same in two groups. Intervention was not encouraging all or most families to provide support to pregnant women to consume iron tablets. Intervention is based on research that there is a significant relationship between the support of family with the level of compliance pregnant women consume iron tablets. Efforts to increase family support are expected to improve maternal compliance of taking iron tablets so that the coverage of iron tablets increases and anemia of pregnant women is decreased. The lack of optimal family support through interventions needs

further study, possibly because of their participation only once or perhaps the implementation of the intervention has not been optimal. Need to examine even further research for how to increase family support to pregnant women to consume iron tablets. The following table about the amount of iron tablets consumed.

Table 3: The amount of iron tablets consumed by pregnant women post pregnant women class and midwife counseling (n = 30 each group)

Statistical measures	Group 1	Group 2	Total
Mean	28,87	29,83	29,35
Median	30	30	30
Minimal	21	27	27
Maksimal	30	30	30
Consumed 30 iron tablets	18 (60 %)	28 (93,3 %)	46 (76,67 %)
Shapiro Wilk Test	0,000	0,000	0,000

Percentage of pregnant women who consumed 30 iron tablets for a month, more in the midwife counseling group (93.30%) than in the pregnant women class group (60%). Counseling can encourage almost pregnant women to consume iron tablets daily for a month (indicating high compliance). Counseling is individual communication, while the class of pregnant women is group communication. Individual communication is more intense on individual issues than the class of pregnant women. However in some cases the pregnant women class have the advantage of exchanging experience in solving problems between pregnant women.

Use different test U Mann Whitney, there's no significant difference between pregnant women class group and midwife counseling group in family support to check pregnancy (p 0,080) and support to consume iron tablets (p 0.077). Another result there's significant differences (p 0.003) between two groups in the amount of iron tablets consumed by pregnant women. Based on husband's education, there's no significant different family support for pregnancy check (p 0,143) and no significant different family support to consume iron tablet (p 0,888). Based on husband's occupation, there's no significant different family support for pregnancy check (p 0,357) and no significant different family support to consume iron tablet (p 0,977).

The results showed no significant difference between pregnant women class and midwife counseling group in family support to pregnant mother to check pregnancy and support to consume iron tablet. Mother and her family get information and exchange information about pregnancy, childbirth, childbirth and newborn care on pregnant women class. The class of pregnant women should be attended by at least four meetings, preferably at least one meeting attended with husband or family. Social support is still needed and must be pursued through other efforts to be suggestions for further researchers and a challenge for health workers in the field. This is in line with other research that suggests strategies such as social support from families, stronger community-based counseling, and increased health care provider and community awareness of preeclampsia are critical for women to understand the benefits of supplementation and resolve confusion caused by current descriptors used for anemia and hypertension.¹⁷

The results that have not been optimal are likely due to the lack of optimal implementation of activities by the officers, although in this study observation sheets have been used to monitor the implementation of classes for pregnant women and counseling by midwives and the results are good. Pregnant women class material is pursued in accordance pregnant women class guidelines that contain pregnancy care, childbirth, postnatal care, newborn care, mythos, sexually transmitted diseases and birth certificates. But do not rule out any other material according to the needs of pregnant women who become participants. The material or message that will be delivered to the target class of pregnant women and midwife counseling should be tailored to the health needs of individuals, families, communities so that the material can be perceived directly benefited. To facilitate understanding and attract the attention of the target material should be delivered using a language that is easily understood by the target. To facilitate understanding and attract the attention of the target material should be delivered using a language that is easily understood by the target.

The possibility of not optimal implementation by officers can be explained by the results of other studies of health care providers. The result showed most of the health care providers were able to recognize three signs of anaemia, taken to test for anaemia or the underlying causes almost everyone measuring of the haemoglobin concentration, almost half measuring

the serum ferritin and fraction stool tests for parasites. Almost everyone mentioned the lack of laboratories, the lack of education materials as the barrier to diagnosing anaemia and controlling parasites. There are gaps in the clinical records in the health centres. Recommended to strengthen the counselling capacities on a healthy providers, prevention and treatment of anaemia, and use of growth charts. More other develop and include indicators of activities on the education.¹⁸

This research then shows the results, as a significant difference between pregnant women class and midwife counseling groups in the amount of iron tablets consumed by pregnant women. This difference is thought to be due to more instantiated knowledge changes in the midwife counseling group. Consumption of iron tablets as 30 tablets in the counseling group showed that compliance of post-counseling iron tablet consumption was higher than adherence in pregnant women class. Good counseling is necessary encourage mothers to abide by consuming iron tablets, also encourage mothers to adhere consumption of iron tablets. The advice from the midwife to consume iron tablets as well as the information submitted by the midwife that the tablet will be beneficial to the mother's health.

Other studies showed many factors related to pregnant women compliance iron tablets, such as religion, level of education of women and their husbands and socioeconomic status were found to be significantly associated with the prevalence of anemia in pregnancy. Low socioeconomic class, illiteracy, Hindu religion were significantly associated with high prevalence of anemia during pregnancy in Indian women.¹⁹ Residence, educational status, iron supplementation during pregnancy, and meal frequency per day were statistically associated with anemia among the pregnant women. Awareness creation and nutrition education on the importance of taking iron supplementation and nutritional counseling on consumption of extra meal and iron-rich foods during pregnancy are recommended to prevent anemia in the pregnant women.²⁰

Another advantage if pregnant women was not anemia, other studies have been found diagnosis and treatment of physiologic factors, especially anaemia, would reduce the risk of postpartum depression.²¹ Involvement of husbands and other family members during pregnancy and birth should also be encouraged and re-inforced by health promotion programmes. Community and religious leaders should be engaged to support key messages.²²

The message and clear directions from the health workers on mothers indicating a good awareness from mothers. However, mothers did not know the need to consume iron tablets on a continuous basis and start taking them early in pregnancy. Monitoring and counseling provided by community officials (in Indonesia is a cadre) is considered one of the key successes of this program. Through counseling there is a two-way communication, midwives are expected to counsel properly so as to encourage changes in the behavior of message recipients, including maternal compliance in consuming iron tablets can be achieved.

Another thing to consider in tackling anemia in pregnant women is to intervene to teenage girls long before they get pregnant. Several studies have found low knowledge about anemia and foods that should be eaten to prevent anemia, a neutral and even negative attitude towards preventing anemia. This data directs the need for health education for young women about prevention of anemia through various methods and on various occasions.^{23,24,25} It is necessary to advocate for policy makers in the health department and at the public health center to develop more intensive reproductive health activities for girls in school. This health education will be an investment for the creation of pregnant women who do not suffer from anemia in the next decade. Prevention and improvement efforts must begin to be intensified and not only dwell on controlling problems now.

CONCLUSIONS

The research conclusion is no difference in family support for pregnant women to checking pregnancy and consumed iron tablets, but is a significant difference in the number of iron tablets consumed after pregnant women classes and midwife counseling. Recommended that pregnant women classes and midwife counseling be implemented to all pregnant women, at least one time involvement the family, if possible more often so the support is stronger. Further research is suggested to develop a model of pregnant women class that can encourage pregnant women to consuming iron tablets completely, by paying attention to packaging material according to the conditions and needs of the audience.

Conflict of Interest: There is no conflict of interest.

ACKNOWLEDGEMENTS

Thank you submitted to the chairman of Institute of Health Sciences Dharma Husada Bandung who has been supportive and has financed the research.

Ethical Clearance: The study was carried out by following the rules of research ethics including the signing of informed consent, privacy, anonymity, confidentiality and protection from discomfort.

REFERENCES

1. WHO. The global prevalence of anaemia in 2011. http://apps.who.int/iris/bitstream/handle/10665/177094/9789241564960_eng.pdf;jsessionid=05A34AF302D1891AC59BDB7E59E6FB9B?sequence=1
2. WHO/UNICEF/UNU. Iron deficiency anaemia assessment, prevention, and control: A guide for programme managers. Geneva, World Health Organization, 2001. http://www.who.int/nutrition/publications/en/ida_assessment_prevention_control.pdf.
3. Agus Y, Horiuchi S. Factors influencing the use of antenatal care in rural West Sumatra, Indonesia. *BMC Pregnancy Childbirth*. 2012; 12(1): 9. <https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/1471-2393-12-9>.
4. Ministry of Health Republic of Indonesia. Basic health research 2013. <http://labmandat.litbang.depkes.go.id/riset-badan-litbangkes/menu-risernas/menu-riseksdas/374-rkd-2013>.
5. Ministry of Health Republic of Indonesia. Strategic Planning Ministry Of Health 2015-2019. http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/indonesia/restra_2015_translated_1.pdf.
6. WHO. Recommendations on Antenatal Care for a Positive Pregnancy Experience: Summary. <http://apps.who.int/iris/bitstream/handle/10665/259947/WHO-RHR-18.02-eng.pdf?sequence=1>.
7. WHO. Preventing and controlling iron deficiency anemia through primary health care. 1990. http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/ida_preventng_control_primary_healthcare.pdf.
8. Rukmaini N.I, Lipoeto M, Effendi N. Effect of Mobile control application on the compliance of ferrum tablets consumption among pregnant women. 2018. *Journal of Medical Sciences*, 18: 63-68. DOI: 10.3923/jms.2018.63.68 URL : <https://scialert.net/fulltext/?doi=jms.2018.63.68>.
9. Langi G.G, Raharto S, Ahmad R. A. Evaluation of iron supplementation program for pregnant women in Gunungkidul, Indonesia, 2015. The 3rd International Conference on Public Health 2017. <http://tiikmpublication.com/Proceedings/doi/icoph.2017.3211.pdf>.
10. Imdad A, Bhutta Z. A. Routine Iron/Folate Supplementation during Pregnancy: Effect on Maternal Anaemia and Birth Outcomes. *Paediatric and Perinatal Epidemiology*, 2012, 26 (Suppl.1), 168–177 doi: 10.1111/j.1365-3016.2012.01312.x
11. Habib A, et al. Knowledge, attitude and practices of pregnant women regarding iron deficiency anemia in a rural area of Lahore. *Journal of Health, Medicine and Nursing* Vol.50, 2018. <https://iiste.org/Journals/index.php/JHMN/article/viewFile/42464/43732>
12. Sonkar, V.K., Knowledge and practices of pregnant women regarding the iron supplementation during pregnancy. *Journal of Community Medicine and Public Health*. 2017 Aug; 4(8) : 2891-2894 <http://www.ijcmph.com/doi/10.18203/2394-6040.ijcmph20173341>
13. Odmivar S. Associations of psychosocial factors with pregnancy healthy life styles. *PLoS ONE* 13(1):e0191723. <https://doi.org/10.1371/journal.pone.0191723>. <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0191723&type=printable>
14. Sarafino, P. 1994. *Health Psychology Bio psychosocial Interactions*. New York. Jhon Willey Sons, Inc.
15. Bobak, et al. 2005. *Maternity Nursing Textbook*. Jakarta: EGC.
16. Yusriani. Survey of nutritional status and health behavior of pregnant women in Bontomate'ne Health Center of Jenepono District, Indonesia. *Public Health of Indonesia*. 2016 June;2(2): 55-67 <http://stikbar.org/ycabpublisher/index.php/PHI/index>.

17. Birhanu, Z. Ethiopian women's perspectives on antenatal care and iron-folic acid supplementation: Insights for translating global antenatal calcium guidelines into practice. *Maternal Child Nutrition Journal* 2018; 14(S1): e12424. <https://doi.org/10.1111/mcn.12424>
18. Petrela E. Knowledge, attitude AND practice survey on anaemia and infant feeding practices of primary health care providers (PHCP). <https://www.unicef.org/albania/kap-survey-infant-feeding2010-en.pdf>
19. Lokare P.O, Karanjekar V.D, Gattani P.L, AKulkarni A.P. A study of prevalence of anemia and sociodemographic factors associated with anemia among pregnant women in Aurangabad City, India. *Journal of Nutrition and Metabolism* Volume 2015, Article ID 165430, 7 pages <http://dx.doi.org/10.1155/2015/165430> <https://www.hindawi.com/journals/jnme/2015/165430/abs/>
20. Gebre A, Mulugeta A. Prevalence of anemia and associated factors among pregnant women in North Western Zone of Tigray, Northern Ethiopia: A Cross-Sectional Study. *ANM Journal* 2012 Vol 6 issue 1 page 30 – 34.
21. Goshtasebi A, Alizadeh M, Gandevani S.B. Association between maternal anaemia and postpartum depression in an urban sample of pregnant women in Iran. *J Health Popul Nutr.* 2013 Sep; 31(3): 398–402.
22. Wulandari LPL, Whelan AK. Beliefs, attitudes and behaviours of pregnant women in Bali. <https://doi.org/10.1016/j.midw.2010.09.005>. *Midwifery.* Vol 27, Issue 6 December 2011, Pages 867-871.
23. Aprianti R, et all. Factors correlated with the intention of iron tablet consumption among female adolescents. *Jurnal Ners* Vol. 13, No. 1, April 2018. <http://dx.doi.org/10.20473/jn.v13i1.8368>
24. Bandyopadhyay L. Intervention for improvement of knowledge on anemia prevention: A school-based study in a rural area of West Bengal. 2017 *International Journal of Health & Allied Sciences.* Website: www.ijhas.in DOI: 10.4103/ijhas.IJHAS_94_16. <http://www.ijhas.in> on Saturday, September 22, 2018
25. Jalambo M.O. Short communication knowledge, attitude and practices of iron deficient and iron deficient anaemic adolescents in the Gaza Strip, Palestine. *Asian Journal of Clinical Nutrition* ISSN 1992-1470 DOI: 10.3923/ajcn.2017.51.56. [http:// docsdrive.com/pdfs/ansinet/ajcn/2017/51-56. pdf](http://docsdrive.com/pdfs/ansinet/ajcn/2017/51-56.pdf)

Effective Communication Methods for Increase Mothers Intention to Inspection Visual Acetic Acid Test

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ABSTRACT

Cervical cancer affects many women and deadly after breast cancer. The mortality rate is high, 70% patients come in advanced stage, one reason is early detection low coverage including VIA test. Research aims determined effective interventions to improve women intentions perform VIA test. Mixed methods explorative sequential conducted, first qualitative explorations to know factors related VIA test intention as basis message formulation. Next, quasi experimental two groups pre-post tests. The population is women 30-50 years, purposive sampling determined 30 women each group. Indepth interviews conducted eight informants, suggest IEC individuals through home visits with counseling supporting leaflets and IEC Groups through group discussions supporting video and stick posters in strategic places. The messages are VIA test definition, procedure with emphasis isn't painful, short times, quickly known results, fees and place services. who should tested, family supports. The results similar between group, 100% women in the weak intentions categories before intervention and switch to strong intentions categories after intervention. T test result showed significant difference of intention (p 0,000) before and after intervention in both groups and there's no significant difference in intention change (p 0,859) between two groups. The IEC individual as good as IEC Group method, the combination of techniques and media can improve the expected changes. No significant different (p>0,05) intention change based on education, occupation, married age, number of children. Interventions expected to continue so that stronger intention become to real behavior and expanded to other areas.

Keywords: IVA, intention, information education communication, counseling, group discussion.

INTRODUCTION

Cervical cancer is the second most common type of cancer in women worldwide. Almost 80% of cases occur in developing countries,¹ the prevalence of cancer in Indonesia 1.4 per 1000 population.² Chronic human papilloma virus (HPVs) infection is strongly associated with the development of cervical cancer. The screening for HPVs in the general population is urgently needed as a means of early detection of cervical cancer. In developed countries, incidence and mortality rates have decreased, which attributed largely to early detection. With screening and early detection, the progression of

precancerous cervical lesions can be completely avoided in most cases. In early stages, the cancer cervix is highly treatable.¹

Visual inspection of the cervix with acetic acid (VIA) is very sensitive for ectocervical lesions. The advantages of the VIA method are low cost, ease of use (can by paramedical), high sensitivity and immediate results. Its main limitation is a high rate of false-positive results, which may lead to over treatment if a "see and treat" policy is applied.³ Screening for precancerous and cancerous cervical lesions using VIA is a simple, low-cost, and efficient alternative to cytologic testing in low-resource areas.⁴ The VIA benefit would facilitate development of screening, diagnosis, treatment of cervical neoplasia and improve awareness of cervical cancer prevention.⁵

Early detection of cervical cancer needs a mechanism to establish and strengthen the multi-sectoral response in general for the prevention and control of cervical cancer

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and increasing awareness of the community towards cervical cancer screening and strengthening the health system in particular.⁶

Using planned behavior theory, try to find out which mothers are at what level in the planning stage of carrying out VIA tests. How far is the mother's intention to do VIA test and the factors associated with the problem. The results used as basis formulating messages and methods. The planned behavior theory that essentially behavioral beliefs as produce likes or dislikes, normative beliefs that generate awareness of the pressure of the social environment or subjective norms, control beliefs as beliefs about the existence of factors that can support or hinder the behavior and awareness of the strength of these factors.⁷

The underlying problem is the low coverage of VIA tests, the research problem is what is the more effective communication intervention to improve women's intentions of performing VIA tests. While the purpose of the study to determine the effective intervention in improving the intention of women performing VIA tests.

METHOD

Mixed methods research design⁸ is qualitative in order an assessment women intention to VIA test which will base the intervention formulation, and quantitative with experimental quasi two group pre-posttest design to see effectiveness of each intervention. The study conducted in Puter Bandung City on April - June 2017.

Qualitative data collection with in-depth interview to three informants had VIA test, three informants hadn't VIA test, one cadre, one midwife holded VIA test program. Interviews conducted at public health center and informant house. Analysis by arranging transcripts, reading the whole to build a general sense of information and reflect the overall meaning, detailed analysis by coding data, describing categories, themes, interpreting.

The population for quantitative method are women of childbearing age (30-50 years), with samples as formula 30 people each groups selected purposive sampling. The're intervention group (Group 1) and comparison group (Group 2) that received different IEC intervention.

The intervention group filled pre test, after that done intervention 1, one week later filled post test.

The comparison group filled pre test, then conducted intervention 2, one week later filled out post test. Pre-post test developed in structured interview arranged by innovation diffusion theory.

RESULTS AND DISCUSSIONS

Qualitative Research Results: All informants more know pap smear than VIA test. Unclear information about who at risk, procedures, VIA test cost, place of services, not yet known sure VIA test at local health center. Need clear information about VIA test. Rarely got health information from health workers directly. Direct education and counseling with the media became the choice in obtaining health information.

Informants who hadn't VIA test, they want to do VIA test but didn't know where, not known VIA test. The husband support to do VIA test not yet maximal, they hadn't expose clearly about VIA test so they submit decisions to the wife. Informants had VIA test, stated the VIA test isn't frightening as it was heard before, doesn't take long and fast results. The husband in favor of the decision to do the VIA test could be because the wife explained so the husband understand and support. The findings indicate that the behavior control arises from herself, the informant feels the importance of VIA test because it will be known how the health condition. Free cost is also the reason for the informant to perform tests, as well as friend invitation to perform the test.

All informants know cervical cancer that attacks the dangerous uterus, can be contagious. In part informants didn't know the risks and vulnerabilities of cervical cancer. All informants know the benefits VIA test to knowing the health condition as early as possible, if necessary the treatment can be done as soon as possible. Direct education and counseling with the media became the community's choice in obtaining health information.

Development of Intervention: Based on above analysis, interventions developed with the individual and group IEC. Individual IEC through home visit with counseling method and supporting with media leaflets. Group IEC through group discussion method, supporting video and stick posters in strategic places. The messages are VIA test definition, procedure with emphasis isn't painful, short times, quickly known results, fees and place services. who should tested, family supports.

Quantitative Research Results

Table 1: VIA Test Intentions Before and After Interventions

Intervention	Mean	Median	P value	Intention Category**	
				Weak	Strong
Indiv. IEC					
Before	44,97	45,61	0,518	77%	23%
After	77,89	78,07	0,167	0	100%
Group IEC					
Before	43,04	42,54	0,485	90%	10%
After	76,26	76,32	0,440	0	100%

* Shafiro wilk test

** Categories use cut of point 50 as the ideal average

That increased 32.92 score of intention after individual IEC also rose by 24.22 after group IEC, with cut of point 50, there's 100% women in weak category before intervention switch to strong category after intervention, the same in both groups.

Table 2: Different Test of Intention Between Two Groups

Variables	Type of intervention	Mean	t	p value
Intention Before	Individual IEC	44,97	1,415	0,163
	Group IEC	43,04		
Intention After	Individual IEC	77,89	1,769	0,083
	Group IEC	76,26		
Change of intention	Individual IEC	32,92	-0,172	0,859
	Group IEC	33,21		

Note: Intention different individual IEC before and after p 0,000

Intention different Group IEC before and after p 0,000

There're significant differences (p 0,000) of VIA test intentions before and after intervention in two groups. There's no significant difference (p 0,163) intentions between two groups at baseline, no significant difference (p 0.083) intention after intervention also no significant difference (p 0.859) intention change between two groups. Intention is the closest step to the occurrence of real behavior, which first arises knowledge, attitudes related to the expected behavior appear. The occurrence of intention changes is an indication that IEC, which is

carried out individually or in groups, can be used as an alternative method to encourage mothers to do VIA test.

Previous studies about VIA test showed 81.8 % lacking knowledge related to HVVs and cervical cancer including its nature, types, symptoms, transition mode, diagnosis, vaccination and possible complications. HPV's education program appropriate for different age groups and cultures represented an essential demand to upgrade women's knowledge and attitude towards HPV. Stressing nursing role in early detection of cervical cancer is a must in the gynecological outpatient's clinics.⁹

Another study showed a high percent of women knew that it is appropriate for all women to get cervical cancer screening, but only a small proportion of women actually got screening. There may be an opportunity to design educational materials for this population that will not only encourage participation in cervical cancer screening but also remediate misconceptions.¹⁰ This research tries to answer these suggestions where two approaches are developed, as individuals and groups with different media. Apparently both showed a change in intent to conduct a VIA test.

The increase in respondent's intentions was due to repeated intervention by home visits after the intervention, there's intended to strengthen the knowledge and understanding of respondents to the message delivered. Continual intervention is needed to make that intention more strong and become a real behavior. Rogers defines the diffusion of innovation as a process of disseminating the uptake of new ideas or things in an attempt to transform a society that occurs continuously from one place to another place, from time to time, from one field to another fields to a group of members of the social system. The main goal of innovation diffusion is the adoption of an innovation by society and other social milieu.⁷

The diffusion stage of innovation consists of five stages as knowledge, persuasion, decision, implementation and confirmation. If the stages of the innovation diffusion theory are well passed by the women, she will perform the VIA test periodically. Individuals are convinced that this VIA test is very important and useful for the women health. When the individual has a very strong intention, in the near future he will perform the behavior. Conversely, when the individual has weak intentions takes a long time to behavior individual behaves.⁷

The both interventions are equally effective in increasing intentions, the interventions provided are highly capable of increasing the intentions of all women. The research results can be the basis for public health center in providing health information to the community. With frequent direct counseling, it's hoped that the women will be more aware with health and will automatically improve the community health status. In terms of efficiency, both time, energy, material, the group IEC most efficient intervention. The Group IEC only do one time, whereas Individual IEC must do more times to make home visits. Respondents' houses are scattered throughout the area so it takes a lot of time and effort.

In making efforts to increase the coverage of VIA test needs to pay attention to the factors related to the practice of the mother carrying out the VIA test. Below this results of this study are test different of changes in intention based on the characteristics of respondents.

The test showed characteristics of respondents in both groups are equal (chi square test $p > 0.05$) includes mother's age ($p 0,267$), education ($p 0,567$), occupation ($p 0,458$), marriage age ($p 0,513$), number of children ($p=1$). Different test results in VIA test intention change based on respondent's characteristic is no significantly differences ($p > 0,05$). It's interpreted, no contribution characteristic of respondent to increase of intention.

Table 3: Different of Intention Change Based on Respondent's Characteristic

No.	Characteristic	p value	Type of Test
1.	Mother's age	0,449	Independent T test
2.	Education	0,542	Independent T test
3.	Work	0,858	One Way Anova test
4.	Age married	0,617	One Way Anova test
5.	Children Number	0,929	One Way Anova test

The previous study showed the experiences include developing community partnerships to listen and learn from the community, thereby enhancing appropriateness of services; developing culturally appropriate messages and educational materials; making access to high-quality screening services easier; and identifying effective ways to encourage women and their partners to complete diagnosis and treatment regimens. Cervical cancer prevention programs that use these strategies are more likely to increase demand, ensure follow-through for treatment, and ultimately reduce disease burden.¹¹

Hopefully the IEC efforts increased coverage of VIA tests so that they can contribute to a decrease in the incidence and death of women due to cervical cancer. However, so that mothers can do VIA tests need to be supported by the availability and affordability of mothers for VIA test services. This concerns the policy of local health services as well as increasing the number and quality of health workers who provide VIA test services. Strong advocacy is needed for policy makers to expand the reach of health education about VIA tests for mothers with the support of relevant cross-sector policy makers. Previous studies suggest experience demonstrates the role that evidence-based advocacy efforts play in the ultimate success of cervical cancer prevention programs, particularly when new screening and treatment approaches.¹²

CONCLUSIONS

Interventions developed based on qualitative analyzes are individual IEC with counseling at home visits supported leaflets and group IEC with group discussion supported video and stick a poster at strategic points. There's significant differences ($p 0,000$) of intention to perform VIA tests before and after individual also group IEC. There's no significant difference ($p 0.859$) VIA test intention change between individual and Group IEC. There's no significant difference ($p > 0,05$) change of intention based on mother's age, education, occupation, married age and number of children, that's mean respondent characteristic didn't contribute to increase intention. Both interventions are equally effective and able to improve women intention from weak to strong category. Individual and Group IEC should be followed up with home visits to strengthen knowledge and strong intentions to turn into concrete behaviors. The media (leaflets, posters, videos) can be used to strengthen the IEC activities undertaken. It's hoped the research to see the impact of Individual IEC and Group IEC by looking at the increased coverage of the VIA test program.

Conflict of Interest: There is no conflict of interest.

ACKNOWLEDGEMENTS

Thank you submitted to the chairman of Institute of Health Sciences Dharma Husada Bandung who has been supportive and has financed the research.

Ethical Clearance: The research carried out by following the rules of research ethics including the signing of informed consent, privacy, anonymity, confidentiality, discomfort protection.

REFERENCES

1. WHO. WHO guidance note : comprehensive cervical cancer prevention and control, a healthier future for girls and women. 2013. http://apps.who.int/iris/bitstream/handle/10665/78128/9789241505147_eng.pdf?sequence=3.
2. Ministry of Health of Republic Indonesia. Basic Health Research. 2013. <http://labmandat.litbang.depkes.go.id/riset-badan-litbangkes/menu-risikesnas/menu-risikesdas/374-rkd-2013>.
3. Goel A, Gandhi G, Batra S, Bhambhani S, Zutshi V, Sachdeva P. Visual inspection of the cervix with acetic acid for cervical intraepithelial lesions. *International Journal of Gynecology and Obstetrics* (2005) 88, 25 — 30. <https://doi.org/10.1016/j.ijgo.2004.09.018>.
4. Sauvaget C, Fayette JM, Muwonge R, Wesley R, Sankaranarayanan R. Accuracy of visual inspection with acetic acid for cervical cancer screening. *Int J Gynaecol Obstet*. 2011. Apr;113 (1) : 14-24. doi: 10.1016/j.ijgo.2010.10.012.
5. Nessa A, Hussain MA, Rahman JN, Rashid MH, Muwonge R, Sankaranarayanan R. Screening for cervical neoplasia in Bangladesh using visual inspection with acetic acid. *Int J Gynaecol Obstet*. 2010. Nov;111(2):115-8. doi: 10.1016/j.ijgo.2010.06.004.
6. Gelibo T, Roets L, Getachew T, Bekele A. Coverage and Factors Associated with Cervical Cancer Screening: Results from a Population-Based WHO Steps Study in Ethiopia. *Journal of Oncology Research and Treatments*. 2017. Vol 2 Issue 1, 1000115. <https://www.omicsonline.org/open-access/coverage-and-factors-associated-with-cervical-cancer-screening-results-from-a-populationbased-who-steps-study-in-ethiopia.pdf>.
7. Glanz K, Rimer BK, Viswanath K. Editors Foreword by Orleans CT. *Health Behavior and Health Education. Theory Research and Practice*. Published by Jossey-Bass A Wiley Imprint 989 Market Street, San Francisco, CA 94103-1741-2008. www.josseybass.com. <http://riskybusiness.web.unc.edu/files/2015/01/Health-Behavior-and-Health-Education.pdf>.
8. Creswell JW, Clark VLP. *Designing and Conducting Mixed Methods Research*. Sage Pub. 2011.
9. Ahmed SS, Elkheshen SA. The Effect of an Educational and Visual Inspection with Acetic Acid Interventions on Improving Knowledge and Early Detection of Cervical Cancer. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)* e-ISSN: 2320–1959. p- ISSN: 2320–1940 Volume 5, Issue 3 Ver. IV (May – Jun 2016), PP 13-18 www.iosrjournals.org DOI: 10.9790/1959-0503041318.
10. Orang'o EO, Wachira J, Asirwa FC, Busakhala N, Naanyu V, Kisuya J, et al. Factors Associated with Uptake of Visual Inspection with Acetic Acid (VIA) for Cervical Cancer Screening in Western Kenya. *PLoS ONE* 11(6): e0157217. 2016. <https://doi.org/10.1371/journal.pone.0157217>
11. Agurto I, Arrossi S, White S, Coffey P, Dzuba I, Bingham A, et al. Involving the community in cervical cancer prevention programs *International Journal of Gynecology and Obstetric*. Vol 89 Issue 2. 2005. <https://doi.org/10.1016/j.ijgo.2005.01.015>
12. Sherrisa J, Agurtob TI, Arrossic S, Dzubad I, Gaffikine L, Herdmana C, et al. Advocating for cervical cancer prevention. *International Journal of Gynecology and Obstetrics* (2005) 89, S46 — S54. doi:10.1016/j.ijgo.2005.01.01.

Depression Associated with Quality of Life in People with Paraplegia

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ABSTRACT

Introduction: Spinal cord injury significantly affects one physically and psychologically, especially in self-acceptance. Problems with self-acceptance can lead people with spinal cord injury to depression. Depression is a significant factor influencing the quality of life of people with spinal cord injury.

Method: This study was a descriptive analytic research with cross-sectional design. Data was collected from people with paraplegia interviewed using questionnaires. The sampling technique was random cluster sampling with the formula of limited proportion. Beck Depression Inventory (BDI) was used to assess depression and World Health Organization BREF (WHOQOL-BREF) to assess quality of life. The data were then analyzed using SPSS.

Results: A total of 30 respondents with paraplegia aged 25 – 65 years participated in this study. Statistical analysis showed a significant correlation between depression and quality of life in the 4 domains of WHOQOL-BREF: physical health ($r=-0.621$, $p<0.001$), psychological ($r=-0.608$, $p<0.001$), social ($r=-0.440$, $p=0.015$), and environment ($r=-0.574$, $p=0.001$). People with paraplegia who had higher depression tended to have poorer quality of life

Conclusions: There is an association between depression and quality of life in people with paraplegia.

Keywords: *Depression, Quality of life, Disability, Spinal Cord Injury*

INTRODUCTION

According to the World Health Organization (WHO) disability covers impairment, activity and participation limitation¹. Based on Indonesian National Social and Economic Survey, the prevalence of disability in Indonesia in 2012 was 2.45% of the total population².

WHO classifies disability into several categories, one of them is disturbance of foot use³. Disability disruption of foot or leg use can be caused by damage to the spinal cord resulting in temporary or permanent changes in

motor, sensory, and normal autonomic functions. Spinal cord injury can cause weakness of lower limbs referred to as paraparesis⁴.

The Department of Health of Yogyakarta Special Province recorded 19,511 people suffered disability, including those becoming paraplegic due to Java earthquake in 2006 and Mt.Merapi eruption in 2010⁵. Paraplegia affects psychological condition and may reduce quality of life⁶. In this research the problem to be discussed is to find out if there is a correlation between depression and quality of life in people with paraplegia.

Previous several research have studied about the correlation between depression and quality of life. Shin et al (2012) studied about depression and quality of life in patients within the first 6 months after the spinal cord injury⁷. A total of 36 respondents with SCI within 6 months were asked to fill out questionnaires concerning Beck Depression Inventory (BDI), World Health Organization Quality of Life Questionnaire-BREF, Stress Response Inventory, and Connor-Davidson

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resilience scale. The result in this research were the patients within six months after SCI injury had higher rate of depression and higher overall level of depression. Also, patients with motor complete injury had affected significantly on depression, QOL and stress⁷.

Ataog 1u, et al (2013) studied about effects of chronic pain on quality of life and depression in patients with spinal cord injury⁸. A total of 140 patients (104M, 36F) with SCI who underwent inpatient rehabilitation treatment were examined. A questionnaire including clinical variables was applied. Motor score of Functional Independence Measure was used to assess daily- life activities, the 36-Item Medical Outcomes Short-Form Health (SF-36) for QoL and Beck Depression Inventory (BDI) for depression. Patients were then divided into those having chronic pain (Group I) and those without any pain (Group II), and groups were compared according to demographic and clinical variables. The result in this research SCI patients with chronic pain had higher depression ratings and their BDI scores were correlated with some of the SF-36 domains (general health, vitality, social functioning and mental health)⁸.

To the knowledge of this study researchers there has been no research related to the association between depression and quality of life to people with paraplegia in Indonesia.

METHOD

This cross-sectional study was conducted in Bantul, Kulonprogo and Gunungkidul districts using primary data with the Beck Depression Inventory (BDI), WHOQOL – BREF, Activity of Daily Living (ADL) questionnaire, and Instrumental Activity of Daily Living (IADL) in November 2017. Only results of BDI and WHO_QOL BREF were presented in this paper. This research was conducted in cooperation with Pusat Rehabilitasi YAKKUM (YAKKUM Rehabilitation Center). The respondents consisted of 30 persons with paraplegia who were clients of PRY. The sampling technique of this research was consecutive sampling with inclusion criteria of persons with paraplegia aged 18 - 64 years, and exclusion criteria of persons with communication problems such as deafness and severe psychiatric disorders that could not cooperate during data collection. Data obtained was processed in Clinical Epidemiology and Biostatistics Unit Faculty of Medicine, Gadjah Mada University Yogyakarta using Pearson correlation test to find out the correlation between depression and quality of life.

RESULTS AND DISCUSSIONS

A total of 30 respondents with paraplegia participated in this study. Eleven of them were men and the rest were women. The mean age was 44.77 years. Twenty-five of them (83.33%) had incomplete paraplegia and 5 of them (16.67%) had complete paraplegia. Twenty-two respondents (73.33%) were married, 2 (6.67%) were divorced, and 6 (20%) were single. The data were presented in Table 1.

Table 1: Characteristic of respondents (n = 30)

Variable	f	%
Sex		
Female	19	63.33
Male	11	36.67
Age		
25–35	7	23.33
36–45	8	26.67
46–55	10	33.33
56–65	5	16.67
Severity of Injury		
Incomplete	25	83.33
Complete	5	16.67
Marital Status		
Married	22	73.33
Divorced	2	6.67
Single	6	20.00

Screening on depression using BDI revealed that 18 respondents (60%) might not have depression, 5 respondents (16,66%) might have mild mood disorder, 3 respondents (10%) have clinical depression, 2 respondents (6,67%) have moderate depression, and 2 respondents (6,67%) were classified as having severe depression. Table 2 presented these results.

Table 2: Beck Depression Inventory (BDI)

Level depression	N (30)	Percent (%)
Reasonable	18	60
Mild mood disorder	5	16,66
Clinical depression	3	10
Moderate depression	2	6,67
Severe depression	2	6,67
Extreme depression	0	0
Total	30	100

The quality of life of the respondents assessed using WHOQOL-BREF was shown in Table 3. Among 30 respondents 22 respondents (73,33%) had good quality of life in physical domain and environmental domains, while 8 respondents (26,6%) had poor quality of life in those domains. In psychological domain there were 24 respondents (80%) who had good quality of life and 6 respondents (20%) did not. Meanwhile in social domain 20 respondents (66,67%) had good quality of life and 10 respondents (33,33%) had poor quality of life.

Table 3: WHO QOL-BREF

WHOQOL-BREF		N	Percent (%)
QOL Domain 1 (physical)	Good (≥ 50)	22	73,33
	Poor (< 50)	8	26,6
	Total	30	100
QOL Domain 2 (psychological)	Good (≥ 50)	24	80
	Poor (< 50)	6	20
	Total	30	100

Table 4: Correlation of Depression (BDI) and Quality of life (WHO QOL-BREF)

	QOL Domain 1 (physical)	QOL Domain 2 (psychological)	QOL Domain 3 (social)	QOL Domain 4 (environment)
Pearson Correlation	-.621**	-.608**	-.440*	-.574**
Sig. (2-tailed)	.000	.000	.015	.001
N	30	30	30	30

This research studied people with paraplegia, most of them (25 respondents) were 2006 Java earthquake victims. There were more female than male respondents in this study. Hu et al (2012) followed 26 people with spinal cord injuries due to an earthquake in China, there were 15 women and 11 men⁹. Earthquake caused houses to collapse that afflicted the respondents. It was mostly experienced by female respondents because they were housewives and tended to stay at home and escaped last⁹.

This research was participated by the respondents aged between 25 - 65 with the mean age 44.77 years. Abbudi et al (2017) studied 193 respondents with paraplegia aged 18 - 65 years¹⁰. Most respondents of this study had incomplete paraplegia. Hu et al (2012) reported most of the respondents in their study had incomplete paraplegia with the level of injured at T₇ - L₂⁹.

As presented in Table 2 more than half respondents (60%) might not have depression. They became paraplegia about 5 - 18 years ago. Most of them had been able to accept their condition, while few of them were

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QOL Domain 3 (social)	Good (≥ 50)	20	66,67
	Poor (< 50)	10	33,33
	Total	30	100
QOL Domain 4 (environment)	Good (≥ 50)	22	73,33
	Poor (< 50)	8	26,6
	Total	30	100

A statistical analysis of correlation between BDI scores and 4 domains of WHOQOL-BREF revealed that there were significant correlations between depression and quality of life in physical domain (r=-0.621, p<0.001), psychological domain (r=-0.608, p<0.001), social domain (r=-0.440, p=0.015), and environmental domain (r=-0.574, p=0.001). The results of statistical analysis were presented in Table 4.

still in the process. Several factors have affected like social supports and physical health. Respondents with complete paraplegia mostly have severe of depression level than incomplete paraplegia. As well as respondents with lack of social support. Almeida et al (2013) reported most individuals with spinal cord injuries and pressure ulcers had depression, and their main symptoms included body image issues, self-deprecation, social withdrawal, and suicidal thoughts¹¹.

Table 3 showed that most respondents had good quality of life in physical domain, psychological domain, social domain, and environment domain. This might be related to the fact that they had been through the process of self-acceptance and able to adjust their life to their current condition. However, some respondent still had poor quality of life due to health complication such as decubitus. Dalete et al (2016) reported high prevalence of pressure ulcer in spinal cord injury patient showed a significant dissatisfaction in quality of life especially regarding the physical domain¹².

Based on statistical analysis of BDI with WHOQOL-BREF, it can be concluded that there is a significant correlation between depression and quality of life in physical, psychological, social and environmental domains. Respondents with higher level of depression tend to have lower quality of life in all domains. This is consistent with the results of the study of Aman, et al (2012) examining the prevalence of psychological problems and quality of life in 50 people with spinal cord injuries in Pakistan¹³. The study reported that the higher the depression scale measured by HADS (Hospital Anxiety and Depression Scale), the lower the quality of life of patients with spinal cord injury as measured by WHOQOL-BREF¹³. Ataoglu, et al (2013) examined the quality of life using SF-36 scores and depression using BDI scores of people with spinal cord injuries who had chronic pain. The study reported that the more severe the physical condition experienced by people with paraplegia such as chronic pain the higher the level of depression. The study also showed a negative pattern of correlation between BDI scores with SF-36 scores of general health, vitality, social functioning, and mental health domains aligned with the results of this study⁸.

The study of Shin, et al (2012) reported people with complete paraplegia who had higher level of depression (BDI) also had poorer quality of life (WHOQOL-BREF) than people with incomplete paraplegia⁷. The study suggested that poor quality of physical health can affect mental health as well. In anticipation of these conditions people who suffer from spinal cord injuries need to go through the stage of self acceptance and adjustment. Most of the respondents of this study had gone through the stage of self-acceptance and adjustment because the injury took place more than 5 years before the data collection, but some were still experiencing difficulties due to health problems such as urinary tract infections and decubitus. According to Dezarnaulds & Ilchef (2014), someone who experiences spinal cord injury has the character and how to accept themselves differently, the time required can be short or long¹⁴.

Several studies suggested psychological dimensions such as personality, behavior, and perception have a role in how people accept themselves with spinal cord injury¹⁴. Loss of interest/passion, guilt, loneliness, suicidal intent and feeling helpless are some examples of depressive symptoms that spinal cord injury sufferers often suffer. If rapid depression symptoms are addressed the prognosis

will be better. In addressing the psychological problems of spinal cord injury sufferers it is important to know that there are other factors that may affect the adjustment stage, namely chronic pain, health complications (decubitus, urinary tract infection, etc.) and long-term drug use. Some external factors such as family support and social environment, as well as socioeconomic and financial status can also affect the process of acceptance and adjustment of spinal cord injury sufferers¹⁴. In this study the respondents had overcome most factors and reached self-acceptance and adjustment with the support of family and social environment. In Bantul District, there were quite a lot of people with paraplegia due to the earthquake, so there were Disabled People Organizations formed for people with disability to gain peer support and self-advocacy. In Kulonprogo District 2 respondents had supportive families while 1 respondent lacked attention from the family. The differences between these two groups were evident from BDI scores and physical health. Respondents who received family support showed good BDI scores as well as no complications such as decubitus. While respondents who received less family attention showed a poor BDI score and had severe decubitus. In Gunungkidul District, 1 respondent had gained self-acceptance and adjustment while 1 respondent had not. The respondent in Gunungkidul District who had self-acceptance and adjustment was active in disability organizations while the one who had not, was more isolated inside the house. According to Skevington, Lofty and O'Connell (2004) depression keeps people away from the community because someone who is depressed is more melancholy and loves to be alone so the more severe the depression becomes, the further the person is from his social activities¹⁵.

CONCLUSIONS

There is a relationship between depression and quality of life in people with paraplegia. Depression reduces the quality of life of people who are paralyzed because of spinal cord injuries.

ACKNOWLEDGEMENTS

I would like to thank my supervisors, dr. Maria Meiwati Widagdo, dr. Rizaldy Pinzon and dr. Mitra Andini Sigilipoe for the patient, guidance, encouragement and advice they were provided throughout my time as their student. I would also like to express my gratitude to my

family and friends who always encourage me throughout the process of this research. Thank you for the support and prayers so this research is finally complete. I have been extremely lucky to be surrounded by the people who genuinely love me.

Ethical Clearance: Ethical clearance for this study was obtained from the Ethics Committee for Health Research, Faculty of Medicine, Duta Wacana Christian University.

Source of Funding: This research was self-funded.

Conflict of Interest: The researchers had no conflict of interest in this research.

REFERENCE

1. World Health Organization. World Report on Disability WHO Library Cataloguing-in-Publication Data. 2011
2. Badan Pusat Statistik. National Social Economic Survey Year 2012 (in Indonesian). Jakarta; 2012.
3. Marjuki. People with Disability Based on International Classification of Functioning for Disability and Health (ICF) (in Indonesian). 2010.
4. Lawrence S Chin. Spinal Cord Injuries Clinical Presentation: History and Physical Examination. 2017.
5. Badan Pusat Statistik. Daerah Istimewa Yogyakarta in Numbers (in Indonesian). Yogyakarta; 2011.
6. Nugroho W. Gerontic and Geriatric Nursing (in Indonesian). EGC; 2008.
7. Shin JC, Goo HR, Yu SJ, Kim DH, Yoon SY. Depression and Quality of Life in Patients within the First 6 Months after the Spinal Cord Injury. *Ann Rehabil Med.* 2012;36(1):119-25
8. Ataoğlu E, Tiftik T, Kara M, Tunç H, Ersöz M, Akkuş S. Effects of chronic pain on quality of life and depression in patients with spinal cord injury. *Spinal Cord.* 2013;51(1):23–6.
9. Hu X, Zhang X, Gosney JE, Reinhardt JD, Chen S, Jin H, et al. Analysis of functional status, quality of life and community integration in earthquake survivors with spinal cord injury at hospital discharge and one-year follow-up in the community. *J Rehabil Med.* 2012;44(3):200–5.
10. Abbudi A, Joodah RAS, Ibraheem EK, Abdelilah ZA, Jameel HD, Shalan JAM, et al. Prevalence and Determinants of Depression Among Traumatic Spinal Cord Injured Patients Attending Ibn-Al-Quff Hospital, Baghdad, Iraq. *Iraq J Psychiatry.* 2017;20(6):428.
11. Almeida S, Santo P, Silveira M, Openheimer D, Dutra R, Bueno M, Pereira M. Depression in patients with traumatic spinal cord injuries and pressure ulcers. *Rev Bras Cir Plástica/Brazilian J Plast Surg.* 2013;28(2):282–8.
12. Ribeiro D, Barbosa M. Quality of life in patients with spinal cord injury and pressure ulcers. *Enferm Glob.* 2016;31–9.
13. Aman H, Jabeen S, Aslam A. Prevalence of psychological problems and the quality of life of spinal cord injury patients. *Gulf Med J.* 2012;1(S2):S15–8
14. Dezarnaulds A, Ilchef R. Psychological Adjustment after Spinal Cord Injury. 2014
15. Skevington SM, Lotfy M, O’Connell KA, WHOQOL Group. The World Health Organization’s WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A Report from the WHOQOL Group. *Qual Life Res.* 2004;13(2):299–310.

Pie Formula Biscuit Flour and Soy Protein Isolate as Alternative of High Protein Snack for Toddler

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ABSTRACT

Stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. Food program for stunting that have been given by government is complementary biscuit. The low acceptance of biscuit is caused by lack of innovation in delivery to children. This study was conducted to improve the acceptance of the complementary biscuit by adjusting the biscuit flour into a pie with fla that has different flavor and more appealing to the children. This research used an experimental study with a complete randomized design of 4 levels. Substitution of complementary biscuit flour given 0, 5, 10 and 15% while protein isolate 0, 9, 11, and 13%. 30 Panelists evaluated samples on acceptability of colour, appearance, texture and taste using a five point hedonic. The selected formula according to the test is a pie with a substitution of 10% complementary biscuit flour and 11% soy protein. The nutritional content analysis showed that the substitution of complementary biscuit flour and isolate protein were significantly different for the protein and fat content. Preferred test results of selected formula biscuits have the best color, aroma and texture in addition to other formulas. Pie with the addition of biscuit flour and soy protein could be an alternative to increase nutrient intake of malnourished children.

Keywords: *Pie, Biscuit Flour, Soy Isolate.*

INTRODUCTION

Malnutrition rates remain alarming in children under 2 years. Based on the Basic Health Research data (Riskesdas) 2013 shows that children malnutrition prevalence has been increasing since 2007 (4,9%, 5,4% and 5.7% in 2007, 2010, 2013 respectively)^{1,2,3}. The prevalence of malnutrition in East Java also increase from 12.1% (2013) to 12.3% (2014) ⁴. The effects of malnutrition on human performance, health and survival have been the subject of extensive research for several decades and studies show that malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction, and physical work capacity.

Malnutrition is an underlying factor in many diseases particularly in children, and it contributes greatly to the disability-adjusted life years worldwide. Malnutrition is particularly prevalent in developing countries, where it affects one out of every three preschool-age children.

The primary determinants of malnutrition, as conceptualized by UNICEF relate to unsatisfactory food intake, severe and repeated infections, or a combination of the two⁵. The nutritional needs of children during the first 6 months can be delivered by mother breast milk, however at 6-24 months of breast milk is not enough to meet the nutritional needs of child food ⁶. The 1,000 days between pregnancy and a child's 2nd birthday are the most critical time for positive impact on a child's cognitive and physical development. The right nutrition for the mother and for the child during this time can have a profound impact on the child's growth and development and reduce disease risk, as well as protect the mother's health. Undernutrition during 1000 days of life is a major determinant of stunting and can lead to consequences such as obesity and nutrition-related non-communicable diseases in adulthood.

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Recently, Indonesian government implemented a program to support and improve the nutritional status of children by provision of complementary food⁶. Complementary food for children 6-24 months in the form of biscuits containing macro and micro nutrients needed for children growth and development^{7,8}. Each pack of PMT Toddlers consists of 12 pieces of biscuits or 540 calories (45 cal/biscuit). Ages 6-11 months are given 8 pieces/day and 12-59 months are given 12 pieces/day. However, special attention need to be given to the effectiveness of the program due to low acceptance. Therefore this study was necessary to improve the acceptance by re-formulation a more attractive complementary food

Pie is one of a popular snack in Indonesia. The solid texture of the pie can be introduced in toddlers because of the ability to chew the children⁹. Indonesian people usually serve pie with cream fla, fruits, and gelatin. In this study, the formulation of pie can be served with cream fla based purple yam flour. Sweet purple has a good quality in terms of nutritional content, especially carbohydrates, vitamins and minerals. The objective of this research was

to improve the acceptance of the complementary biscuit by adjusting the biscuit flour into a pie with fla that has different flavor and more appealing to the children.

METHOD

The design used in this study was experimental by giving variattion in the additional level of biscuit flour and completely randomized design. The research was conducted in the Department of Nutrition of FKM Unair. This study was approved by the ethics committee of the Faculty of Public Health Airlangga University with No. 645-KEPK on December 19th, 2017.

The main ingredients used to make crust pie are wheat flour, butter, powdered sugar, eggs and salt. The variation level of complementary biscuit flour (ranging 0-15%) and soy protein isolate (0-13%) was substituted by wheat flour. The fla making material consists of sago flour, granulated sugar, milk powder and purple yam flour. The formula and proportions of each ingredient for the control formula (F0) and the treatment formula (F1, F2, and F3) are listed in Table 1.

Table 1: Ingredients of pie in different formulas

Ingredients	Formula							
	F0		F1		F2		F3	
	n(g)	%	n(g)	%	n(g)	%	n(g)	%
Crust								
Wheat flour	280	53	205	39	165	31	130	25
Mentega	125	24	125	24	125	24	125	24
Sugar	60	11	60	11	60	11	60	11
Egg	60	11	60	11	60	11	60	11
Salt	2	0	2	0	2	0	2	0
Substitution Crust								
Complementary biscuit flour	0	0	25	5	55	10	80	15
Soy Protein Isolate	0	0	50	9	60	11	70	13
Total	527	100	527	100	527	100	527	100
Fla								
Sago flour	80	50	80	50	80	50	80	50
Sugar	50	31	50	31	50	31	50	31
Milk Powder	20	13	20	13	20	13	20	13
Purple Sweet Potatoe Flour	10	6	10	6	10	6	10	6
Total	160	100	160	100	160	100	160	100

Sensory evaluation was conducted to determine the acceptability of product developed. 30 Panelist

were selected among mothers in Posyandu Tenggilis Mejoyo Surabaya, on the based on their willingness to

participate. Four different coded samples were served to the panelists. Sensory scores for different attributes like colour, appearance, texture and taste. The codes of samples include; 1=very bad, 2= bad, 3=middling, 4=good and 5=very good. Comparison of sensory scores and nutrition composition between formula were tested by analysis of variance (ANOVA) Friedman. The significantly different score between formula from ANOVA was analyzed using wilcoxon signed ranks test.

RESULT AND DISCUSSION

The result of experimental data obtained by sensory and nutritional analysis result. Selected formula was considered by the calculation of sensory and nutritional analysis result. The content of macro nutrients in pie on each treatment formula (F1, F2, and F3) has an increase in protein and fat content compare than F0. Table 2 shows the distribution of panelist preferences to the pie treatment formula based on the assessment of color, aroma, texture and taste. After the calculation of nutritional value and respondent responses, formula with the highest weight value is formula two (F2), so it can be concluded the selected formula.

Table 2: Responses for different formulations of pie containing complementary biscuit flour

Formula	Dependent Variable			
	Color	Flavor	Texture	Taste
F0	4	4	4	4
F1	2,3	3	2,3	2,3
F2	3,4	3	4	3,4
F3	3	3	3	2,3

Proximate Analysis: Proximate analysis test result shows in table 3. The content of protein and fat decreased compare to complementary biscuits on protein, fat and carbohydrate no significantly different. Serving recommended if the selected formula used to replace the role of complementary biscuit is 4 pieces of pie/day. Whereas if functioned as a snack or snack foods enough 2 pieces of pie in a day can already meet 10-15% of daily nutritional needs based on Indonesian RDA¹¹.

Table 3: Nutritional content of selected formula, complementary biscuit and RDA (100 g)

Formula	Energy (Cal)	Protein (g)	Fat (g)	Carb (g)
Selected formula	361.7	8.8	8.7	61.8
Complementary Biscuits	450	9	14	71
Pie/Serving Size	104.9	2.5	2.5	17.9
Standard (10-15% RDA)	112,5	2.6-3.9	6.6	23.25

Acceptance Test: Color is one of important quality attributes for consumer acceptance of biscuit¹³. The acceptance test of biscuit by untrained panelist (mothers) was variative. The highest level of favorite color is second formula biscuit (F2) (mean rank = 2.32), followed by pie control formula (mean rank = 2.16) and which received the lowest score is the complementary biscuit (mean rank = 1.52). In F2 the appearance of the crust pie color is rather brown than F0 tends to be pale due to the effect of the addition of soy protein isolate. Pie color is preferred over the bundle of MP-ASI because in the pie there is a purple flame fla field that provides a variation of purple color.

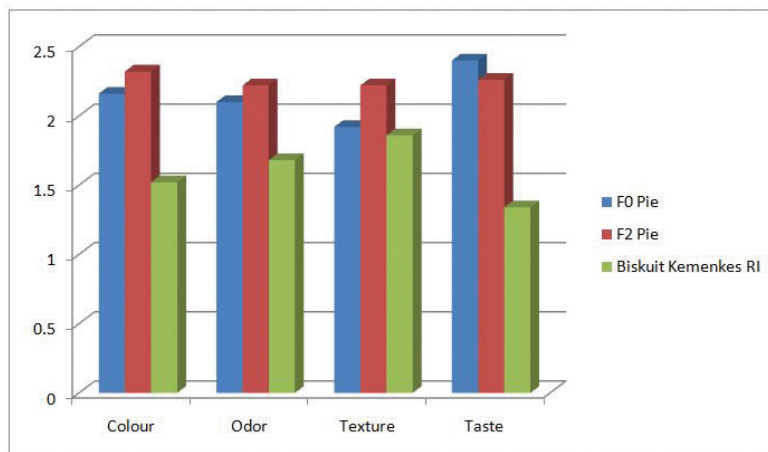


Figure 1: Responses of panelist to different formulas

On the odor/smell aspect, the best result is the pie with F2 (mean rank = 2.22), then the pie of control formula (mean rank = 2.1) and the lowest score is the MP-ASI biscuit. In the control formula pie and the second formula there is no significant difference ($\alpha = 0.15$) has a neutral scent similarity. While the aroma of the second pie formula (F2) compared to biscuit MP-ASI have significant difference ($\alpha = 0.07$). Biscuits MP-ASI kemenkes RI has a strong aroma of milk that tends to be boring. A positive hedonic value of food, or food reward, is a powerful determinant of eating behavior¹⁴.

The highest texture aspect score was pie with the second formula (F2) (mean rank = 2.22), then the pie with the control formula (F0) (mean rank = 1.92) and the lowest score was the MP-ASI bikuit Kemenkes RI rank = 1.86). In the pie F0 and F2 have a texture that is not significantly different ($\alpha = 0.83$), whereas F2 with biscuit MP-ASI Kemenkes RI has significant difference ($\alpha = 0.035$). This is because the texture of the biscuit is harder than the texture of the pie.

On the taste aspect that received the highest rating is the Formula control pie (F0) (mean rank = 2.4), then the pie with the second formula (F2) (mean rank = 2.26) and the lowest score is the MP-ASI biscuit RI (mean rank = 1.34). In the control formula pie and the second formula has no significant difference ($\alpha = 0.18$) while the pie formulas (F2) have significant differences when compared with the biscuit MP-ASI Kemenkes RI ($\alpha = 0.0$). The taste of biscuits tends to be out of favor because it creates a bitter taste at the end.

The assessment of preferred level by untrained panelists (Children aged 12-24 months) based on figure 3, shows the highest preference for pie with formula modification (F2) (Mean rank = 2.24), then on pie with control formula (F0) = 2.18) and who got the lowest favorite rating is biscuit MP-ASI Kemenkes RI. There was no significant difference between F0 and F2 ($\alpha = 0.317$) whereas F2 and biscuit MP-ASI Kemenkes had significant difference ($\alpha = 0.001$). Pie is preferred by children aged 12-24 months because of the more color aspect has a variation of purple color so it is more interesting, from the aspect of the aroma has a neutral aroma, softer texture if compared with the texture of biscuits and sweet pie flavor tend to be harmonized than bikuit who have after bitter taste.

The more proportion of pie substituted with MP-ASI biscuit flour and soy protein isolate is more acceptable for

children aged 12-24 months, providing variations of the form of MP-ASI in addition to biscuits, the suggestion of consuming pie in a day is less than the recommended consumption of biscuit MP-ASI Kemenkes in a day. The weakness is the content of macro nutrients in 100 grams of pie is still lower when compared to the content of macro nutrients biscuit MP-ASI Ministry of Health RI.

CONCLUSION

The best modified Pie Formula is the second formula (F2) which is a pie with substitution of 10% biscuit of MP-ASI biscuit and 11% soy protein isolate. The content of macro nutrients in pie F2 per 100 grams lower than biscuit MP-ASI Ministry of Health RI. Pie F2 has a higher acceptance than the biscuit MP-ASI Kemenkes RI.

Ethical Clearance: This study was approved by the ethics committee of the Faculty of Public Health Airlangga University with No. 645-KEPK on December 19, 2017.

Conflict of Interest: The authors whose names are listed have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

ACKNOWLEDGMENT

Acknowledgments were submitted to the Ministry of Health which has provided financial support in this research through 100 HPK research grants, Tenggilis Posyandu cadres who also supported the intervention of the organoleptic test and Surabaya Health Department who have allowed this research to be disseminated.

REFERENCE

1. Ministry of Health (MOH) [Indonesia]. Indonesia Basic Health Reserach Data. 2013.
2. Ministry of Health (MOH) [Indonesia]. Indonesia Basic Health Reserach Data. 2010.
3. Ministry of Health (MOH) [Indonesia]. Indonesia Basic Health Reserach Data. 2007.
4. Ministry of Health (MOH) [East Java Indonesia]. Health Data Profile of East Java Province. 2014.

5. Dardjito E, Suryanto. Evaluation of Local MP-ASI Management and Its Effect on Increased Body Weight and Nutritional Status of Toddlers Aged 6-24 Months at South Purwokerto Health Center, Banyumas Regency. PGM. 2009; 32(1):.9-1
6. Ministry of Health (MOH) [Indonesia]. Kementerian Kesehatan RI. Decree of the Minister of Health of the Republic of Indonesia Number: 224/Menkes/SK/II/2007 concerning Technical Specifications of 2007 Breast Milk Companion Foods. 2017.
7. Ministry of Health (MOH) [Indonesia]. Implementation Guidelines for Providing Additional Food Recovery for Malnourished Toddlers (Health Operational Assistance). 2017
8. Yuandari, Meita. Description of Nutrition Counseling in Under Nourished Children Based on Nutrition Counseling Guidelines. 2008.
9. Adriani M, Wirjatmadi, B. The Role of Nutrition in the Life Cycle. Jakarta: Kencana Prenada Media Group. 2014.
10. Bradbury, J.H. and W.D. Holloway. Chemical composition of root crops. In J.H. Bradbury and W.D. Holloway (Eds.). Chemistry of tropical root crops: significance for nutrition and agriculture in the pacific. ACIAR Monograph 1988 ; 6: 1-88.
11. Ministry of Health (MOH) [Indonesia. Minister of Health Regulation of the Republic of Indonesia no 75. 2013
12. Indonesia Nutritionist Association. Persatuan Ahli Gizi Indonesia. List of Indonesian Food Composition. 2010..
13. Bajaj S, Urooj A. Effect of incorporation if mint in texture, colour and sensory parameters of biscuit. International Journal of Food Properties. 2005.
14. Burger KS, Cornier MA, Ingebrigsen J, Johnson S. Assesing food appeal and desire to eat: the effect of portion size and energy density. International Journal Behavioural Nutrition Phisical Activity. 2011.

Misclassification of Nutrition Status among Elderly Based on Combination of Stature Predictor

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ABSTRACT

The combination of arm span and knee height as the stature predictors on elderly was arranged to obtain the most precise and accurate prediction of actual height. However, there was not much research that calculated prediction errors. This study aimed to measure the size of the misclassification of elderly nutritional status which was calculated by predictive combination regression model. The study was an observational study with cross-sectional design. The study population was 60-69 years old men and women in Wonogiri District, Central Java. The sample size were 65 men and 71 women, which were chosen purposively in the community. Anthropometric measurements on knee height and arm span and the actual height were done by standardized technique. Data of BMI were analysed using Friedman post hoc Wilcoxon test then classified to nutrition status to calculate sensitivity and specificity. Among the men subjects, the overweight and underweight status using BMI were overestimated by 8.3% and 12.5%, respectively. Among the women subjects, overestimation also occurred on underweight by 12.5%. In all respondents, underestimation of underweight was 7.2% and overestimation in the normal nutritional status was 3.7%. It was concluded that some misclassification of BMI, by predicted height among elderly based with combination regression model was found.

Keywords: *misclassification; height; combination of predictors; nutrition status*

INTRODUCTION

Body Mass Index (BMI) was a simple calculation to monitor nutritional status in individuals (aged >18 years) by comparing body weight (in kilograms) and squares of height (in meters) then categorized them.¹ Therefore, height was an important variable to assess nutritional status at the elderly. However, the height measurement generally performed in stand position could not be applied to elderly people who have lost the ability to stand. Thus, World Health Organization recommended arm span and knee height as a predictor of elderly height.¹

Using arm span and knee height as a predictor of height in elderly would directly affect the results of calculation of BMI and determine the nutritional status. When overestimation occurred at the height it would increase the prevalence of underweight while whereas an estimate below the actual height (underestimation) would increase the prevalence of overweight. The condition would be affected to make large prevalence of malnutrition in the elderly, further impact will also lead to inaccuracy in health policy making related to those problems.²

Phenomenon of overestimation and underestimation of high prediction results would affect the categorization of nutritional status and affect the prevalence of nutrition in the elderly. Research in Sweden showed the lowest prevalence of underweight with knee height BMI compared to actual BMI and Chumlea.³ Prevalence of obesity was higher (overestimation) based on measurement of knee height BMI than actual BMI. Obesity diagnosis in men based on knee height BMI was 26.2% while based on actual BMI was 17.5%. It could be

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interpreted that the prevalence of obesity based on knee height BMI was twice higher than actual BMI.³ Other studies have shown that overestimation of height was calculated based on knee height on female respondents reached 2.22 cm and caused underestimation of BMI reached 10%.⁴

A study developed a formula using two predictors. Theoretically it was done because the more variables x added the more degrees of freedom lost. So, the study arranged regression model of the elderly by combining arm span and knee height.⁵ The predictor formula were:

$$\text{Women} = 40.915 + (0.457 \times \text{AS}) + (0.818 \times \text{KH}) \quad \dots(1)$$

$$\text{Men} = 34.426 + (0.513 \times \text{AS}) + [0.813 \times \text{KH}] \quad \dots(2)$$

With:

(1) : Formula for predicted women’s elderly height.

(2) : Formula for predicted men’s elderly height.

AS : The measurement result of arm span in centimeters.

KH : The measurement result of knee height in centimeters.

The study showed highest overestimation happened at Chumlea’s formula in men was 6.01 cm and highest underestimation happen at Fatmah’s formula in women group was -0.72 cm.⁵ While, combination predictor showed the lowest underestimation in men and women with the smallest average difference compared with the long and high knee predictors.⁵

The combination of predictors has more accurate ability to predicted height in the elderly. However, no further calculation has been done on body mass index and diagnosed malnutrition in the elderly.

METHOD

Research Design: The type of research was observational analytic with cross sectional study. Cross sectional study was suitable for correlation research with the observation approach (point time approach).⁶

Study Subject and Sample Size: Actual BMI as dependent variable, combination predictor’s BMI as independent variables. The results of this study presented in men and women’s groups.

Study population at this study was individuals aged 60-69 years in Wonogiri sub district at January – July 2017. Inclusion criteria were individuals in health conditions, able to stand upright and willing to be

respondent by filling informed consent. The exclusion criteria were when the individuals have unable stretched his or her arms properly (straight) because of a broken or physical disability and experiencing foot fractures and or using prosthetic limbs. The sample selection method was purposive sampling included 65 men and 71 women.

Measurements: Measurements on each respondent were repeated three times and then taken the mean value of the measurement results by standardized enumerator and standardized measurement (shows in Fig 1). The measurement results were recorded by the researchers on the provided sheet.

Arm span was measured with arm line that was modified. There was a tape measuring (“BUTTERFLY” brand) with a precision of 1 mm attached to the aluminum rod (shows in Fig 2). Arm span was measured from the tip of the middle finger of one hand to the tip of the middle finger of the other hand with the individual standing with their back to the wall with both arms abducted to 90°, the elbows and wrists extended and the palms facing directly forward. Body mass index estimated from the arm span was calculated through combination predictors and Fatmah formulas.⁷

Knee height was measured with knee height caliper belonging to Nutrition Laboratory of Public Health Faculty, Diponegoro University with 1 mm of accuracy (shows in Figure 2). Measurements were performed on the left knee with the perfect sitting position (upright body, hands free down and facing directly forward). Make sure each knee forms 90° angle, consisting of a fixed part, which has been positioned in the plantar surface of the foot (heel) and movable part, which was positioned over the patella. Body mass index estimated from the arm span was calculated through combination predictors and Chumlea’s formulas.⁸

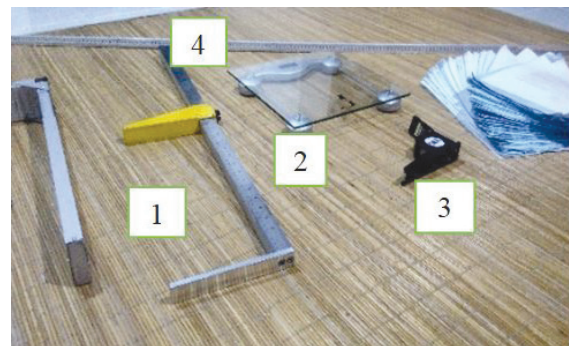


Figure 1: (1) Knee height caliper; (2) Digital scale for weight measurement; (3) Actual height measurement; (4) Arm span measurement



(1)



(2)

Figure 2. (1) A respondent was measured the arm span by enumerator; (2) A respondent was measured the knee height by enumerator



(1)



(2)

Figure 3: (1) A respondent was measured the actual height by enumerator; (2) A was measured the weight by enumerator

Actual height was measured by microtoise “GEA” SH-2A series with 1 mm of accuracy (shows in Figure 3). Standing height was measured with microtoise against the wall on barefooted subjects, with their heels together and the heels, buttocks touching the wall.

Digital scales brand “CAMRY” series EB9-4A with 0.1 kg accuracy to measure weight (shows in Figure 3). Enumerator asked respondents to remove shoes or footwear, jackets, hats, and others. Then, they allowed them to step up onto the digital scale, right in the middle of the stamping place. The enumerator adjusted respondent’s position to stand upright with his eyes

facing forward and not moving. They also ensured that the respondent was not touching or being touched or touched by another. Process of measuring the respondent shown in Figure 1, Figure 2 and Figure 3.

RESULTS AND DISCUSSIONS

Mean Difference Test Of Body Mass Index: Table 1 shows that there’s difference BMI between combination predictor’s formula, Chumlea’s formula and Fatmah’s formula in men and women. There’s only BMI’s combination predictor formula that similar with BMI’s actual predictor in men ($p=0.883$) and women ($p=0.184$).

Table 1: Result of Mean Difference Test

BMI (kg/m ²)	Sex	
	Men*	Women**
Actual	21.46 ± 3.28	21.93 ± 3.45
Combination Predictor	21.40 ± 3.26	21.94 ± 3.44
Chumlea	21.32 ± 3.27	20.22 ± 3.18
Fatmah	20.97 ± 3.20	22.15 ± 3.47
p value	<0,001 ^a	<0,001 ^b

Note:

* Normality test for Actual BMI $p=0.192$, Combination Predictor’s BMI $p=0.088$, Fatmah’s BMI $p=0.027$, and Chumlea’s BMI $p=0,200$

** Normality test for Actual BMI $p=0.040$, Combination Predictor’s BMI $p=0.047$, Fatmah’s BMI $p=0.031$, and Chumlea’s BMI $p=0,082$

^a Friedman test result. Post hoc Wilcoxon test Actual vs Combination Predictor 0.883; Actual vs Chumlea 0.031; Actual vs Fatmah <0.001; Combination Predictor vs Chumlea 0,006; Combination Predictor vs Fatmah <0.001; Chumlea vs Fatmah <0.001.

^b Friedman test result. Post hoc Wilcoxon test Actual vs Combination Predictor 0.184; Actual vs Chumlea <0.001; Actual vs Fatmah <0.001; Combination Predictor vs Chumlea 0,006; Combination Predictor vs Fatmah <0.001; Chumlea vs Fatmah <0.001.

The highest difference in BMI was found in the female was calculated by Chumlea’s formula (1.70 kg/m²) and Fatmah’s formula in men (0.43 kg/m²). Predictor combinations show the lowest difference.

BMI is a reliable indicator for body fatness for most people. BMI does not measure body fat directly,

but studies have shown that BMI correlates with body fat, such as water weight and dual energy x-ray absorptiometry [8]. BMI can be considered as an alternative to direct measures of body fat. In addition, BMI methods are easy and inexpensive.

Increasing age there are physiological and pathological changes in a person. This situation makes the elderly become very susceptible to a disease. Diseases in the elderly usually occur in many organs so that drug administration must polypharmacy. Polypharmacy means the use of multiple drugs at once in a patient, more than is required logically-rationally associated with an estimated diagnosis. Among the many medications that was swallowed by elderly there was some drug interactions can lead to hospitalization or death. The main diseases that attack the elderly are hypertension, heart failure and infarction and heart rhythm disorders, diabetes mellitus, impaired kidney function and liver. In addition, there are also situations that often interfere with the elderly such as impaired cognitive function, balance the body, sight and hearing. All these circumstances cause elderly to receive treatment of many kinds.⁹ Problems that arise when the elderly sick are the doses of drugs that would be given should right. Growing age will affected to LADME system. It means changes in drug release from dosage form, absorption, distribution, metabolism and drug excretion. In this case, the elderly group needs special attention. Drug dose calculations can be based on age, weight, body surface area and Body Mass Index (BMI). Calculation of dose with body surface area claimed most accurately.¹⁰

Diagnostic Test On Combination Predictors to Determine Nutritional Status: Comparison of nutritional status was calculated based on predictors and actual height in women and men group showed in Fig 4 and Fig 5.

Women's BMI which was calculated by a combination of predictors resulted 2 error in the diagnosis of nutritional malnutrition and showed an overestimation phenomenon. Although with the same diagnosis error, nutritional malnutrition that calculated with BMI of combination predictor in men showed underestimation phenomenon. In Chumlea showed high underestimation reached 11 people in women and overestimated 6 people in men. Difference in underestimation of 4 women and 4 overestimations in men if the BMI is calculated by the Fatmah formula. (Shown in Figure 4 and Figure 5).

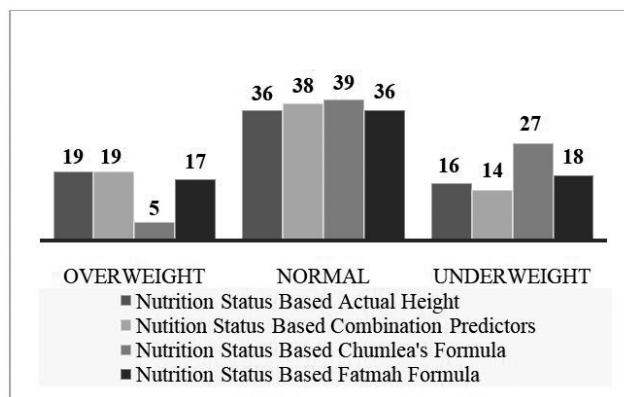


Figure 4: Comparison of Nutritional Status based Various Formula and Actual Height in Women Respondents

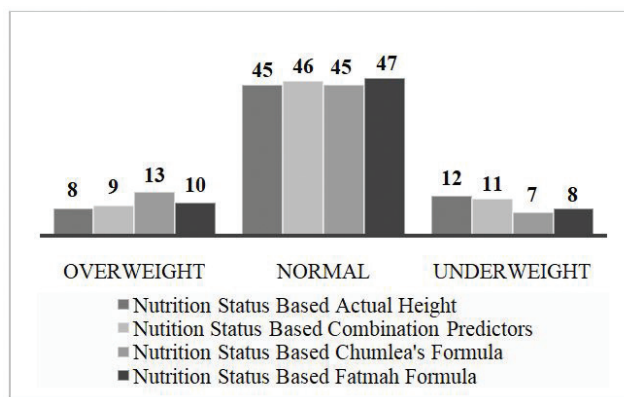


Figure 5: Comparison of Nutritional Status based Various Formula and Actual Height in Men Respondents

Then, there were calculate of the sensitivity and specificity of combination predictors when used to determine nutritional status. The results of the analysis were shown on the Tab 2. The results of calculations showed sensitivity was 90.90% and specificity was 95.60%. When the value was > 80%, it mean that the regression model has a good diagnostic test for malnutrition in the elderly. Previous research in Indonesia on new diagnostic tests was performed on a body mass index measured by arm span and knee height. The results show that the length of the depa has a sensitivity value of 78% and knee height has a sensitivity of 69%. This value is at a weak strength.⁷

Theoretically combination predictor can give more accurate the number of elderly because more variables χ added the more degrees of freedom lost. It is proved in this research with specificity value 95,06% and

sensitivity 90,90%. Thus the regression model with this predictor combination can be used to predict the height of the elderly in an effort to produce values with high accuracy. Thus, the risk of inaccuracy dosage of medication that would be given to sick elderly can be minimized.

Table 2: Diagnostic Test Table

		Nutrition Status Based Actual Height	
		Malnutrition	Normal
Nutrition Status Based Combination Predictors	Malnutrition	50	4
	Normal	5	77

Sensitivity = $a/(a+c)$... (3)

Specificity = $d/(b+d)$... (4)

Sensitivity of Combination Predictor = $50/(50+5)$
= 90.90%

Specificity of Combination Predictor = $77/(4+77)$
= 95.06%

ACKNOWLEDGEMENTS

All lecturer from Master’s Program in Epidemiology, Postgraduate School and Department of Public Health Nutrition, Faculty of Public Health, Diponegoro University, Indonesia who has conducted this research. The enumerator team who has provided support in collecting and analyzing the data in this study.

Ethical Clearance: Taken from Public Health Faculty, Diponegoro University Ethics Committee on July 14, 2017 with Number 165/EC/FKM/2017.

Source of Funding: Self.

Conflict of Interest: Nil.

REFERENCES

1. Chittawatarnat K, Sakda P, Vibul T. Height Prediction from Anthropometric Length Parameters in Thai People. *Asia Pacific Journal Clinical Nutrition*. 2012; 2(3):347-354.
2. World Health Organization. *Physical Status: The Use and Interpretation of Anthropometry*. Geneva. 1999:365-368.
3. Gavriilidou, M. Pihlsgård, Elmståhl. High Degree Of BMI Misclassification of Malnutrition among Swedish Elderly Population: Age-Adjusted Height Estimation using Knee Height and Demispan. *European Journal of Clinical Nutrition*. 2016; 69(2):565-571.
4. Fogal AS, Sylvia C.C.F, Silvia E.P. Stature Estimation Using The Knee Height Measurement Amongst Brazilian Elderly. *Nutrition Hospital*. 2015; 31(2):829-834.
5. Julia P, Martha I.K, Djoko T.H.P. A Calculating Actual Stature of Elderly through Arm Span and Knee Height Measurements. *Health Notions*. 2018; 2(2).
6. Notoatmodjo, S. *Metode Penelitian Kesehatan*. Jakarta: Rineka Cipta. 2012; 76-78.
7. Fatmah. Predictive Equations for Estimation of Strature from Knee Height, Arm Span, and Sitting Height ini Indonesian Javanese Elderly People. *International Journal of Medicine and Medical Science*. 2006; 1(10):456-461.
8. Chumlea WC, Guo S. Equations for Predicting Stature in White and Black Elderly Individuals: *Journal Gerontology*. 1992; 47:197-203.
9. Darmansjah, I. Polifarmasi pada Usia Lanjut: *Jurnal Ilmiah*. 1994; 1(1):1-5.
10. Grummer-Strawn L.M. *Centers of Assessing Your Weight: About BMI for Adult*. (Online: http://cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html [Accesed on July 25. 2018])

Is the *Maternal and Child Health Handbook* a Source of Information for Maternal and Child Health Continuum of Care?

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ABSTRACT

To ensure continuum care for maternal, newborn, and child health (MNCH), home-based records (HBRs) are expected to promote communication between healthcare providers, pregnant women and children's caregivers. WHO guidelines (2018) recommend HBRs use for MNCH, and request their effective implementation. However, information on HBRs global implementation is inadequate. This study aimed to identify implementation regarding Maternal and Child Health (MCH) handbook, an integrated HBR for ensuring continuum care. This study included literature review to explore components of MCH handbook usage, to identify researchers' acknowledgment of the handbook as a feasible source of information, and to examine existing national/subnational level implementation information. Components of the handbook usage in this study focuses on *distribute*, *explain*, and *record/multi-record* by health personnel, and *receive*, *retain*, *bring/multi-bring*, and *read* by women/mothers. While existing nationally representative data of many countries allows us to measure *distribution/receipt* and *retention* of HBRs regarding child immunization, some countries have used MCH handbook in surveys to obtain more information (e.g., antenatal/birth records) for their health policies. The researches that have used the handbook for information on different stages of MNCH may have indicated its implementation maturity in their countries.

Keywords: *continuum of care; maternal, newborn, and child health; home-based record; Maternal and Child Health Handbook; Indonesia*

INTRODUCTION

A continuum care must be implemented for every woman and child, especially for the first 1000 days after conception, the most important period for their well-being.^{1,2} To ensure that maternal, newborn, and child health-care is provided continuously, platforms for connecting caregiving sites, including households, communities, and clinical-care settings to the life-course (pregnancy, childbirth, postnatal, childhood, and adolescent period) are necessary. Home-based records (HBRs) offer mobility, accompanying subjects from their homes to different levels of health facilities.^{3,4} HBRs are potential tools for sharing information with relevant health personnel and caregivers, and tracking

individuals' health trajectories,³ as long as they are used conscientiously.^{4,5}

According to World Health Organization (WHO), "A home-based record is a record of an individual's health status and their history of health services received (primarily maternal, newborn, and child health: MNCH). The record is kept in the household by the client or by the caregiver. For MNCH, HBRs can take different forms, such as antenatal care records, immunization cards, child health booklets, or an integrated maternal and child health (MCH) handbook. Besides being important for data collection and surveillance tools, HBRs can facilitate behavioral change, communication, and patient-centered care."³ WHO recommends the use of HBRs along with facility-based records for the care of pregnant women, mothers, newborns, and children, to improve: care-seeking behaviors; male involvement and support in the household; maternal and child home care practices; infant and child feeding, and communication between health personnel and women/caregivers.³

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The necessity of effective implementation of HBRs for MNCH care is emphasized by WHO guidelines as HBRs' ability to contribute to health outcomes depending on the implementation quality.³ However, little is known about HBRs implementation in various settings. Most reports have examined HBRs implementation with a focus on child immunization programmes,⁶ and the literature available on other types of HBRs implementation is insufficient. MCH handbook has been reported as an integrated format of HBRs for MNCH as it has advantages for monitoring and facilitating continuum care, considering a child's life course.⁷⁻⁸ MCH handbook covers all MNCH stages, from antenatal care to child growth monitoring and development. By February 2016, at least 25 countries had used a national standard format of the handbook.⁹ Therefore, this study aimed to review the implementation of MCH handbook in several settings to determine its measurable information and use in continuum care.

METHOD

First, a literature review was conducted to identify studies outlining the components and/or degrees of MCH handbook usage, which influence their effectiveness. Second, the existing data available in the public domain were reviewed to identify information for national/subnational implementation.¹⁰⁻¹² Third, Indonesian literature was reviewed to identify researchers' acknowledgment of MCH handbook use as a tool for data acquiring. In Indonesia, MCH handbook was introduced in 1997, after a pilot implementation in a province. A ministerial decree was passed for its implementation in 2004, and now, it is implemented in all provinces.¹³

RESULTS

Kusmayati et al. (2007) identified some components of handbook use and its effectiveness regarding preferable knowledge and practices among mothers. These involved health workers explaining MCH handbook contents (*explain*), mothers reading the handbook (*read*), and mothers frequently taking to health services (*bring*).¹⁴ Hikita et al. (2018) suggested that both usage by health personnel (i.e., *explain*) and maternal socio-economic factors (e.g., maternal education) often influenced mothers to read (*read*) and/or to self-record (*self-record*).¹⁵ Osaki et al. (2018) examined the effective use of MCH handbook and

compared it to the low-use, to promote the consecutive services received from pregnancy to early child-rearing; preferable home practices included feeding and sick childcare, and encouraging husbands' roles in MNCH. The handbook's effective use identified in the study included health personnel distributing to their clients (*distribute/receive*), explaining its contents (*explain*), and multiple health personnel adding records to the same handbook (*record; multi-record*). Family members (*family-read*), as well as pregnant women and mothers read MCH handbook (*read*), and took it to multiple health service centers on several occasions (*bring; multi-bring*).⁷ In other words, the handbook's effective use by both health personnel, women and their family members, were considered as achieving the objective to facilitate the continuum care.

Studies on MCH handbook effectiveness identified health personnel, women/mothers, and children other caregivers as users. MCH handbook use includes: i) *distribute*, ii) *explain*, iii) *record*, iv) *receive*, v) *retain*, vi) *bring*, vii) *read*, viii) *self-record*, ix) *family-read*, x) *multi-bring*, and xii) *multi-record*.

Regarding its distribution and retention, basic information on handbook's implementation is often unavailable. Demographic Health Surveys (DHSs) have allowed us to determine the prevalence of HBRs for child immunization considering the components *receive/receive* and *retain*.⁶ For example, based on the latest available DHS data sets of 67 countries, prevalence of HBRs among 12-23 month children is diverse (42.4%-100.0% for *receive*; 24.3%-97.5% for *retain*).⁶ Among them, some countries have regarded MCH handbooks as HBRs in their respective DHSs. If DHSs were repeatedly conducted and no other records were used after MCH handbook's implementation, DHSs could monitor the prevalence of child immunization.

Some countries like Kenya, Indonesia, and Burundi use MCH handbooks in their DHSs for birthweight data as these are important for determining child's vulnerability to illnesses and survival.¹⁶⁻¹⁸ For example, birth weight was recorded in Kenyan DHSs questionnaire (i.e., whatever was available: Kenyan MCH handbook, other written record, or mother's recollection). Indonesian DHSs also helped to identify MCH handbook distribution points and facilities for antenatal care. Pregnant women in Indonesia received MCH handbook during antenatal care from private or

public health facilities. The distribution points for those who had received MCH handbook differed depending on residence settings and economic status.¹³ This finding may facilitate the efficient procedures for universal access by beneficiaries in different settings, and may also confirm the role of professional organizations committed to the distribution.

Another periodic survey in Indonesia, Basic Health Survey (*RISKESDAS*), provides specific information on MCH handbook both at national and sub-national levels. According to *RISKESDAS* conducted in 2010 and 2013, the adults responsible for infants who received MCH handbook increased from 46.6% to 57.3%, while non-receivers decreased from 29.3% to 17.4%.¹¹⁻¹² Data from 2013 showed that variation in handbook receive (52.1%–96.1%) and retention (24.3%–81.8%) between provinces were common. MCH handbooks were placed outside of the household (e.g., health facilities; from 17.0% to 19.1%), loss of MCH handbooks (from 7.1% to 6.2%) was also reported. Although the percentage of retention has increased, the unimproved percentages of loss or MCH handbooks placing outside of homes requires scrutiny.

RISKESDAS 2013 assessed records in MCH handbook to evaluate birth preparedness and complication readiness in five years preceding the survey. These records could reflect the communication between clients and health personnel and enable the consensus among the main stakeholders involved in birth planning.

In other words, *RISKESDAS* intends to collect information on various practices employed: *explain*, and *record* to establish consensus between health personnel and clients through MCH handbook. However, relevant records in MCH handbook were frequently not filled (e.g., planned birth assistant name: 35.4%; blood donor name: 12.1%); this may be due to health personnel' failure to record information or consensus failure between health personnel and clients.¹²

Existing DHSs and relevant data in public domain allow us to estimate the distribution and retention of MCH handbooks, and to measure its distribution and retention on child vaccination and beyond. Countries having MCH handbooks can have a wider range of information that could be used for policy evaluation for MNCH compared to program-specific HBRs.

Takeuchi et al. (2015) reviewed articles based on samples collected in Japan, where MCH handbook has been used for seventy years. Thirty seven studies from January 1980 to May 2017 were identified using the key word “Maternal and Child Health handbook.” Seventeen studies had used MCH handbooks as data sources for health information at later in life.⁵ This demonstrates that researchers have acknowledged MCH handbook as health information potential source when it is well kept at home (e.g., more than 80% of university students could submit their immunization record from MCH handbook). This condition assumed that recording in and retained MCH handbook for a certain duration, demonstrating the effective use of MCH handbook.

Literature review on Indonesian articles showed that Indonesian researchers have referred MCH handbook data to assess mothers and children health from the conception to five years. Sixty-one studies after 2000 were identified using “*Buku KIA*” key word, through Google Scholar. Twelve articles in 2010s had referred MCH handbook data related to pregnancy (e.g., background information,¹⁹ tetanus toxoid injection,²⁰ and iron tablets²¹), birth records (e.g. birth height²²⁻²³ and birth weight²⁴⁻²⁵), breastfeeding,²⁶ and child immunizations.²⁷⁻²⁸

DISCUSSIONS

The findings demonstrate that the components of MCH handbook use include *distribute*, *explain*, and *record* by health personnel, and *receive*, *retain*, *bring*, and *read* by women/mothers. When MCH handbook is designed for mothers/caregivers to fill, it includes *self-record*. Sometimes, family members read it (*family-read*). *Multi-bring* and *multi-record* are included as components when MCH handbook acts as a connecting care-giving sites across different MNCH stages. While the existing nationally-representative data allows us to measure *distribution/receipt* and *retention* of HBRs focusing on child immunization in many countries, some countries have used the handbook to evaluate their health policies. Researches that have used MCH handbook on the different stages of MNCH may have indicated the maturities of its implementation.

Components of usage could be categorized as variables in implementation research. WHO guidelines did not identify any studies that could help answer the question: For women during pregnancy and after

birth, and for caregivers (P), does any component of HBRs usage (I), compared to inconsistent use of it (low use) (C), improve health service outcomes (O)?³ For further assessment of the effectiveness of MCH handbook intervention, it is necessary to operationalize its components.

MCH handbook is being used more than ever in Indonesia. However, the varying levels of prevalence, and retention in different places indicate more efficient procedures needed to support the continuum care. Indonesian literature has measured health personnel's practices beyond distribution, but not across facilities (e.g., public and private; health centers and hospitals) nor across timings or focuses (e.g., different stages of MNCH period). Logically, more emphasis is needed to measure the recordings after its distribution. Ensuring the information correctness recorded is another issue to be crosschecked with health facilities. Effective record-keeping services provided to beneficiaries are a pre-condition for the effective use for continuum care.

While maturity of MCH handbook implementation increased, Indonesian researchers have started to acquire records on pregnancy, birth, and child health, besides child immunization. If more families retain MCH handbook until the child reaches adolescence, researchers can use it as a potential research tool. While the child immunization record is often used to estimate Expanded Programs on Immunization coverage at 12–23 months,⁶ MCH handbook can help to explore various aspects of continuum care. Finally, privacy needs to be secured when researchers use the handbook data.

Further research can assess implementation issues such as: i) whether women have access to MCH handbook, and if not, what are the factors; ii) whether women are active users, if not, what are the factors; iii) whether women receiving quality care, and whether their records are provided; and iv) whether women/children enjoy better health and provided health care services. This study is the first in exploring measurable information for facilitating effective HBRs and ensuring continuum care through MCH handbook use.

CONCLUSIONS

While use of MCH handbook/HBRs for MNCH is necessary, the information to monitor its effective implementation is insufficient. Researchers can play

important roles in ensuring that MCH handbook/HBRs provide maximum benefits to mothers and children by assessing the efficiency, equitability and the provided care quality.

Conflict of Interest: No research fund is applied. The author has no conflicts of interest.

Ethical Clearance: The study uses data without individual case identification codes.

REFERENCES

1. Kerber KJ, de Graft-Johnson JE, Bhutta ZA, Okong P, Starrs A, Lawn JE. Continuum of care for maternal, newborn, and child health: from slogan to service delivery. *Lancet*. 2007; 370 (9595):1358-69.
2. World Health Organization. *The Global Strategy for Women's, Children's and Adolescents' Health 2016-2030*. Italy: Every Woman Every Child; 2015.
3. World Health Organization. *WHO recommendation on home-based records for maternal, newborn and child health*. Geneva: WHO; 2018.
4. Japan International Cooperation Agency. *Study on the use of the Maternal and Child Health Handbook in the Maternal and Child Health Projects—Knowledge, Lessons and Challenges*. Tokyo: JICA; 2012.
5. Takeuchi J, Sakagami Y. *The possibility of MCH Handbook as a research resource*. Technical Brief for global promotion of maternal and child health handbook. Vol 16. Tokyo: Japan International Cooperation Agency, 2016
6. Brown DW, Gacic-Dobo M. Home-based record prevalence among children aged 12–23 months from 180 demographic and health surveys. *Vaccine*. 2015; 33: 2584-93.
7. Osaki K, Hattori T, Toda A, Mulati E, Hermawan L, Pritasari K, *et al*. Maternal and Child Health Handbook use for maternal and child care: a cluster randomized controlled study in rural Java, Indonesia. *J Public Health (Oxford)*. 2018.
8. Dagvadorj A, Nakayama T, Inoue E, Sumya N, Mori R. Cluster randomised controlled trial showed that maternal and child health handbook was effective for child cognitive development in

- Mongolia. *Acta Paediatrica*. 2017; 106(8):1360-1.
9. Osaki K, Aiga H. What is MCH Handbook Technical Brief for global promotion of maternal and child health handbook. Vol 1. 2016. Japan International Cooperation, Tokyo.
 10. ICF International. The Demographic Health Survey Program. Rockville, USA.
 11. Research and Development, Ministry of Health. Indonesia Basic Health Survey 2010. Jakarta, Balitbangkes Kemkes, 2010.
 12. Research and Development, Ministry of Health. Indonesia Basic Health Survey 2013. Jakarta: Balitbangkes Kemkes, 2013.
 13. Anung S, Osaki K. Stakeholders' roles and responsibilities in nationwide operation of MCH Handbook for continuum of care. Technical Brief for global promotion of maternal and child health handbook. Vol 11. 2016. Japan International Cooperation Agency, Tokyo.
 14. Kusmayati A, Nakamura Y. Increased utilization of maternal health services by mothers using the maternal and child health handbook in Indonesia. *J Intl Health*. 2007; 22(3): 143-51.
 15. Hikita N, Haruna M, Matsuzaki M, Shiraishi M, Takehara K, Dagvadorj A, *et al*. Utilisation of maternal and child health handbook in Mongolia: A cross-sectional study. *Health Education J*. 2018; 77(4): 458-69.
 16. Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development, and The DHS Program, ICF International. Kenya Demographic Health Survey 2014. Nairobi, Kenya: Rockville, MD, USA: Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development, and ICF International. 2015.
 17. Ministère à la Présidence chargé de la Bonne Gouvernance et du Plan Burundi (MPBGP), Ministère de la Santé Publique et de la Lutte contre le Sida Burundi (MSPLS), Institut de Statistiques et d'Études Économiques du Burundi (ISTEEBU), et ICF. Troisième Enquête Démographique et de Santé au Burundi. Bujumbura, Burundi: ISTEEBU, MSPLS, and ICF. 2017.
 18. Statistics Indonesia (BPS), National Population and Family Planning Board (BKKBN), Ministry of Health (Kemenkes), and ICF International. Indonesia Demographic and Health Survey 2012. Jakarta: BPS, BKKBN, Kemenkes, and ICF International. 2013.
 19. Damayanti. Relationship between knowledge levels of pregnant women about the high risk of pregnancy with compliance antenatal care visit at Pandan Arang hospital, Boyolali. *Berita Ilmu Keperawatan*. 2010; 3(4): 174-82.
 20. Azizah N. Knowledge of primigravid about tetanus toxoid injection. *EduHealth Journal*. 2015; 5(2): 131-6.
 21. Diana M, Hadi H, Rahmawati NI. Level of compliance with taking iron tablets with premature events in Bantul district. 2013. *Nursing dan Midwife Indonesian Journal*. 2013; 1(2): 43-7.
 22. Nuryanto KY. Difference of newborn baby length between from KEK and non KEK pregnant mother. *Journal of Nutrition College*. 2014; 3(1): 235-42.
 23. Najahah I. Risk factors of short baby length in delivery room, Patuh Patju Hospital, Lombok Barat District. *Media Bina Ilmiah*. 2014; 8(1): 16-23.
 24. Tazkiah M, Wahyuni CU, Martini S. Epidemiology determinants of LBW on malaria endemic areas in Banjar District, South Kalimantan Province. *J Berkala Epidemiologi*. 2013; 1(2): 266-76.
 25. Sulistyorini D, Putri SS. Analysis of factors influencing LBW in rural public health care in Banjarnegara District 2014. *Medsains*. 2015; 1(1): 23-9.
 26. Dahliansyah, Hanim D, Salimo H. association of exclusive breast feeding, nutritional status, and occurrence of diarrhea with motoric development during the first 1000 days of life. *Sari Pediatri*. 2018; 20(2): 70-8.
 27. Putri DSK, Utami NH, Nainggolan O. Association of utilization continuity of maternal health care and completeness of basic immunization in di Indonesia. *J Kesehat Reprod*. 2016; 7(2): 135-43.
 28. Prayogo A, Adelia A, Cathrine, Dewina A, Pratiwi B, Ngatio B, *et al*. Completeness of basic immunization on children 1-5 years old. *Sari Pediatri*. 2009; 1(1): 15-20.

The Correlation between Regulation Understanding by Inter-Professional 1000 HPK Health Workers and the Acceleration of Toddler Stunting Prevention

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ABSTRACT

Promoting exclusive breastfeeding, infant and young child feeding (IYCF) practice are strategies to solve and prevent stunting. However, in fact, this effort does not yet achieve the expected target. Regulations on exclusive breastfeeding and IYCF have been provided and widely socialized so far. This study aims to analyze the correlation between regulation understanding (focusing on exclusive breastfeeding and IYCF) by inter-professional health workers collaboration and the implementation of stunting prevention in urban areas. Observation based study with mixed method using cross sectional design was performed in Surabaya city (33 primary health care centers) and Sidoarjo district (13 primary health care centers), during September-December 2017. The subjects of 199 health workers were selected purposively. The data were collected through interview using structured questionnaire combined with Focus Group Discussion (FGD). Then, the data were evaluated using descriptive and contingency coefficient analysis. The understanding of regulation by inter-professional health workers on the exclusive breastfeeding and IYCF varied with average of 76.4% and 63.6%, respectively. The implementation of this regulations by the inter-professional health cares did not yet in line with the condition of stunting program prevention. However, the performance synergism of multisector institutions and the cross profession to achieve the exclusive breastfeeding target was stronger than that of IYCF. According to contingency coefficient analysis ($p < 0.05$), good understanding, well-organized documents availability, and the regulation conformity by health workers significantly correlated with the implementation of exclusive breastfeeding regulation. Good understanding of health workers on exclusive breastfeeding and IYCF regulations is a key factor in the practical collaboration of inter-professional health workers to educate people to achieve the target and to implement the cross sectional programs to prevent toddler stunting.

Keywords: regulation; coloboration; inter-professional; stunting

INTRODUCTION

The implementation of the accelerated program of nutrition improvement through the rescue movement of the first 1000 days of life in Indonesia, is one of the efforts to achieve the target of SDGs. The achievement

of the SDGs targets can only be done if the majority of policy concern are given to the nutritional improvement (Input, Output) on sustainable development. According to The National Team for The Acceleration of Poverty Reduction (TNP2K) in 2017 (1), the first 1000 days of life (1000 HPK) program has not shown encouraging results such as lack of integration planning, budgeting implementation, service, monitoring and evaluation, as well as the lack of common purpose and agreement of the importance of handling the 1000 HPK issue. Similarly, policy and intervention programs as effectively stunted because policy and regulation related to stunting intervention have not been maximally used as a common ground for handling stunting.

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Stunting in children is the most fundamental challenge in the world to promote development (2). Childhood stunting, being short for one’s age, has life-long consequences for health, human capital and economic growth (3). In Indonesia, stunting prevalence of children under five are 37%. Promoting exclusive breastfeeding and IYCF are strategies to solve and prevent stunting. However, in fact, this effort does not yet achieve the expected target. Regulations on exclusive breastfeeding and IYCF have been provided and widely socialized so far.

Both regulation and policy related to 1000 HPK, particularly regulation on exclusive breastfeeding and IYCF, are available in form of rules: Laws (*Undang-undang*), Health Ministerial Regulation (*Permenkes*), Health Ministerial Decree (*Kepmenkes*) as well as Regional Regulation (*Perda*). The rules are: Law No. 36/2009 concerning health, Government Regulation (PP No. 33/2012 about exclusive breastfeeding), and Health Ministerial Decree RI No.450/Menkes/SK/IV/2004 about exclusive breastfeeding in Indonesia; and Provincial Government Regulation of East Java No 11/2011 about nutrition improvement (4). However, the main challenges to execute the nutrition policy (5) are the coordination complexity inter and intra sectors, the lack of concern of decision makers about scale and the impact of nutrition problem on socioeconomic as well as for the next generation growth, and lack of social pressure and advocacy leading to low commitment.

The challenges as previously mentioned give impact directly and indirectly on the achievements of nutrition improvement, which are not optimum yet such as the implementation on exclusive breastfeeding and IYCF. The earlier implementation on breastfeeding initiation or *Inisiasi Menyusui Dini* (IMD) is accounted as 50% out of total given birth mothers and 65% of the infants get less than 6 months exclusive breastfeeding (6). This study aims to analyze the correlation between regulation understanding (focusing on

exclusive breastfeeding and IYCF) by inter-professional health workers collaboration and the implementation of stunting prevention in urban areas.

METHOD

Observation based study with mixed method using cross sectional design was performed in Surabaya city (33 primary health care centers) and Sidoarjo district (13 primary health care centers), during September-December 2017. The subjects of 199 health workers (head of primary health care unit, medical doctor, nutritionist, midwife, and others health workers) were selected purposively. The data were collected by interview using structured questionnaire and combined with focus group discussion (FGD).

Data collection was performed by trained enumerator and inspected by investigator team work. The data were collected through surveillance to health workers, and then FGD was conducted on them. The data were further analysed descriptively using frequent distribution, presented in tables and narations. The correlation between variables was performed with contingency coefficient. Ethical clearance was obtained from the ethics committee of Faculty of Public Health, Universitas Airlangga, no 503-KEPK.

RESULTS AND DISCUSSION

The characteristics of health workers selected for this study were presented in Table 1. The average age of both planner (head of primary health care unit) and program executor (medical doctor, nutritionist, midwife, and others health workers) were 39.6 years old. The head of primary health care unit as planner, around 48.9 years old; and medical doctor, nutritionist, midwife and other health professionals as program executor, around 37.7 years old. Most of the selected health workers were female, with the education level of BSc and medical doctor (72.7%) for planner, and D3/D4 for nutritionist, midwife, and others.

Table 1: Characteristics of Health Workers

Variable	Head of Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professionals	Total
Age (years)	48.9 ± 6.2	38.3 ± 7.2	42.2 ± 9.4	36.8 ± 9.6	33.3 ± 9.8	39.6 ± 9.9
Gender						
Male	8 (24.2%)	3 (9.4%)	11 (31.4%)	0 (0)	4 (20%)	26 (13.2%)
Female	25 (75.8%)	29 (90.6%)	24 (68.6)	77 (100%)	16 (80%)	171 (86.8%)

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Education Level						
D1	0 (0)	2 (5.7)	0 (0)	0 (0)	0 (0)	2 (1)
D3/D4	0 (0)	0 (0)	25 (71.4)	74 (96.1)	9 (40.9)	108 (54.3)
Bachelor (BSc)	24 (72.7)	26 (81.3)	8 (22.9)	2 (2.6)	13 (59.1)	73 (36.7)
Graduate (master)	9 (27.3)	6 (18.8)	0 (0)	1 (1.3)	0 (0)	16 (8)

Regulation and Understanding: In general, policies that become national programs will be strengthened institutionally with local regulations. The regulation and policy related to 1000 HPK, especially regulation on exclusive breastfeeding and IYCF are provided in 19 regulations in different level such as Laws, Health Ministerial Regulation, Health Ministerial Decree as well Government Regulation. If traced futher, not all region follow up the Presidential Regulation No 42/2013 about the Movement of 1000 HPK. East Java is the only province in Indonesia that has a Provincial Government Regulation for the nutrition improvement, and the district of Sidoarjo is also the first district that has a Regional Regulation No 1/2016 concerning nutrition improvement and exclusive breastfeeding (7). Among 19 regulations, 14 regulations (8 on exclusive breastfeeding and 6 regulations on IYCF) were asked to health workers regarding to their understanding, documentation, reading and implementation.

The knowledge of regulation on exclusive breastfeeding: The knowledge of health workers on exclusive breastfeeding regulation is presented in Table 2. PP no. 33/2012 on Exclusive Breastfeeding regulation and UU No. 36/2009 on Health, are the most widely known regulations by the subjects (health workers).

Regulations on exclusive breastfeeding such as PP no. 3/2012 (Exclusive breastfeeding), Permenkes RI No. 15/2013 on provision of nursery facility, Kepmenkes RI no.450/Menkes/SK/IV/2004 on exclusive breastfeeding to infant in Indonesia, are well known by head of primary health care unit, nutritionist and midwife. Other regulations known by the health workers particularly in Sidoarjo district is Perda Sidorajo District no. 1//2016 on nutrition improvement and exclusive breastfeeding.

Documentation of Regulation on Exclusive Breastfeeding: Based on the documentation, more than 50% subjects did not have the document about exclusive breastfeeding regulation. Among the subjects who told that knowing well and have the document regulation, regrettably they couldn't showed the document. Among the regulations which were well known by the subjects (PP No. 33/2012 on Exclusive Breastfeeding), only 30% of the health workers could showed the document.

Among 8 regulations as shown in table 2, the most frequently read and implemented regulations by the subjects were PP no. 33/2012 and UU no. 36/2009. Between those regulations, PP no. 33/2012 was the most widely known regulations, available documents, reads, and implemented by health personnel.

Table 2: The Health Workers Who Knew the Exclusive Breastfeeding Regulations

Regulation	Head of Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professionals	Total
PP No. 33/2012	26 (83.9)	18 (56.3)	32 (91.4)	61 (85.9)	18 (81.8)	155 (81.2)
Permenkes RI No. 15/2013	24 (77.4)	12 (37.5)	25 (71.4)	52 (73.2)	13 (59.1)	126 (66)
Kepmenkes RI No. 450/ Menkes/SK/IV/2004	22 (71)	11 (34.4)	26 (74.3)	49 (68.1)	13 (59.1)	121 (63)
Permeneg PP & PA RI No. 3/2010	18 (58.1)	8 (25)	21 (60)	40 (54.1)	5 (25)	92 (47.9)
UU No. 36/2009 about health	28 (90.3)	19 (59.4)	29 (82.9)	62 (84.9)	15 (75)	153 (80.1)
Perpres No. 42/2013	19 (61.3)	5 (15.6)	22 (62.9)	41 (56.2)	5 (25)	92 (48.2)
Permenkes RI No. 25/2014	18 (58.1)	11 (34.4)	22 (64.7)	44 (61.1)	7 (35)	102 (54)
Permenkes RI No.15/2014	19 (61.3)	9 (28.1)	23 (65.7)	43 (59.7)	8 (40)	102 (53.7)

Based on the contingency coefficient study, there is a significant correlation ($p < 0.05$) between knowledge, availability of document, regulations read, and the implementation of exclusive breastfeeding regulations. This result supports the urgency of regulation socialization, document provision physically, regulation that can be read by health personnel so the regulation can be optimally implemented.

IYCF regulation knowledge: About 6 regulations were asked to health workers (subjects). There were fewer subjects who knew the IYCF regulation compared to the exclusive breastfeeding one (Table 3). As shown in the table, less than 50% subjects knew the IYCF regulation. Among 6 regulations asked, only Permenkes RI no. 39/2013 about infant formula milk and other products was known by half of the subject especially head of primary health unit, nutritionist, and midwife.

As shown in table 3, more than 60% of the subjects did not have the document of IYCF regulation. Among the health workers possessing the regulation document, less than 15% of them could show the document. The document shown by 11% of the health workers was Permenkes RI No. 39/2013 about infant formula milk and other products, and Kepmenkes RI No. 224/2007 about technical specification on complementary food.

There is less than 30% of the health workers have read the IYCF regulation. This regulation was most widely read by nutritionist. Overall, IYCF regulation which was most widely read by health workers was Permenkes RI No. 240/MENKES/PER/V/1985 about

breastfeeding meanwhile, the IYCF regulation which was most widely read by nutritionist was Kepmenkes RI No. 224/2007 about technical specification on complementary food.

The IYCF regulation was more implemented by nutritionist than other health professionals. The most implemented regulations were Permenkes RI No. 39/2013 about infant formula milk and other products, Permenkes RI No. 240/MENKES/PER/V/1985 about breastfeeding substitution, and Kepmenkes RI No. 224/2007 about technical specification on complementary food.

Based on the contingency coefficient test, there was a significant correlation ($p < 0.05$) between knowledge, document availability, regulations read, and the implementation of IYCF regulation. This result also supports the urgency of regulation socialization, document provision, and regulation reading to achieve optimum implementation of IYCF regulation.

The understanding of regulation by inter-professional health workers on exclusive breastfeeding and IYCF varied with average of 76.4% and 63.6%, respectively. The implementation of these regulations by these inter-professional health workers did not yet in line with the condition of stunting program prevention.

According to contingency coefficient analysis ($p < 0.05$), good understanding, well-organized documents availability, and the regulation conformity by health workers significantly correlated with the implementation of exclusive breastfeeding regulation.

Table 3: The Health Workers Who Knew the IYCF Regulations

Regulation	Head Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professional	Total
Permenkes RI No. 240/MENKES/PER/V/1985	15 (48.4)	7 (21.9)	19 (54.3)	36 (51.4)	8 (40)	85 (45.2)
Permenkes RI No. 39/2013	17 (54.8)	7 (21.9)	22 (62.9)	41 (55.4)	9 (45)	96 (50)
Permenkes RI No. 49/2014	15 (48.4)	8 (25)	20 (57.1)	33 (45.2)	8 (36.4)	84 (43.5)
Permenkes RI No. 51/2016	12 (38.7)	7 (21.9)	16 (47.1)	31 (42.5)	3 (15)	69 (36.3)
Kepmenkes RI No. 237/Menkes/SK/IV/1997	13 (41.9)	7 (21.9)	18 (52.9)	30 (40.5)	3 (15)	71 (37.2)
Kepmenkes RI No. 224/2007	13 (41.9)	7 (21.9)	19 (54.3)	39 (52.7)	6 (30)	84 (43.8)

The commitment of multisectoral and intra professional institutions: Table 4 shows the health workers commitment at planner and executor levels.

Most of the planners and the executors have strong commitment to achieve the target of exclusive breastfeeding, IMD, and IYCF.

More than 50% of the health workers both at planner and executor levels showed very strong commitment to achieve exclusive breastfeeding, IMD, and IYCF targets. While, more than 1/3 of the health workers have strong commitment. As shown in the table, the

commitment to achieve exclusive breastfeeding target was stronger as compared to both IMD and IYCF targets. The performance synergism of multisector institutions and the cross profession to achieve the exclusive breastfeeding target was stronger than that of IYCF.

Table 4: The Commitment of Health Workers on Exclusive Breastfeeding, IMD, and IYCF

Variables	Head of Primary Health Care Unit	Medical Doctor	Nutritionist	Midwife	Other Health Professionals	Total
The commitment to achieve exclusive breastfeeding target						
Very strong	23 (69.7)	22 (68.8)	24 (68.6)	40 (51.9)	11 (50)	120 (60.3)
Strong	9 (27.3)	9 (28.1)	11 (31.4)	34 (44.2)	11 (50)	74 (37.2)
Moderate strong	1 (3)	1 (3.1)	0 (0)	3 (3.9)	0 (0)	5 (2.5)
The commitment to achieve IMD target						
Very strong	21 (63.6)	19 (59.4)	17 (48.6)	37 (48.1)	12 (54.5)	106 (53.3)
Strong	9 (27.3)	10 (31.3)	14 (40)	38 (49.4)	10 (45.5)	81 (40.7)
Moderate strong	3 (9.1)	3 (9.4)	4 (11.4)	2 (2.6)	0 (0)	12 (6)
The commitment to achieve IYCF target						
Very strong	18 (54.5)	19 (59.4)	22 (62.9)	34 (44.2)	13 (59.1)	106 (53.3)
Strong	11 (33.3)	10 (31.3)	12 (34.3)	37 (48.1)	9 (40.9)	79 (39.7)
Moderate strong	4 (12.1)	3 (9.4)	1 (2.9)	6 (7.8)	0 (0)	14 (7)

More than 50% of the health workers both at planner and executor levels showed very strong commitment to achieve exclusive breastfeeding, IMD, and IYCF targets. While, more than 1/3 of the health workers have strong commitment. As shown in the table, the commitment to achieve exclusive breastfeeding target was stronger as compared to both IMD and IYCF targets. The performance synergism of multisector institutions and the cross profession to achieve the exclusive breastfeeding target was stronger than that of IYCF.

CONCLUSIONS

Good understanding of health workers on exclusive breastfeeding and IYCF regulations is a key factor in the practical collaboration of inter-health workers to educate people to achieve the target and to implement the cross sectional programs to prevent toddler stunting. The equal commitment of all health professionals on breastfeeding-related policies as well as regulations is urgently needed to achieve optimal target of stunting prevention acceleration.

Conflict of Interest: The authors declare there are no conflict of interest.

ACKNOWLEDGEMENTS

We would like to thanks to Ministry of Health, Surabaya Health Office, and Sidoarjo Health Office for their help to complete this research.

Ethical Clearence: This analysis was approved by the Ethics Committe of Faculty of Public Health Airlangga University and all patients gave their written informed consent.

Source of Funding: This research was funded by Ministry of Health Republic of Indonesia.

REFERENCES

1. TN2PK. 100 Regencies/Cities for Intervention of Dwarf Children. Jakarta: National Team for Achieving Poverty Reduction. 2017.
2. Antonio Suarez, Weise. Stunting Policy Brief. WHO Global Nutrition Target. 2014 page 2-4.
3. Shekar, M. Kakietek, J. D’Alimonter MR. Rogers HE. Eberwein JD. Akuoku JD. Akuoku JK. Pereira A. Soe-Lin S. Hecht R. Reaching the global target to reduce stunting an investment framework. *Health Policy an d Planning*. 2017; 32,2017, 657-668.

4. East Java Province Regional Regulation No 11 of 2011. Concerning Nutrition Improvement Policies. 2011.
5. Ecker, O. and Nene, M. Nutrition Policies in Developing Countries: Challenges and Highlights. Policy Note, International Food Policy Research Institute. 2012.
6. Pocket Book of Nutritional Status Monitoring and Nutrition Performance Indicators. Indonesia Health Ministry. 2015.
7. Sidoarjo Regency Regional Regulation Number 1 of 2016 Concerning Improvement of Nutrition and Exclusive Breastfeeding. 2016.

The Effectiveness of Training and Mentoring Activities to Improve Cadre Performance in Child Growth Monitoring (CGM)

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ABSTRACT

Routine growth monitoring of children in Indonesia is done through Posyandu. Posyandu cadres who have sufficient knowledge about Child Growth Monitoring (CGM) are needed to improve early detection of child malnutrition to prevent stunting. The ability to use WHO-Anthro software followed by mentoring programs is expected to help increase cadre capacity in CGM performance. This study aims to determine the effectiveness of training and mentoring activities in using WHO-Anthro software to improve cadres' performance in monitoring children's growth. This research was a collaborative research with the Ministry of Health. This experimental research used one group pretest-posttest design. This research was conducted on 30 female cadres from 30 Posyandu in Semarang City, Indonesia. Intervention activities and data collection were carried out for three months. Data were analyzed by comparison tests. The results showed that after the intervention there was an increase in knowledge scores, practice scores and performance scores of cadres in CGM. It was concluded that training and guidance on the implementation of WHO-Anthro software improved cadre performance in CGM.

Keywords: *Posyandu cadre, child growth monitoring, WHO-Anthro, nutritional surveillance*

INTRODUCTION

In Indonesia, child growth monitoring activities for early detection of growth disturbances are carried out through activities at Posyandu. The existence of Posyandu as an effort to early detection of community-based child growth disorders, was initially promoted by Unicef in the 1980s with the aim of weighing children and heavy plots on growth charts for early detection of growth faltering, thus enabling community workers (cadres) to advise mothers about how to improve the growth of disturbed children¹. The existence of Posyandu has been proven to play an important role in survival activities through growth monitoring and promotion activities (Growth Monitoring and Promotion) in children in Indonesia^{2,3}. Like experience in many countries, child growth

Monitoring and Promotion activities are supported by community participation through volunteer labor⁴⁻⁶.

However, there are a number of problems related to the implementation of Posyandu in child growth monitoring activities in Indonesia, among others: there are still inadequate facilities and skills of cadres¹, Posyandu cadres are volunteers, often change without being followed by training or retraining, as a result the technical abilities of active cadre are inadequate⁷, lack of ability which is very severe in weighing and plotting⁸, lack of ability of Posyandu cadres in conducting "nutritional counseling" causes nutritional education activities to become jammed or not implemented, so that toddlers who come are only weighed and recorded in Growth Monitoring Chart without adequate explanation so efforts to prevent the incidence of malnutrition are less effective⁷. Therefore, it is necessary to increase cadre capacity through ongoing training and mentoring activities^{9,10} so that cadres have knowledge and self-efficacy cadres are increasing^{11,12} so that cadres become more confident in carrying out their tasks¹³, related to growth monitoring and providing nutrition counseling.

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Nutrition surveillance activities for early detection of nutritional problems in infants required strengthening of information systems in cadres. Strengthening of information subsystem in this matter was urgent so need to do the joint effort to push for all activity recording and data processing result of measurement of nutrition status gradually needed to be changed towards digital or computation.

Currently, the anthropometric index can be calculated using the World Health Organization’s Child Growth Standard (WHO, 2007) using WHO-Anthro software. This application is simple enough to operate but is able to calculate anthropometry indicators and can present the data in the form of individual charts more accurately⁹. Introducing the used of WHO-Anthro software to cadres expected to improve the validity of weighing data processing Posyandu. Thus, this study aims to determine the effectiveness of training and mentoring activities in using WHO-Anthro software to improve cadres’ performance in Child Growth Monitoring (CGM). The location of this study was Semarang City because the participation rate for Posyandu was 70.0% with the percentage of children under five coming and weighing 80.5%⁸.

MATERIAL AND METHOD

Research Design and Study Subject: This research is an experimental study with the design of a pretest-posttest group without a control group with the nonrandom sample. The study was conducted on 30 female cadres from 30 Posyandu in health care Pudukpayung, Semarang City, Indonesia.

Data Collection: Data collection was carried out using a questionnaire consisting of seven parts. Part 1 is the characteristics of respondents consisting of 6 questions, including age, occupation, length of time as cadres, education, training history as cadres and frequency of cadre training. Section 2 is knowledge consisting of 37 questions, Part 3 is an attitude consisting of 29 questions. Section 4, practice consists of 29 questions. Section 5 is self-efficacy consisting of 30 questions. Section 6 is the cadre performance in Child Growth Monitoring (CGM), including (a) monitoring the nutritional status of children under five (2 questions), (b) data quality (7 questions), (c) data processing (5 questions), (d) cadre data analysis (3 questions), (e) program success (3 questions) and (f) achievement of cadre program targets (1 question).

The intervention consisted of training and mentoring the use of the Anthro WHO software for data management in Posyandu. Cadres are taught how to install Anthro WHO software and how to use the three main menus: (a) Anthropometric Calculator, b) Individual Assessment, and (c) Nutrition Survey, according to manual¹⁴. Then the trainer teaches the use of child growth monitoring charts. Intervention activities and data collection were carried out for three months. Data were collected twice (pretest and posttest), before and after the intervention.

STATISTICAL ANALYSIS

Data analysis was done with IBM SPSS Statistics. Research Method. Data distribution was tested using the Kolmogorov Smirnov test in which data is normally distributed if $p \geq 0.05$. In answering the research objectives and proving the hypothesis, statistical tests were carried out using Mann Whitney, Wilcoxon and Rank Spearman tests.

FINDINGS

Characteristics of Respondents: Table 1 showed that most of the cadres were housewives who were not working (80.0%). The education level of cadres was mostly highly educated (83.3%). Two of the three cadres claimed to have attended the training twice. The average age of cadres was at 45.4 years with the average length of duty as a cadre for 10.1 years.

Impact of Intervention: The results showed an increase in the scores of cadre knowledge, attitudes, practices, self-efficacy and cadre performance in CGM (Table 2), but only scores of cadre knowledge, practice, and cadre performance in CGM were significantly different between before and after the intervention ($p < 0.05$). A score of cadre attitudes and cadre self-efficacy did not differ significantly between before and after the intervention ($p \geq 0.05$).

Table 1: Characteristics of Respondents (n = 30)

Characteristics of Respondents	N	%
Work Status		
Workers	6	20,0
Not Workers	24	80,0
Education Level		
Low	5	16,7
High	25	83,3

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Training History as Cadres		
Never	10	33,3
Ever	20	66,7
And Frequency of Cadres Training		
Mean ± S.D	1,4 ± 2,51	
Median (Min–Max)	0,0 (0,00–10,00)	
Age (Years)		
Mean ± S.D	45,4 ± 6,44	
Median (Min–Max)	45,5 (28,00–56,00)	
Length of Duty as Cadres		
Mean ± S.D	10,1 ± 9,31	
Median (Min–Max)	6,5 (1,00–35,00)	

Factors related to changes in cadre performance:
 The relationship between personal characteristics of cadres and changes in knowledge, attitudes, practices, self-efficacy and CGM performance scores are presented in Table 3. Based on Table 3, the cadre’s personal characteristics are significantly related to changes in knowledge scores are the level of education of cadres and history have attended cadre training, while those related to changes in attitude scores are the status of cadre work, and related to changes in practice scores are the frequency of cadre training. However, no cadre personal characteristics were significantly associated

with changes in self-efficacy scores. The personal characteristics of cadres significantly related to changes in CGM performance scores are cadre work status.

Table 4 shows the results of correlation analysis between various variables, including changes in knowledge score, attitude scores, practice scores, self-efficacy scores, and CGM performance scores. The results showed a positive correlation between changes in knowledge scores and changes in practice scores ($r = 0.407$; $p = 0.026$). While there is no significant correlation between the other variables (Table 4)

DISCUSSION

The skills of cadres in the management of anthropometric measurement data can be increased by providing training in accordance with procedures. During this time cadres have received basic training and refresher on service activities in Posyandu with conventional approaches, namely training with lecture methods, accompanied by discussions with trainers. One of the weaknesses of the conventional method is that it only increases knowledge, but does not improve the skills of trainees. The method used in training should be adapted to the problems, situations, and conditions of the trainees so that the skills and performance of Posyandu cadres can increase¹⁵.

Table 2: Comparison of pretest and posttest score (n = 30)

Variable	Pretest Score	Posttest Score	Δ (Score Change)	Percentage of Δ (%)	p
Knowledge					
Mean ± S.D	64,1 ± 2,88	64,7 ± 3,62	2,4 ± 2,71	4,0 ± 4,56	0,001 ^a
Median (Min–Max)	64,0 (58,00–70,00)	66,0 (56,00–70,00)	2,0 (-2,00–10,00)	3,2 (-2,94–17,86)	
Attitude					
Mean ± S.D	54,2 ± 2,34	54,7 ± 3,16	1,2 ± 1,74	2,4 ± 3,30	0,131 ^b
Median (Min–Max)	54,5 (49,00–57,00)	56,0 (44,00–58,00)	2,0 (-2,00–5,00)	1,8 (-3,57–9,80)	
Practice					
Mean ± S.D	52,2 ± 3,62	53,5 ± 3,57	1,6 ± 3,31	4,7 ± 6,57	0,048 ^b
Median (Min–Max)	52,5 (43,00–58,00)	55,0 (45,00–58,00)	2,0 (-3,00–12,00)	3,2 (-7,14–20,42)	
Self Efficacy					
Mean ± S.D	65,0 ± 15,02	64,81 ± 22,04	7,7 ± 9,97	14,6 ± 19,22	0,614 ^b
Median (Min–Max)	64,9 (38,83–90,33)	69,8 (0,00–90,33)	6,8 (-17,00–31,66)	8,8 (-20,65–70,88)	
CGM Performance					
Mean ± S.D	4,4 ± 1,37	3,6 ± 3,85	0,7 ± 1,48	0,5 ± 0,74	0,007 ^b
Median (Min–Max)	4,9 (0,47–5,96)	3,8 (0,0–4,77)	0,6 (-3,30–2,79)	0,17 (-3,30–1,0)	
^a Paired T-Test, ^b Wilcoxon Test					

Table 3: The relationship between individual cadre characteristics and change of cadre performance score (score gain) after intervention

Variable	Δ Knowledge score	Δ Attitude score	Δ Practice score	Δ Self Efficacy score	Δ CGM Performance score
Employment Status	0,374 ^b	0,044^c	0,462 ^b	0,416 ^c	0,041 ^c
Age (Year)	r = 0,090 p = 0,337 ^d	r = 0,022 p = 0,910 ^e	r = -0,070; p = 0,411 ^d	r = 0,085 p = 0,657 ^e	r = 0,002 p = 0,991 ^e
Education Level	0,022^b	0,463 ^c	0,208 ^b	0,496 ^c	0,538 ^c
Long Being a Cadre	r = -0,124 p = 0,512 ^d	r = 0,022 p = 0,910 ^e	r = -0,260; p = 0,166 ^d	r = 0,160 p = 0,398 ^e	r = 0,255 p = 0,173 ^e
History Following Cadre Training	0,013 ^b	0,424 ^c	0,559 ^b	0,617 ^c	0,609 ^c
Frequency of Cadre Training	r = -0,164 p = 0,385 ^d	r = 0,246 p = 0,190 ^e	r = 0,350; p = 0,038^d	r = -0,021 p = 0,914 ^e	r = 0,126 p = 0,507 ^e

^b Mann Whitney Test, ^c Unpaired T-Test, ^d Rank Spearman Test, ^e Pearson Product Moment

Table 4: Correlation (r) among change of knowledge, attitude, practice, self-efficacy, and CGM performance score

		Δ Knowledge score	Δ Attitude score	Δ Practice score	Δ Self Efficacy score	Δ CGM Performance score
Δ Knowledge score	r		-0.021	0.407	-0.094	-0.085
	(p)		(0.911)	(0.026)	(0.622)	(0.655)
Δ Attitude score	r			0.234	0.253	-0.090
	(p)			(0.214)	(0.177)	(0.636)
Δ Practice score	r				-0.063	0.159
	(p)				(0.742)	(0.401)
Δ Self Efficacy score	r					-0.131
	(p)					(0.491)
Δ CGM Performance score	r					
	(p)					

This study proves that training is followed by mentoring on the use of WHO-Anthro software in CGM activities affected changes in cadre knowledge scores, practices, and cadre performance. It proves that with the accompaniment of continuously, knowledge of cadres would be increased. With increasing knowledge, it would also improve the ability of practice. As practice was a manifestation of an action based on the previous empowerment. With the increased practice score, then indirectly would also increase the performance of cadres Posyandu. Thus, cadres could perform the tasks in accordance with the objectives to be achieved from the implementation of Posyandu¹⁶. In the indicator of data quality and the achievement of program facilities in performance surveillance variable did not change the score of the possibility occurred because the cadres were actually experiencing confusion data processing through

the computerized system with WHO-Anthro. After being assisted, the cadres learned more about Posyandu and WHO-Anthro so they realized that facilities in their Posyandu still lacking¹⁷.

The impact of the training on improving the skills of Posyandu cadres has been widely demonstrated, that the skills of Posyandu cadres in anthropometric measurements increase after participating in training^{18,19}.

The results of this study are similar to the findings of the study in the city of Banda Aceh¹⁸, which found the quality of information on training groups based on WHO-Anthro software after one month of training had a good improvement, especially in terms of timely, completeness, and accuracy aspects. After one month of training and the application of WHO growth standards in the treatment group based on WHO-Anthro software

showed an increase in the percentage of information quality of nutritional status data on children under five reaching 13.6%. The quality of nutritional data from trainees based on WHO-Anthro software had better effectiveness than manual-based training. This finding is reinforced by De Onis et al., The use of WHO-Anthro software can accelerate the process and increase the validity of input-output data produced, and become an important part in the assessment or monitoring of nutritional status²⁰.

The impact of interventions on changes in cadre performance at CGM was higher found in cadres with working status than those who did not work. The cadres who work are thought to be better able to adapt and implement new applications because they have better working skills. The intervention on changes in knowledge and practice was found to be higher in cadres who previously had a history of training or more training frequency. Previous training that has been accumulated will increase more trained knowledge, insight, and skills. The link between training increased knowledge and skills has been found through this study, that changes in knowledge are positively correlated with changes in cadre practices.

In this study, training did not significantly affect changes in self-efficacy variables, and a number of characteristics of cadre characteristics were also not related to changes in self-efficacy scores. However, self-efficacy scores have proven to increase after training and mentoring. this may occur because the activity is not focused on how to improve good self-efficacy because if this process is carried out it will take longer and not less cost. Factors such as mastery experiences, vicarious experiences, social persuasion, physiological and emotional states²¹ have not been included in the analysis. The results of this study are different from the results of research conducted on Posyandu cadres in East Java, where interventions can significantly improve self-efficacy and affective abilities²². The higher self-efficacy will have a positive effect on improving the affective ability of a cadre, and the higher the affective ability of a cadre will have an effect on increasing healthy behavior²³. Increased cadre ability will have an impact on Posyandu management, especially growth monitoring and health promotion.

Training activities on the implementation of WHO-Anthro software have been proven to improve Posyandu cadre knowledge, but to improve the practice and cadre

performance need three months of assistance. This research completed evidence, that to change the pact and ability of cadres could not be done in a short time, but needed assistance. Intervention with the training model alone is not enough, it needs to be continued with field assistance that is carried out on-going.

Although training and mentoring on the use of WHO-Anthro software have been proven to be able to improve the knowledge, practice, and performance of Posyandu cadres, the intervention model has not been able to address all the issues related to cadres in the Posyandu. The cadres often change and need to be followed by training or retraining so that the technical skills of active cadre nutrition are adequate and have the ability to do “nutrition counseling and counseling” so that nutritional education activity can be run⁷.

CONCLUSION

It was concluded that training and guidance on WHO-Anthro software implementation improve cadres performance and nutrition surveillance in *Posyandu*. To improve the capacity of cadre in handling the Posyandu information system, it is necessary to train and carried out the mentoring activities (in at least three months).

Conflict of Interest: The authors declare that there was no conflict of interest.

Source of Funding: The research was funded by the Directorate of Community Nutrition, the Indonesian Ministry of Health

Ethical Clearance: This study was approved by the Ethics Committee for Health Research at the Faculty of Public Health, Diponegoro University, Indonesia

REFERENCES

1. MOH-Pokjantal. General guidelines for posyandu management. Jakarta; 2011.
2. Anwar F, Khomsan A, Sukandar D, Riyadi H, Mudjajanto ES. High participation in the Posyandu nutrition program improved children nutritional status. *Nutr Res Pract*. 2010. <https://doi.org/10.4162/nrp.2010.4.3.208>
3. Leimena SL. Posyandu: a community based vehicle to improve child survival and

- development. *Asia-Pacific Journal of Public Health*. 1989;3(4), 264–267. <https://doi.org/10.1177/101053958900300402>
4. Ma Y, Kim H, Cho Y, et al. Effects of community health volunteers on infectious diseases of children under five in Volta Region, Ghana: study protocol for a cluster randomized controlled trial. *BMC Public Health*. 2017;(17):95 <https://doi.org/10.1186/s12889-016-3991-z>
 5. Yadav DK, Gupta N, Shrestha N, Kumar A, Bose DK. Community-based nutrition education for promoting the nutritional status of children under three years of age in rural areas of Mahottari District of Nepal. *J Nepal Paediatr Soc*. 2014. <https://doi.org/10.3126/jnps.v34i3.10286>.
 6. Faber M, Phungula MAS, Kvalsvig JD, Benadé AJS. Acceptability of community-based growth monitoring in a rural village in South Africa. *Food Nutr Bull*. 2003. <https://doi.org/10.1177/156482650302400405>.
 7. Kalsum U, Jahari AB. The strategy to reduce the prevalence of malnutrition among children under five in Jambi Province. *JMJ*. 2015;3(1):45-59. Available online: <https://media.neliti.com/media/publications/71185-ID-strategi-menurunkan-prevalensi-gizi-kura.pdf>
 8. Dixon RA. Cost-effectiveness of growth monitoring and promotion. *Lancet*. 1993;342(8867):317. [https://doi.org/10.1016/0140-6736\(93\)91465-X](https://doi.org/10.1016/0140-6736(93)91465-X).
 9. WHO. Guidelines for training community: health workers in nutrition.; 1981. Available online: <http://pesquisa.bvsalud.org/bvsmis/resource/pt/mis-17660>.
 10. Zaman S, Ashraf RN, Martines J. Training in complementary feeding counseling of healthcare workers and its influence on maternal behaviors and child growth: a cluster-randomized controlled trial in Lahore, Pakistan. *J Heal Popul NUTR*. 2008;26(2):210-222. Available online: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2740673/>
 11. Martocchio JJ. Effects of conceptions of ability on anxiety, self-efficacy, and learning in training. *J Appl Psychol*. 1994;79(6):819-825.
 12. Shirazi KK, Niknami S, Wallace L, Hidarnia A, Rahimi E, Faghihzadeh S. Changes in self-efficacy and decisional balance following an intervention to increase consumption of calcium-rich foods. *Soc Behav Personal an Int J*. 2006. <https://doi.org/10.2224/sbp.2006.34.8.1007>.
 13. Judge TA, Bono JE. Relationship of core self-evaluations traits - self-esteem, generalized self-efficacy, the locus of control, and emotional stability - With job satisfaction and job performance: A meta-analysis. *J Appl Psychol*. 2001;86(1):80-92. <https://doi.org/10.1037//0021-9010.86.1.80>.
 14. WHO. WHO-Anthro for personal computers manual, software for assessing growth and development of the world's children. WHO, Dep Nutr Heal Dev Geneva. 2011. Available online: https://www.who.int/childgrowth/software/anthro_pc_manual_v322.pdf.
 15. Sukiarko E. Effect of training with learning methods based on problems with knowledge and skills of nutrition cadres in Posyandu activities study in Tempuran Subdistrict, Magelang Regency. Diponegoro University. Semarang:2007. Available online: <http://eprints.undip.ac.id/15497/>
 16. Sengkey S, Kandou G, Pangemanan JM. Performance analysis of cadres Posyandu in Puskesmas Paniki Manado. *JIKMU*. 2015;5(2b):491-201. Available online: <https://ejournal.unsrat.ac.id/index.php/jikmu/article/download/7858/7908>
 17. Saepudin E, Rizal E, Rusman A. Roles as mothers and children health information center. *Rec Libr J*. 2017;3(2). Available online: <https://e-journal.unair.ac.id/RLJ/article/viewFile/7338/4439>
 18. Rahmad AH. The effectiveness of WHO-Anthro growth standard training on the quality of nutritional status data for children under five. *Journal of Information Systems for Public Health*. 2016;1(1):39-46. Available online: <https://journal.ugm.ac.id/jisph/article/view/6095>
 19. Fitri HM, Mardiana. Training toward skill of Posyandu cadres. *Kemas*. 2011;7(1):22-27. Available online: <http://journal.unnes.ac.id/index.php/kemas>.

20. De Onis M, Garza C, Onyango AW, Borghi E. Comparison of the who child growth standards and the CDC 2000 growth charts. *J Nutr.* 2007;137:144-148. <https://doi.org/137/1/144> [pii].
21. Bandura A. Self-efficacy: the exercise of control. *Am J os Heal Promot.* 1997;149(3):8-10. doi:10.1177/0957154X9400501708.
22. Pratiwi NL, Pradopo S. Effect of self-efficacy on improving affective ability of health cadres and impact on healthy behavior of teeth through detection model of OHI-S, DMFT Index. *Bul Penelit Sist Kesehat.* 2006;9(1):51-60.
23. Baranowski. Cheryl IP, Guy S Parcel. How Individual, Environment, and Health Behavior Interact, Social Cognitive Theory in Text Book Health Behavior and Health Education, Editor: Karen Glanz, Frances M L. Barbara K Rimer. 2nd Edition by Jossey-Bass Inc.; 1997.
24. Bandura A. *Encyclopedia of Mental Health.* Vol 4. Academic Press; 1994.

Socio-economic Status of Families as Predictors of Stunting Phenomenon among Elementary School Students at Semarang City, Central Java, Indonesia

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ABSTRACT

The prevalence of stunting in children is related to poverty, low education levels, and inadequate health and health services. However, in a society with sufficient income, it is not guaranteed to be free from stunting. The purpose of this study was to determine the relationship between family socioeconomic aspects and stunting in favorite elementary school children. This research was an analytic observational study with a cross-sectional design. The research subjects were 458 children from favorite primary schools in Semarang Indonesia, who were selected using simple random sampling. The dependent variable was stunting status. Independent variables were gender and age of school children, level of education, occupation, and income of their parents. Hypothesis test used Chi-square and multivariate analysis with Logistic Regression. The study found that the percentage of stunted children in favorite elementary school students was relatively low. Bivariate analysis showed there were several variables related to stunting in students, namely the child's age, maternal education and father's income. Multivariate analysis showed maternal education levels related to stunting status in children, mothers with low education risk increasing the stunting of children in favorite schools (OR = 4.65; 95% CI: 1.50-14.45). Parent factors are related to stunting in children.

Keywords: *mother's education, social-economic, elementary school, stunting*

INTRODUCTION

The main component needed to implement national development are qualified human resources. Meanwhile, one of the determinants of the quality of human resources is the adequacy of nutrition. Good nutrition will produce healthy, intelligent and productive human resources. Extensive research has shown the health, economic and intergenerational consequences of stunting: higher risk of dying, poorer psychomotor and mental development and school achievement, loss of human capital and economic productivity in adulthood, increased risk of chronic diseases, and reduced maternal reproductive¹.

Children in school and adolescence have growth mentally, intellectually, physically, and socially. This age group needs to get special attention. That is the most important phase to form the human resources that will hold the future of a country. When their nutritional needs are not fulfilled properly, then their mental and physical development is also not optimal. So they can not carry out the role of a leader in the future².

One of the nutrition problems faced by Indonesian children, including school-age children, is stunting. Stunting problems in children can lead to adverse cognitive development in childhood and adolescence, fewer school years, cognition losses, and losses via reduced schooling, productivity losses and reduced adult stature³. Prevalence stunting in Indonesia has remained high over the past decade, the national level is approximately 37%⁴. Toddler with stunting status will have a higher risk of poor cognitive, lower educational achievement in life and can cause a problem in subsequent socio-economic, inter-generational consequences. There are three causes of stunting phenomenon in

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South Asia and in most developing countries, (1) poor feeding practice; (2) poor maternal nutrition and (3) poor sanitation. All of the causes factor related to socio-economic aspects⁵.

Stunting in school-age will be associated with cognitive development, low productivity and shorter stature in adulthood. Indonesian Baseline Health Research in 2010 with sample children aged 6-12 years showed prevalence stunting among school-age children in Indonesia was 35.4% was 41.6% in rural areas and 29.8% in urban areas⁶. Current research showed risk factors for stunting in school-aged are a number of family member, occupational, maternal education and education of the family's head⁵.

Based on various studies, it appears that low economic conditions, poor families and low education are always considered to be the cause of stunting. There have been no studies examining the incidence of stunting in families with good economics (sufficient income) with their children attending favorite schools.

The purpose of this study was to determined the relationship between socio-economic aspects of the family and the incidence of stunting in school-age children from the favorite primary school in Semarang, Jawa Tengah Province in Indonesia.

MATERIAL AND METHOD

This research is an analytic observational study with a cross-sectional design. This study was conducted on male and female students at a primary school, "SD Sendangmulyo 04", in Semarang City, Central Java Province, Indonesia. This school is a favorite school with international standard schools. The number of subjects was 458 consisting of 219 boys and 239 girls were selected with simple random sampling from grades 1 to 6. The dependent variable is stunting status. Independent variables studied include sex, age, father's education level, mother's education level, father's job, mother's job, father's income, and mother's income.

The data were collected by asking respondents with questionnaires. Data collection was conducted by 10 selected collages from the Department of Public Health Nutrition, Faculty of Public Health, Diponegoro University.

After data was collected by enumerators, it started with data editing, coding, data entry, and data cleaning.

Data were categorized (1) Categories of age <9.6 years and ≥9.6 years. (2) Stunting category (HAZ < -2SD) and not stunting (HAZ ≥ -2SD); (3) The level of education was categorized: low (never studied in high school) and high (studied in high school and or university); (4) Job status consists of: not working and working; and (5) family income per month was categorized: no income, two million rupiahs or less and more than two million rupiahs every month.

Statistical analysis of this study was carried out on a categorical scale. Data analysis was performed with IBM SPSS Statistics. The hypothesis test used in this study was Chi-square and the variable said to be related to stunting when p<0.05. Furthermore, the independent variables which had p<0.025 were included with multivariate analysis using Logistic Regression.

RESULTS

Based on the data presented in Table 1, it was found that a number of students who suffered stunting (7%).

Table 1: Stunting status of children (n = 458)

Stunting Status	Boys		Girls		Total	
	n	%	n	%	n	%
Stunting	15	6.8	17	7.1	32	7.0
No Stunting	204	93.2	222	92.9	426	93.0
Total	219	100.0	239	100.0	458	100.0

The majority of father and mother's education level was at a high level. However, the low number of educational levels on the respondents' mothers was 3.9%. The result of bivariate analysis at all subject (n=458) from this study was shown in Table 2. Variable that associated with stunting in school-age children were the age of the child (p=0.049), mother's education (p=0.005) and father's income (p=0.040). The odds ratio from that variable showed OR=2.0 (95% CI:0.94– 4.25) in the age of the child, its mean that children in <9.6 years old have a risk to become stunting twice higher than children in ≥9.6years old. Variable mother's education level showed OR=5.8 (95% CI:1.95–17.71), its mean that children who have a mother with low education will have a risk to stunting five times higher than the children who have a mother with high education. In line with the variable age of the child, variable father's income showed OR=2.0 (95%CI:0.98–4.32). Its mean that children who have a father with low income will have a risk to stunting twice higher than the children who have a father with high income (Table 2).

Table 2: The relationship between the socio-economic status of families variables and stunting status (n = 458)

Variable	Stunting Status				P	OR (95%CI)
	Yes		No			
	n	%	n	%		
Sex:						
Male	15	6.8	204	93.2	0.530	0.9 (0.46–1,79)
Female	17	7.1	222	92.9		
Age (years):						
< 9.6	21	9.2	208	90.8	0.049	2.0 (0.94–4.25)
≥ 9.6	11	4.8	218	95.2		
Education Level:						
<i>Father</i>						
Low*	2	22.2	7	77.8	0.125	3.9 (0.794–0.05)
High	30	6.7	419	93.3		
<i>Mother</i>						
Low*	5	27.8	13	72.2	0.005	5.8 (1.95–17.71)
High	27	6.1	413	93.9		
Occupational Status:						
<i>Father</i>						
No*	0	0.0	0	0.0	-	-
Yes	32	7.0	426	93.0		
<i>Mother</i>						
No*	23	7.6	278	92.4	0.290	1.3 (0.61–3.01)
Yes	9	5.7	148	94.3		
Family Incomes:						
<i>Father</i>						
Low*	13	10.9	106	89.1	0.040	2.0 (0.98–4.32)
High	19	5.6	320	94.4		
<i>Mother</i>						
No*	23	7.6	278	92.4	0.290	1.3 (0.61–3.01)
Yes	9	5.7	148	94.3		

The father's occupation variable cannot be analyzed because all fathers work or have jobs.

So, it made the data became constant and can not continue to analyze. In this study, the variables unrelated to stunting status of the whole children were sex ($p=0,530$), father's education ($p=0,125$), mother's occupation ($p=0,290$) and mother's income ($p=0,290$) (Table 2).

Multivariate analysis was performed on all respondents using variables that met the requirements, based on the results of the bivariate analysis. There were three variables that fulfill the conditions, namely age, mother's education, and father's income ($p<0,025$).

Table 3: The result of multivariate analysis (n = 458)

	Coefficient	p	OR	95% CI	
				Min	Max
Age < 9,6 years	0.543	0.169	1.72	0.79	3.73
Mother's Education was low	1.538	0.008	4.66	1.50	14.45
Father's Income was low	0.543	0.165	1.72	0.80	3.70
Constanta	0.567	0.315	1.76		

Multivariate analysis showed maternal education levels related to stunting status in children, mothers with low education risk increasing the stunting of children in favorite schools (OR = 4.65; 95% CI: 1.50-14.45). So, mother with low education level was the risk factor of stunting in school-aged children.

DISCUSSIONS

The result of this research showed that incidence of stunting in one of favorite school with an international level at Semarang, Jawa Tengah Province, Indonesia are 7% with 6.8% in boys and 7.1% in girls. The previous study found that in Indonesia was 35.4% incidence of stunting at school-age children with 41.6% in rural area and 29.8% in an urban area; then 35.8% in boys and 35.0% in girls.

The results of this study indicate that the incidence of stunting in one of the favorite schools with international standards in Semarang, Central Java Province, Indonesia is 7% with 6.8% in boys and 7.1% in girls. This finding is far lower than previous studies found that in Indonesia there were 35.4% of the incidence of stunting in school-age children with 41.6% in rural areas and 29.8% in urban areas; then 35.8% in boys and 35.0% in girls⁷. This can happen because the group studied has a better socio-economic background, above the average Indonesian families. Other studies have proven that family socioeconomic, especially better income can prevent malnutrition in children because access to food and health services is better⁸⁻¹⁰.

In this study father's income is associated with stunting of children ($p=0.040$). Stunting is generally an indicator of chronic malnutrition. Other studies show that stunting is more common in children living in poor households. The study also found that children from the poorest families were more likely to experience stunting. This may be because they lack resources to obtain adequate health and nutrition care services¹⁰. In other studies in line with this study, it was explained that socioeconomic parents influence nutritional status, while socio-economic inequalities based on per capita income or household asset-based income show an influence on nutritional status (stunting). The ratio of stunting to nutritional status (stunting) decreases sharply if the economic status is high. The decline shows that low socioeconomic status causes poor nutritional status, and a high socioeconomic status has a better nutritional

status¹¹. This study is also in line with previous research in Jamaica explaining that stunting children came from families with low socioeconomic status, and these children were more disturbed in carrying out daily activities compared to children who were not stunting.¹²

In general, this study proves that in community groups with better socioeconomic status, the case of stunting in school-age children is less. These children can have a better chance of life, are not easily sick and do not experience malnutrition, so they are able to access quality education and have good intellectual abilities. Many other studies have proven the economic benefits of increasing nutritional status, including reducing infant and under-five mortality, reducing the cost of care for infants and newborns, increasing productivity due to the reduction of malnourished children and capacity building intellectual, reducing costs due to chronic diseases, and increasing intellectual benefits through improving health quality¹³.

The study found that age associated with stunting status, i.e. children in <9.6 years had a higher risk of stunting than children at 9.6 years. The results of other studies, there are those that show opposite results¹⁴, and some find an insignificant relationship¹⁵, depending on the characteristics of the socio-economic background of the subject of the child under study. This study was conducted on groups of children from wealthier families, at the age of 9.6 years and above, some of them (especially boys) have entered the age of growth-spurt, so they have a higher body length. It is estimated that those who were previously stunting, then at the age of 9.6 years and above become not stunting. To strengthen this evidence, further research is needed.

In this study, sex was not related to children's stunting status ($p=0.530$). This shows that their families provide access to the same nutrition, not differentiated on the basis of sex. Another study found that there was no significant association with child stunting status¹⁶ but some found that sex was associated with stunting, which showed that boys were more stunting than girls¹⁷, especially from lower low-income families.

Multivariate analysis shows the level of education of mothers with stunting status. In conditions of relatively adequate income levels, the level of maternal higher education determines the nutritional status of children in favorite schools. This study is similar to other studies

which show that the prevalence of stunting children in low-educated fathers and mothers is higher than those of parents who have a higher education; a low maternal education will be at risk as much as 0.76 times less nutritional status¹⁸. The results of other studies also support this study that children whose mothers have low education have a risk of 4.2 times stunting compared with children whose mothers are highly educated¹⁹.

The result of this study is the same with review study for child stunting determinants in Indonesia that find low household socioeconomic status, low maternal height and education are particularly important child stunting determinants in Indonesia²⁰. Another study shows that a high level of maternal and paternal education were both associated with protective caregiving behaviors²¹. Mother is a child nutrition gatekeeper, has the greatest impact on long-term nutritional consumption of children²². Therefore, educated mothers will have sufficient knowledge about the health and nutrition of their children, the nutritional status of children can be developed through improved child care, use of health services, hygiene, and sanitation, etc²³.

CONCLUSION

The study found that the percentage of stunted children in favorite elementary school students was relatively low. This is inseparable from a better socioeconomic background and welfare of their families. Maternal education is an important factor in keeping children from becoming stunting. Mother with low education level was the risk factor of stunting in school-aged children. It is important to provide counseling to mothers about balanced nutrition for elementary school children and long-term programs from the government to increase family income. If the family has sufficient income and a good mother's education, indirectly, children's nutrition will also increase.

Conflict of Interest: The authors declare that there was no conflict of interest in this research.

ACKNOWLEDGMENTS

We would like to thank Faculty of Public Health, Diponegoro University Semarang, Indonesia who has provided financial support for this research, and the enumerator team from Department of Public Health Nutrition, Faculty of Public Health, Diponegoro

University who had provided support in collecting and analyzing the data in this study.

Ethical Clearance: This study used general information and there were no interventions that hurt or harm to the respondent and had obtained ethical clearance from the Health Research Ethics from the Faculty of Public Health, Diponegoro University. The availability of students to become respondents was evidenced by filling out informed consent.

REFERENCES

1. Cruz LMG, Gloria GA & Desideria RS Factors Associated with Stunting among Children Aged 0 to 59 Months from the Central Region of Mozambique. *Nutrients*. 2017;9(491):1-16. Available online: www.mdpi.com/journal/nutrients
2. UNICEF Indonesia Summary of Maternal and Child Health Studies. 2012. Available online <http://www.unicef.org/indonesia/pdf>
3. Crookston BT, Penny ME, Alder SC, Dickerson TT, Merrill RM, Stanford JB, .. & Dearden KA. Children who recover from early stunting and children who are not stunted demonstrate similar levels of cognition, 2. *The Journal of nutrition*, 2010;140(11):1996-2001.
4. Basic Health Research 2013. Indonesia Agency for Health Research and Development Ministry of Health Republic of Indonesia. Jakarta: 2014
5. Prendergast AJ and Humphrey JH. The stunting syndrome in developing countries. *Paediatr Int Child Health*. 2014 Apr;34(4):250–265. doi:10.1179/2046905514Y.0000000158
6. Basic Health Research 2010. Indonesia Agency for Health Research and Development Ministry of Health Republic of Indonesia. Jakarta: 2011
7. Salimar, Kartono Dj, Fuada N & Budi Setyawati B. Stunting among school-age children in indonesia by characteristics of family. *Nutrition and Food Research*. 2013;36(2):121-126, Available online: <http://ejournal.litbang.depkes.go.id/index.php/pgm/article/view/3997/3814>
8. Menon P, Ruel MT, Morris SS. Socio-economic differentials in child stunting are consistently

- larger in urban than in rural areas. *Food Nutr Bull.* 2000;21(3):282-289
9. Sari M, De Pee S, Bloem MW, et al. Higher Household Expenditure on Animal-Source and Nongrain Foods Lowers the Risk of Stunting among Children 0–59 Months Old in Indonesia: Implications of Rising Food Prices 1–3. *J Nutr.* 2010;140:195-200
 10. Ikeda N, Irie Y, Shibuya K. Determinants of reduced child stunting in Cambodia: analysis of pooled data from three Demographic and Health Surveys. *Bull World Health Organ.* 2013;91: 341-349. doi:10.2471/BLT.12.113381
 11. Walker S, Chang S, Powell C, Somonoff E & McGregor M. Early Childhood Stunting is Associated with Poor Psychological Functioning in Late Adolescence and Effects are Reduced by Psychosocial Stimulation. *Am Soc Nutr.* 2007;137(11):2464–9.
 12. Duran P, Cabalero B & De Onis M. The association between stunting and overweight in Latin American and Caribbean preschool children. *Food Nutr Bull.* 2006;27(4):300-305.
 13. Al-Saffar A. Stunting among Primary-School Children: a Sample from Baghdad, Iraq. *East Mediterr Heal J.* 2009;15(2):322–9.
 14. De Onis M & Francesco B. Childhood stunting: a Global Perspective. *Maternal & Child Nutrition.* 2016;12(1):12–26.
 15. Ettyang, Grace A. K. and Caroline J. Sawe. Factors Associated with Stunting in Children under Age 2 in the Cambodia and Kenya 2014 Demographic and Health Surveys. DHS Working Papers No. 126. Rockville, Maryland, USA: ICF International; 2016.
 16. Assis AMO, Prado MS, Barreto ML, et al. Childhood stunting in Northeast Brazil: The role of *Schistosoma mansoni* infection and inadequate dietary intake. *Eur J Clin Nutr.* 2004;58:1022–9. doi:10.1038/sj.ejcn.1601926
 17. Torlesse H, Cronin AA, Sebayang SK, Nandy R. Determinants of stunting in Indonesian children: evidence from a cross-sectional survey indicate a prominent role for the water, sanitation and hygiene sector in stunting reduction. *BMC Public Health.* 2016;16(1):669. doi:10.1186/s12889-016-3339-8
 18. Ramli, Agho K, Inder K, Bowe S, Jacobs J & Dibley M. Prevalence and Risk Factors for Stunting and Severe Stunting among Under-Five in North Maluku Province of Indonesia. *BMC Pediatr.* 2009;9(64):1–10.
 19. Monteiro C, Benicio MD, Conde W, Konno S, Lavadino A & Barros A. Narrowing Socioeconomic Inequality in Child Stunting: The Brazilian Experience, 1974–2007. *Bull World Health Organ.* 2010;88:305–11.
 20. Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in Indonesia. *Matern Child Nutr.* 2018;(October 2017):e12617. doi:10.1111/mcn.12617. [Epub ahead of print]. Available online: <https://doi.org/10.1111/mcn.12617>
 21. Semba RD, de Pee S, Sun K, Sari M, Akhter N, Bloem MW. Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. *Lancet.* 2008;371: 322-328. doi:10.1016/S0140-6736(08)60169-5. Available online: http://www.academia.edu/download/1224178/Effect_of_education_BD_IN_Lancet_08.pdf
 22. Wansink B. ‘Nutritional Gatekeepers and the 72% Solution.’ *Journal of the American Dietetic Association.* 2006;106(9): 1324-1327.
 23. Kavosi E, Hassanzadeh Rostami Z, Kavosi Z, Nasihatkon A, Moghadami M, Heidari M. Prevalence and determinants of under-nutrition among children under six: a cross-sectional survey in Fars province, Iran. *International Journal of Health Policy and Management.* 2014;3(2):71-76. doi:10.15171/ijhpm.2014.63.

Analysis of Physical Environment of the House as a Workplace for work-Related Complaints on the Shoe Industry Home Workers in Semarang Regency

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ABSTRACT

Home workers at the shoe industry in Semarang Regency mostly suffer from callus (84.8%), stiff shoulder (75.8%), and headache (72.2%). This study aims to analyze the physical environment of the house as a workplace with a work-related complaint on the shoe industry workers in Semarang regency. It was an observational research with cross sectional approach. The population were all the workers in the shoe industry, Semarang Regency. The Sample for the research 66 workers taken by proportional random sampling method. Data analysis used distribution frequency, Chi-Square test and logistic regression. The results showed that there were several physical environment variables of the house that have relation with the complaints due to work with the value of $p \leq 0.05$ such as light intensity, house ventilation, and house temperature. Multivariate analysis showed work-related complaints were influenced by variables of lighting, temperature and ventilation jointly by 93.5% and the rest influenced by other factors. The conclusion of this study was the importance of maintaining the quality of the physical environment of the house as a workplace because it can affect the complaints due to work. Shoe industry home workers should pay attention to the intensity of light, ventilation, and the temperature of the house as a place of work.

Keywords: *home workers, physical environment, work place, work related complaints*

INTRODUCTION

Home-worker is a worker involved in home-based industry through a putting-out production system. According to ILO Convention No. 177 of 1996 on Home Workers, the term *home worker* means work carried out by a person, to be referred to as a homemaker: in his or her home or in other premises of his or her choice, other than the workplace of the employer; for remuneration; which results in a product or service as specified by the employer, irrespective of who provides the equipment, materials or other inputs used⁽¹⁾. Home workers are classified in three groups, namely working on their behalf, working on order, and contract working. Contract workers produce the work they receive from

intermediaries or subcontractors in accordance with the specifications and time schedule stipulated by the principal⁽²⁾. There are many problems faced by home workers. The seven-country study reported occupational health and safety hazards as a major concern for the home-based workers⁽³⁾. Many home workers are overworked and must maintain unhealthy postures as an ergonomic risk relating to poor posture from sitting on the floor or at low tables (incense stick and cigarette rollers), long work hours with limited rest time; as well as exposure risks to toxic substances (incense stick rollers, shoe makers, metal workers)⁽³⁾. In Bangladesh, reported respiratory and other chronic or acute health problems. In Thailand, reported eye strain, sore eyes and blurred vision. Their workplaces have poor lighting and, particularly in the inner city areas, are often congested, hot and stuffy. Exposure to dust and other irritants, such as the pungent fumes of kerosene, results in allergies and respiratory diseases⁽⁴⁾. In Nepal, home workers are forced to work in candlelight due to frequent power cuts: the dim light affects the eyes and the smoke from the candles irritates the nose and throat⁽⁴⁾.

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Home workers mostly work in their homes that are not according to health requirements. The physical environment factors of the house and also from the production process can have an impact of health problems for workers. In Semarang city, from 146 home workers in charcoal sector identified that housing conditions of home-based workers who were not eligible: ceiling 91.1 percent; floor 57.5 percent; ventilation 42.5 percent and waste disposal facilities 97.3 percent⁽⁵⁾. The work complaints from the charcoal sector were 80 percent joint pain and 13.7 percent out of breath, whereas the more often work complaints were 41.1 percent muscle pain; 19.2 percent stiffness; 13 percent cough and 11.6 percent tingling⁽⁵⁾. Economic activity in Semarang Regency is dominated by industry sector. One of the industries in Semarang Regency is the leather shoes industry. The leather shoes industry in this study employs homeworkers in charge of sewing shoes. This study aims to analyze the physical environment of the house as a workplace with a work-related complaint on the shoe industry workers in Semarang regency.

METHOD

This was observasional research with cross sectional approach. Population home workers from shoe leathers industry were 80 and they spread at Bergas sub distric, Pringapus sub distric and Bawen sub district. The sample size were 66 home workers from Lemeshow formula:

$$n = \frac{Zx^2P(Q)N}{Zx^2P(Q) + e^2N}$$

α= 0.05. Sampling done by proportional random sampling from 3 sub districts from Semarang regency.

The physical environment factors of the house were include: lighting, temperature, ventilation, house wall, house floor and occupancy density. The data were collected by check list for observation the house and questioner for interview the respondent. Data analysis used by distribution frequency, Chi square and logistic regression.

RESULT AND DISCUSSION

All of Home workers from leather shoes industry in Semarang Regency were women. The frequency of complaints from home workers as in table 1.

Table 1: Frequency Distribution of Work Complaints

Work Complaints	Yes (%)	No (%)
Shortness of Breath	54.5	45.5
Headache	72.2	27.5
Eye pain	57.6	42.4
Upper back pain	60.6	39.4
Lower back pain	59.1	40.9
Stiff shoulders	75.8	24.2
Tremor	40.9	59.1
Menstrual Disorders	13.6	86.4
Callus	84.8	15.2
Nausea/Vomiting	22.7	77.3
Itching	42.4	57.6

Headache, Stiff Shoulders, Callus, Upper back pain and Lower back pain were the usually complaints from home workers. The frequency of complaints became the basic for divided in to Complex Complaints and Simple Complaints base on mean values. There were 57.6% Complex Complaints and 42.4% Simple Complaint. Home workers of shoe industries often had to pursue production time and numbers that unmatch with the terms of provisions. Workers usually had to complete up to 20 pairs of footwear within two days. Based on the results of interview, workers could finish 1 pair of footwearwithing one hour so at least the workers need to work 10 hours a day. All the workers who sewed the footwear are female. Therefore, they often had to multitask between work and household activities which certainly added to their physical and emotional burden⁽⁶⁾

The frequency distribution of physical environment factors of the house such as: Lighting, ventilation, house wall, house floor, temperature and occupancy density were in table 2.

Table 2: Frequency Distribution of Physical Environment Factors

Physical Environment Factors	Frequency (%)
Lighting	
Not Qualified	65.2
Qualified	34.8
Ventilation	
Not Qualified	68.2
Qualified	31.8

Conted...

House Wall	
Not Qualified	13.6
Qualified	88.4
House Floor	
Not Qualified	4.5
Qualified	95.5
Temperature	
Not Qualified	62.1
Qualified	37.9
Occupancy Density	
Not Qualified	15.2
Qualified	84.8

Environmental conditions of the house as a work place for home workers with the poor lighting cause

of work-related complaints, too much or too little light strains eyes and may cause eye irritation and headaches⁽⁷⁾. Ventilation that are not in accordance with the requirements will result in disruption to the activities of home workers who do a lot of sewing work activities in a closed house. It certainly can affect the physical condition of respondents who cause work complaints such as respiratory symptoms, asthma (shortness of breath), allergy and sick building syndrome such⁽⁸⁾. Environmental conditions of the house as a work place for home workers with temperatures above the Threshold Limit (NAB) can cause work complaints such as fatigue, headache, nausea/vomiting, and shortness of breath. Manual workers who are exposed to extreme heat or work in hot environments may be at risk of heat stress, especially for workers in low-middle income countries in tropical regions⁽⁹⁾

Table 3: The Association between the physical environment factors of the house with Work Complaints

Variables	p value	PR	CI 95%
Lighting	0.001	3.530	1.598-7.799
Ventilation	0.003	2.489	1.234-5.019
House Wall	1.000	0.960	0.514-1.739
House Floor	1.000	1.167	0.510-2.671
Temperature	0.046	1.707	1.012-2.882
Occupancy Density	1.000	1.050	0.603-2.828

There were association between: Lighting with work complaints, ventilation with work complaints and temperature with work complaints. Home workers had risk for work complaints 3.5 times greater if the lighting were not qualified compare with the lighting qualified in their home. Besides that, home workers had risk for work complaints 2.5 times greater if ventilation were not qualified compare with qualified ventilation. And home workers had risk for work complaints 1.7 times greater if temperature not qualified compare with qualified temperature.

Table 4: The Logistic Regression of physical environment factor

Variables	B	p	Adjusted OR	CI 95%
Lighting	2.491	0.001	12.076	2.905-50.205
Ventilation	1.776	0.014	5.906	1.424-24.504
Temperature	1.890	0.009	6.621	1.603-27.338
Constant	-8.754			

The multivariate analysis with logistic regression showed work-related complaints were influenced by variables of lighting, temperature and ventilation jointly by 93.5% and the rest influenced by other factors.

CONCLUSION

The conclusion of this study was the importance of maintaining the quality of the physical environment of the house as a workplace because it can affect the complaints due to work. Shoe industry home workers should pay attention to the intensity of light, ventilation, and the temperature of the house as a place of work.

Conflict of Interest: No conflict of interest for this article to publish

ACKNOWLEDGMENT

Thanks are due to YASINTA NGO especially Mrs Rima, for the accompanied our research and introduce our team to the whole home workers in Semarang Regency. This research funding by ourselves.

Ethical Clearance: Ethical Clearance was approved by Ethic Commission Public Health Faculty, Diponegoro University. No. 024/EC/FKM/2017.

REFERENCES

1. International Labour Organization I. Home Work Convention, 1996 (No 177). Geneva: ILO; 1996.
2. Ozguler VC. Home-based Workers: The Case of Turkey/Eskisehir. *International Journal of Business and Social Science*. 2012;3(19):261-71.
3. Chen MA, Sinha S. Home-based Workers and Cities. *Environmental and Urbanization*. 2016;28(2):343-58.
4. Sinha S. Housing and Urban Service Needs of Home-based Workers: Findings from a Seven Country Study. WIEGO; 2013 March.
5. Dewanti NAY, Sulistiyani, Setyaningsih Y, Jayanti S. Working Environmental Hazard at Home-based Workers in the Chorcoal Industrial Sector in Semarang. *International Conference of Occupational Health and Safety (ICOHS 2017)*; Denpasar, Bali. Indonesia: KnE Life Sciences. 2018. p. 484-95.
6. Sagita QM, Setyaningsih Y, Sulistiyani. Determinant Factors of Work Related Complaints. *International Journal of Public Health Science (IJPHS)*. 2018;7(1):46-50.
7. Roth CL. The Hazard's of Poor Lighting in The Workplace. *Health and Safety International*. 2012.
8. Wargocki P. The Effects of Ventilation in Home on Health. *International Journal of Ventilation*. 2013;12(2):101-18.
9. Xiang J, Bi P, Pisaniello D, Hansen A. Health Impacts of Workplace Heat Exposure: An Epidemiological Review. *Industrial Health*. 2014;52:91-101.

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