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**ENVIRONMENTAL RISK FACTOR AND PREVENTIVE BEHAVIOR OF MALARIA IN PREGNANCY IN
MUARAWAHAU EAST KUTAI EAST KALIMANTAN**

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High incidence of malaria morbidity and changes of environmental conditions in East Kutai put pregnant women as vulnerable groups at risk for malaria. Where levels of acquired immunity are low, women were susceptible to episodes of severe malaria, which can result in stillbirths or spontaneous abortion or in the death of the mother. This study aimed to identify environmental risk factors and malaria prevention behaviors in pregnant women and community levels. This study was part of health intervention research using positive deviance approach. Environmental data obtained through observation by using the checklist. Behavior data were obtained through interview of 20 pregnant and postpartum women, 9 community leaders, and 5 health workers. the landscape of Muara Wahau Village consists of hills, forests, plantations, and Riverside were potential for Anopheles breeding place. Water puddles found in abandon wells, under stilt houses, under trees, swamps, ponds, slow irrigation canals, palm oil plantations, but Anopheles larvae only found in puddles beneath logs with 500 meters distances from the residence. All informants had attempted to prevent mosquito bites, although they can not mention certain types of mosquitoes as malaria vectors. Generally, informants use electric mosquito repellent for daytime and nighttime, some install mosquito nets and burned dried leaves. Environmental conditions in MuaraWaha become the risk for breeding places. Inadequate knowledge and behavior of malaria prevention increase the risk of malaria in pregnancy. Public health interventions needed in the eradication of mosquito breeding and health promotion with a focus on improving malaria prevention behavior.

Keywords: *Malaria in pregnancy, Environmental risk, Behavior*

Environmental risk factor and preventive behavior in pregnancy in Muara Wahau East Kutai East Kalimantan

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Abstract

High incidence of malaria morbidity and changes of environmental conditions in East Kutai put pregnant women as vulnerable groups at risk for malaria. Where levels of acquired immunity are low, women were susceptible to episodes of severe malaria, which can result in stillbirths or spontaneous abortion or in death of the mother. This study aimed to find environmental risk factors and malaria prevention behaviors in pregnant women and community levels.

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Environmental conditions in Muara Wahau become a risk for breeding places. Inadequate knowledge and behavior of malaria prevention increase the risk of malaria in pregnancy. Public health interventions needed on mosquito breeding eradication and health promotion with a focus on improving malaria prevention behavior.

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Introduction

Malaria in East Kalimantan became a concern due to its changes in environmental and forest land use. Deforestation and landscape changes also occurred in East Kutai district due to the massive activities of coal mining and palm oil plantations. This condition caused degraded area and dry land up to 95,742 hectares.¹ Several studies showed that deforestation and changes in land use had an affect to vector and patterns of diseases.²⁻⁴ Mosquitoes are very sensitive to environment changing due to deforestation, resulting in minor changes in environmental conditions, such as temperature, humidity and the availability of suitable larval habitats.^{3,5} This may affect their species distribution, viability and density, which will further affect the incidence and prevalence of malaria.²

Malaria caused mortality in many developing countries, especially in children and pregnant women.⁶ Systematic review study revealed that proportion of women with parasitemia during pregnancy in Asia-Pacific was estimated at 15% (range 1.2-40.8%) based on cross-sectional survey and 36.5% (range 6.0-64.0%) based on longitudinal study.⁷ In 2015, more than two-thirds (70%) of all malaria mortality occurred on children under five years.⁸

In pregnant women, malaria infection is increase the risk of anemia that may induce hemorrhage during labor, also increase infant death risk, preterm birth and low birth weight.⁹⁻¹¹ In second-trimester pregnancies, pregnant women are three times more likely suffer from other severe illnesses when infected with malaria than women who are not pregnant.^{10,12}

This research important because maternal health and malaria were a major issue both nationally and globally as one of SDG's objectives. East Kalimantan as one of the areas of malaria endemic with high stratification, it necessary to accelerate efforts to achieve the target of ending the malaria epidemic in 2030.

Methods

This study was a part of intervention research using positive deviance approach. Positive deviance was applied based on the idea that the problem solving has already existed within the society itself. Therefore, this study focus on potential resources in community, not what was wrong or what cause the problem. This ensures the continuity of the program because positive deviance depends on the resources already exist in the community itself. Discover positive unique behaviors will encourage people to see, seek and re-explore the wisdom and potential of existing resources. It will rebuild its strength to solve the problem especially in this study related to malaria in pregnant women.

Data were collected through several methods to support validity of the study that consist of :

1. Rapid assessment procedure used to explore the socio-cultural aspects of malaria in pregnancy, knowledge and behavior of pregnant women about the prevention and treatment of malaria in pregnancy.
2. In-depth interview, a direct interaction used to collect information from malaria officers at community health centers and midwife. Interview guidelines used to respond the perceptions and experiences of informants in prevention and treatment of malaria in pregnant women.
3. Focus Group Discussion (FGD) has been done to find out insight information about perceptions and ideas of a group of people who share the same relevance. In this study, FGD has been conducted with community health center supervisor and community leaders.

4. Observation of the physical environment condition has been conducted to determine general condition related to breeding, feeding and resting place of mosquitoes from around pregnant women and post partum women house.

The study was conducted April - October 2017 in Muara Wahau Village East Kutai District East Kalimantan Province. The village selected based on discussion and consultation with officers in district health office and Muara Wahau community health center. Muara Wahau represents the village with the majority of Kutai ethnic and also having the highest number of pregnant women and postpartum women compared to other villages.

Participants in the study consisted of 12 pregnant women, 8 postpartum women, 3 husbands of pregnant/ postpartum women, 5 health workers and 9 community leaders, including 4 traditional birth attendances. The sample was purposively obtained based on data available at Muara Wahau community health center, using the maximum variation technique.

The main informants consisted of pregnant and postpartum women whom during pregnancy did not get malaria. It proved by malaria rapid detection examination given by the Puskesmas during the first antenatal care. The next criteria to obtain maximum variation was to seek pregnant or postpartum women with various characteristics as an example in terms of parity sought primipara and multipara pregnant women, the level of education.

Result and Discussion

The environment around houses is the enabling factor causing the high risk of malaria in pregnant women and the population. The landscape of Muara Wahau Village consists of hills, forests, plantations and river banks are a potential for breeding place. Some potential water puddles potential become breeding places were found around wells, under stilt houses, under trees, swamps, ponds, slow irrigation canals, palm oil plantations, but none of *Anopheles* larvae was found. *Anopheles* larvae are found only in puddles beneath logs that are located within 500 meters from houses.

Observations also show that most respondents live in wooden stilt houses close to the garden where there are many trees and shrubs. Environment around houses become the enabling factors that lead to the high risk of malaria in Muara Wahau villagers. This is similar to study result in Kenya and Bangladesh that houses with trees or close to forests (<200 meters) have a higher risk of exposure to malaria compared with far ones.^{13,14}

The absence of *Anopheles* larvae in puddles was caused by rainfall in Muara Wahau. It reach an average of 20 days rainfall per month.¹⁵ In the rainy season, malaria vectors will diminish, swept away by the water flow¹⁶. These finding inline with studies Kebumen which prove that there was a negative correlation with between rain and malaria.¹⁷

Study in Cameroon found the prevalence of malaria parasites was higher in those who lived in plank houses rather than brick houses, but the difference was not significant.¹⁸ This finding is similar with finding from Africa who reported that mosquitoes could easily enter homes made of low quality materials with open roof (such as plank houses, which usually have a crack in the wall), and this is associated with a higher risk of malaria high, because mosquitoes can easily enter and stay in the bedroom at night¹⁹. Although it is differ from study ini Ethiopia that found no correlation between malaria incidence and housing quallity.²⁰

From behavioral factors mostly informant viewed malaria as one of the important health issues affecting pregnant women in their area. Nevertheless, there were no informants of pregnant women,

postpartum mothers and also traditional birth attendants stated that malaria in pregnancy would cause anemia in pregnant women, causing low birth weight, and preterm birth.

These findings similar with study in rural Uganda which stated although all respondents agree malaria is a dangerous disease but the percentage of women who know in detail the negative consequences of malaria for the fetus are low.²¹ Prevention of malaria in pregnant women is very important because it can reduce the potential for mortality from mothers and infants. These in line with study in Thailand and Africa which revealed that pregnant women with malaria are more at risk of anemia and preterm birth.^{9,10}

Informants generally cannot distinguish, even assume it was the same mosquitoes that transmit malaria and dengue (Dengue Hemorrhagic Fever). Fever and shivering are most common malaria symptoms stated by informants. This finding indicates the low knowledge of pregnant women as a result of lack of information about the prevention of malaria which is easy to remember, and continuously from primary health care providers. Information on malaria is given during pregnancy classes, due to the dense content of matter in pregnancy and childbirth, informants couldn't remember the exact contents of the information. Studies in India show similar finding that in areas with low prevalence of malaria pregnant women are poorly informed about malaria and insecticide-treated nets²².

This study showed community malaria behavior, could be categorized well because they prioritize treatment to health care when feeling the symptoms of a disease. Traditional treatment would be sought after the treatment from the community health center, when. As well as villagers, pregnant women are more afraid of dengue fever than malaria. Mostly they connected malaria infection with an unclean living environment. At the same time, knowledge of certain prevention strategies was poor. Low perception of susceptibility encourages prevention behaviors that have been done still focus only on individual level prevention, especially preventing mosquito bites. All informants of pregnant and postpartum women had afforded to prevent mosquito-bites, although they couldn't mention certain types of mosquitoes as malaria vectors. Generally, informants used electric mosquito repellent for day and night, some used mosquito nets at night before bed. Many informants also described traditional methods that may offer protective benefit, most typically burned various items (wood, dried leaves, branches) to make smoke and chases away mosquitoes.

The interview result with health personnel described the preventive activities that had been implemented Muara Wahau community health center. Activities have been implemented such as: fogging (fumigation), blood sampling screening at the first time of antenatal care visit, providing information about during pregnancy class, free medication, and insecticide-treated bed nets distribution.

Nonetheless, malaria prevention behaviors rarely were done based on community action. Related activity to control environmental risk factors such as clean up the environment and houses for controlled mosquito breeding, feeding, resting sites and proper maintenance of insecticide-treated nets no longer activated. The Kimbi's study finding emphasized the importance of prevention of malaria in the form of improvement in environmental factors and prevention behavior especially in rural areas, the finding reported will reduce malaria transmission.¹⁸

The malaria prevention can be derived from the society knowledge about the danger of malaria as a disease. Community with good knowledge about the method to control mosquito breeds is two times more at risk to have good behavior in mosquito breeds than those with poor knowledge.²³ Study at Columbia showed that malaria education programs are related to better knowledge and prevention

behaviour on malaria.²⁴ Therefore, a continuous knowledge improvement intervention program will play an important role in the success of malaria prevention.

The active role of the community needed in achieving the optimal public health status and the successful development of the health sector. The community's active role is manifested in community-based health activities. Various activities had been developed by the Ministry of Health one of which has been firmly rooted in the community is a Posyandu. Posyandu volunteer played an important role in efforts to disseminate health information and mobilize the community. Especially in the activities of clean and healthy living behavior that became the basis of all diseases prevention.²⁵ Health volunteers in Posyandu are a potential resource to be involved in the prevention of malaria in pregnancy. Recent studies showed that training health volunteer is a key strategy for sustainability of maternal and child health programs as well as malaria prevention programs in rural areas.^{26,27}

Its also shown by a study in rural areas that health volunteer with high knowledge of breeding place control tend to support and implement prevention activities.²⁸ Similar with a study in Nigeria which concluded that health volunteer training proved to improve malaria prevention behavior in the group of pregnant women.²⁹

Conclusion

Environmental around residences conditions are at risk for breeding sites. The similar condition also occurred within environment inside houses. Plank stilt houses become potential for mosquito resting place. Inadequate knowledge and behavior of malaria prevention also found. These combinations of circumstances lead to increase the risk of malaria in pregnancy. Controlling mosquito breeding sites and health promotion is needed as public health intervention through improving and maintenance malaria prevention behavior.

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