

015 _ Risk Factors of Coal Mine Accidents in Production Area PT. XXX Kutim_Dina Lusiana S.docx

by

Submission date: 01-Aug-2019 04:17PM (UTC+0700)

Submission ID: 1156735536

File name: 015 _ Risk Factors of Coal Mine Accidents in Production Area PT. XXX Kutim_Dina Lusiana S.docx
(70.93K)

Word count: 5928

Character count: 31430

Risk Factors of Coal Mine Accidents in Production Area PT. XXX Kutai Timur, Indonesia

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15 **Abstract**—The mining industry is known worldwide for its highly risky and hazardous working environment. Coal mining is the most dangerous occupation in the Indonesia, 3th high frequency of injury comparing to other industries. The mining sector in East Kalimantan is still a contributor to the number of accidents. Coal mine accidents are workplace accidents which occur in mining activities when it's started until the working hours end. Based on PT. XXX's incidents resume during 2017 up to October there have been 63 accident thresholds which have caused property damage, lost time injury (LTI). The causes of accidents or injuries are important factors, therefore the authors would like to investigate the influencing factors of accidents in mining operation. This research used analytical survey research and case control research design. The total sample was 56 people in which 28 respondents were in the case group and 28 respondents in the control group. The used in the study was a instrument questionnaire which was adopted from previous researchers and observation sheets made by the researchers themselves. The chi square was used to determine the association analysis used is chi square with $\alpha = 0.05$. 3) Results: The result indicated that the risk factors of accidents in mining sector were skills, motivation, and standard operating procedures. 4) Conclusion: It was concluded that the risk factors of mining accidents occurrence in production area of PT. XXX Kutai Timur is work skills, work motivation, and standard operating procedures. The author recommends that companies can improve work skills through the provision of education and training, work motivation can be increased through rewards and punishments, and controls the supervision of standard operating procedures.

Keywords—Case Control, Mine Accident, Motivation, Skill, SOP

1. INTRODUCTION

2 According to International Labour Office Statistics, 120 million occupational injuries and 210,000 fatal injuries occur annually at workplaces worldwide. The mining industry has a high incidence of injury among all industry divisions, particularly of fatal injuries [1]. Workplace fatalities and injuries bring great losses to both individuals and societies. For example, every year 10 million of the 150 million workers in the European Community are affected by accidents or diseases at work. In the United States, work-related injuries have been estimated at \$125 billion per year. 17

employees die every day as a result of industrial accidents- a total of 63,589 deaths from 1980-1989. In 1992 alone 3.3 million work-disabling injuries were reported, and some 370,000 employees suffered work-related injuries [2].

Safety in the mine industry has been considered an important issue, with coal mine being one of the most dangerous industries. Coal Mine accidents, which are occupational accidents that occur at work / mining activities from the time of entry to end working hours, mining accidents themselves must fulfill five elements, namely accidents that actually occur, resulting in mining workers' injuries, due to mining activities, occurring during working hours and occurs in the area of mining business activities [3].

Based on the Performance Report coal accidents for 2016 amounted to 146 with details of minor accidents 59, weight 71, and death 16. Then, in 2017 a mining accident dropped to 135 with details of a minor accident 47, weighing 75 and dying 13 which then obtained the number of cumulative working hours of 494,503,176 with a note that one million hours (1,000,000) is the number of working hours of 500 workers who work 40 hours a week and 50 weeks per year. 16 In East Kalimantan, stated that Work Accidents in the coal mining sector increased with the number of accidents of mining workers continuing to increase from year to year. In 2014, he noted that there were 8 cases of mining accidents. Whereas in 2015 from January to mid-December there were 14 cases of work accidents and as of the end of 2016 there were 22 fatal accidents in workplace accidents [5].

PT. XXX is a company engaged in the business of "mining & earthmoving contractor", the production area is the department that supports and is responsible for all mining operations and coal and OB (Overburden) production targets. Activities in the production area such as overburden and disposal, overburden activity were the process to remove rock layers. Meanwhile, disposal is a place to store overburden material originating from the mining. Work accidents in the production area were caused by fatigue, stress, lack of skills and inappropriate motivation, three as a result of fatigue, four due to stress, seven due to lack of skills, and 14 due to improper motivation. This creates risks

such as a unit that is overturned, crashed, hit, grazed, collapsed, collapses, exits the fire from the unit, was exposed to material issues, etc [6]. Losses due to accidents can be in the form of losses relating to the occurrence of accidents to workers (fatality, serious injuries, minor injuries, fractures or other injuries), material damage / loss, loss of work time, reduced quality of work, loss of interest in work, decreased production. The purpose of this study was to determine the risk factors of Coal mine accidents occurrence in the production area of PT. XXX Kutai Timur coal mines.

II. METHOD

This Research was a case-control study conducted on workers in the production area of PT. XXX Kutai Timur coal mines. Workers whom were respondents were categorized into case groups and control groups. The inclusion criteria in the case group were among others: 1) working in the same place, 2) having experienced some work accident, 3) being willing to participate in the study. Whereas in the control group with the case group matching was done in the sex and workplace groups. The sample in this study used the Lemeshow formula where results were 27.95 workers or rounded up to 28 workers with a proportion of 1: 1, then the case sample was 28 people and controls were 28 people so that the total sample was 56 people. The following calculation used the Lemeshow formula :

$$n = \frac{Nz_{1-\frac{\alpha}{2}}^2 P(1-P)}{d^2(N-1) + z_{1-\frac{\alpha}{2}}^2 P(1-P)}$$

$$n = \frac{100 (1.96)^2 0.5(1-0.5)}{(0.05)^2(100-1) + (1.96)^2 0.5(1-0.5)}$$

$$n = \frac{100 (3.8416)(0.25)}{2.475 + 0.9604}$$

$$n = 27.95 \text{ (workers)}$$

$$n = 28 \text{ (workers)}$$

TABLE I. CHARACTERISTIC OF RESPONDENTS

Variable	Case		Control		Total	
	n	%	n	%	n	%
Age						
19-24	6	21.4	4	14.4	10	17.9
25-30	7	25.0	19	67.9	26	46.4
31-36	7	25.0	5	17.9	12	21.4
37-42	3	10.7	0	0	3	5.4
43-48	4	14.3	0	0	4	7.1
49-54	1	3.6	0	0	1	1.8
Level of Education						
Senior High School	27	96.4	26	92.9	53	94.6
Associates Degree	0	0	1	3.6	1	1.8
Bachelor Degree	1	3.6	1	3.6	2	3.6
Working Experience						
1-5	6	21.4	6	21.4	12	21.4
6-10	11	39.3	19	67.9	30	53.6
11-15	8	28.6	3	10.7	11	19.6
21-25	1	3.6	0	0	1	1.8
26-30	2	7.1	0	0	2	3.6
Total	28	100.0	28	100.0	56	100.0

Table 2 shows the characteristic of job condition, it is known that the distribution of respondents based on

The survey was conducted from May to August 2018 (four months). The technique of collecting data using a questionnaire that is filled directly by workers of PT. XXX Kutai Timur. Method of measuring work stress variables using questionnaires which adopted from Permenaker No. 5 of 2018, variable work skills with questionnaires made by the researchers themselves based on the Golden Rules Safety Management System at PT XXX, work motivation variables with Lusiana questionnaire (2015) [7] and Margaretha questionnaire (2014) [8] and standard operating procedures with the questionnaire (2014) [9]. Data were analyzed descriptively with frequency tables and analyzed their correlation using Chi Square test with $\alpha = 0.05$. The study was accepted after a complete internal review of proposal that adjudicate to involve some staffs. Ethical permission was carried out through written informed consents obtained from all participants before data collection. Authors must add determination of skill and non-skill levels or stress, how to classify them. Stress level classification based on Permenaker No.5 of 2018, mild stress = <9; moderate stress = 10-24; severe stress => 24. Non-skilled classification = <median 9; skilled = \geq median 9.

III. RESULTS

The distribution of respondents can be seen from the age category, level of education, and years of service. Table 1 shows the age distribution of the highest case group respondents is found in the age category between 25-30 and 31-36, with 25% and the highest control group is in the 25-30 with 67.9%. The majority level of education of the case group respondents were Senior High School with a percentage of 96.4% and a control group with a percentage of 92.9%. Working experience of the case group and control respondents was the highest between 6-10 years, namely 39.3% and 67.9%.

work stress variables, role ambiguity in the case group and controls experienced moderate stress at 82.1% and

57.1%. Job stress items conflict the role of the case group and control experienced moderate stress at 89.3% and 67.9%. Job stress items were quantitatively overload cases and control groups experienced moderate stress at 96.4% and 78.6%. Job stress items qualitative overloaded cases and controls experienced moderate stress at 96.4% and 75%. Job stress items for career development in the case group and controls experienced moderate stress at 82.1% and 57.1%. Job

stress items responsibility for other cases and control groups experienced moderate stress at 85.7% and 57.1%. The variable skills in cases of unskilled workers is 64.3% and the skilled workers control group is 78.6%. Poor motivation of workers in the case group was 67.9% and good motivation in the control group was 71.4%. The act of doing SOP was not good in case group workers by 50% and actions based on good SOP in the control group is 78.6%.

TABLE II. THE CHARACTERISTIC OF JOB CONDITION

Variable	Case		Control		Total	
	n	%	n	%	n	%
Job Stress items Ambiguity Role						
Mild Stress	5	17.9	12	42.9	17	30.4
Moderate Stress	23	82.1	16	57.1	39	69.6
Job Stress items Conflict Role						
Mild Stress	3	10.7	9	32.1	12	21.4
Moderate Stress	25	89.3	19	67.9	44	78.6
Job Stress items the Quantitative Overload						
Mild Stress	1	3.6	6	21.4	7	12.5
Moderate Stress	27	96.4	22	78.6	49	87.5
Job Stress items the Qualitative Overload						
Mild Stress	1	3.6	7	25	8	12.5
Moderate Stress	27	96.4	21	75	48	87.5
Job Stress items Career Development						
Mild Stress	5	17.9	12	42.9	17	30.4
Moderate Stress	23	82.1	18	57.1	39	69.6
Job Stress items Responsibility towards Others						
Mild Stress	4	14.3	12	42.9	16	28.6
Moderate Stress	24	85.7	16	57.1	40	71.4
Job Skills						
Not Skilled	18	64.3	6	21.4	24	42.9
Skilled	10	35.7	22	78.6	32	57.1
Job Motivation						
Low	19	67.9	8	28.6	27	48.2
High	9	32.1	20	71.4	29	51.8
Performing the Standard Operating Procedure						
Not Good	14	50	6	21.4	22	39.3
Good	14	50	22	78.6	34	60.7
Total	28	100	28	100	56	100

Table 3 shows that there's a relationship between work stress: role ambiguity (p = 0.042; OR = 0.290), role conflict (p = 0.253; OR = 0.051), quantitatively overload (p = 0.043; OR = 0.136), qualitatively overload (p = 0.022; OR = 0.111), career development (p = 0.042; OR = 0.290), responsibility to others (p = 0.018; OR = 0.222) with coal mine accidents in the production area of PT. XXX Kutai Timur. There was no relationship between work stress items role conflict (p = 0.051; OR = 0.253) with coal mine accidents in the production area of PT. XXX Kutim. It proved that

workstress was ambiguity role, role conflict, quantitatively overload, qualitatively overload, career development, responsibility towards others including protective factors for coal mine accidents.

There was a relationship between work skills (p = 0.001; Or = 6.600), work motivation (p = 0.003; OR = 5728), work SOPs (p = 0.026; OR = 3.667) and coal mine accidents in the production area of PT. XXX Kutai Timur. Job skills, Work motivation, Standard operating procedures included risk factors of coal mine accidents.

TABLE III. BIVARIATE ANALYSIS

Variable	Coal Mine Accident				Total		p	OR 95% CL
	Case		Control		n	%		
	n	%	n	%				
Job Stress items Role Ambiguity								
Mild Stress	5	17.9	12	42.9	17	30.4	0.042*	0.290 (0.085 - 0.985)
Moderate Stress	23	82.1	16	57.1	39	69.6		
Job Stress items Role Conflict								
Mild Stress	3	10.7	9	32.1	12	21.4	0.051	0.253 (0.060-1.065)

Moderate Stress	25	89.3	19	67.9	44	78.6		
Job Stress items quantitatively overload								
Mild Stress	1	3.6	6	21.4	7	12.5	0.043 ^a	0.136 (0.015-1.214)
Moderate Stress	27	96.4	22	78.6	49	87.5		
Job Stress items qualitatively overload								
Mild Stress	1	3.6	7	25	8	12.5	0.022 ^a	0.111 (0.013-0.975)
Moderate Stress	27	96.4	21	75	48	87.5		
Job Stress Career Development								
Mild Stress	5	17.9	12	42.9	17	30.4	0.042 ^a	0.290 (0.085-0.985)
Moderate Stress	23	82.1	18	57.1	39	69.6		
Job Stress Responsibility towards Others								
Mild Stress	4	14.3	12	42.9	16	28.6	0.018 ^a	0.222 (0.061-0.812)
Moderate Stress	24	85.7	16	57.1	40	71.4		
Job Skills								
Not Skilled	18	64.3	6	21.4	24	42.9	0.001 ^a	6.600 (2.011-21.661)
Skilled	10	35.7	22	78.6	32	57.1		
Job Motivation								
Low	19	67.9	8	28.6	27	48.2	0.003 ^a	5.728 (1.687-16.514)
High	9	32.1	20	71.4	29	51.8		
Standard Operating Procedure								
Not Good	14	50	6	21.4	22	39.3	0.026 ^a	3.667 (1.141-11.787)
Good	14	50	22	78.6	34	60.7		

^a Significant Variable

2 IV. DISCUSSION

This survey was a case control study on coal mine matching was done in the sex and workplace groups to eliminate selection bias in the sample from among workers in a coal company. All respondent workers were male. The questionnaires were administered by individual interviewers.

The study reported that a higher risk coal mine accidents was observed in older workers. Ageing would result in a decrease in physical and mental abilities which may turn alter the quality of work performance and the ability to notice work environmental hazards, particularly when the demanding level of the tasks is high. Some discrepancies were found by some study. Gauchard et al, found no difference for injuries due to falls [10]. Bazroy et al, showed that younger subjects had higher risk [11]. Young age is associated to lack of knowledge, lack of experience and contributes to risk taking behaviour [12]. Based on the result of the research that age was not considered as a risk factor, it might have been better to collect the samples by

matching the age of case and control groups for the next research.

11 According to McShane and Von Glinow (2008), stress is: an adaptive response to a situation that is perceived as challenging or threatening to the person's well-being. These events produce distress-the degree of psychological, psychological, and behavioral deviation from healthy functioning [13]. A combination of role conflict, role overload and role ambiguity indicates work stress [14]. Role conflict refers to the degree of incongruity or incompatibility of expectations associated with a person's role. Role overload is the degree to which inadequate time, training and resources affect performance. Job-related stress has a negative effect on professional work and personal welfare. This includes low organizational commitment, low job satisfaction and a higher incidence of workplace accidents. Stressful jobs or increased intensity of occupational stressors may increase the risk of occupational injury [15]. Role Ambiguity refers to the lack of clarity and predictability of the outcomes of a person's behavior. Role ambiguity produces unclear

role perception, which directly affect job performance [13].

An important finding of our study that occupational stress is a protective factor for the occurrence of mining accidents, which means that if the workers does not experience work stress the mine accident will not occur. Work stress management must be implemented so that work conflicts (role ambiguity, role conflicts) do not occur so that workers do not experience work stress. Our finding was consistent with Bhattacharjee that job stress is significant factors with accidents of Dumper Operators in Coal Mines in India [16]. Role ambiguity had related to coal mine accidents occurrence. It indicated that almost all respondents understood what was expected from their work, the respondents were also aware of their job responsibilities. They also knew to whom they should report. This was not in line with [17], which showed that role ambiguity was not significantly related to work stress experienced by PT. XXX, but both were positively related. Karima argued that the absence of a significant relationship between the inaction of roles and work stress in that study could be influenced by job characteristics [16]. Role ambiguity was also related to obscurity in giving assignments to workers. So that this could lead to frustration and difficulty for workers to achieve satisfaction in work [18]. Role conflicts were not related to work accidents, it indicated that the respondents also did the tasks accordingly. Based on study conducted by Karima (2014), although role conflict had a high propensity scores, but it was not significantly associated with work stress experienced by PT. XXX. This could happen since it was influenced by the differences in sample characteristics which could be affected with work culture which implemented in a country. Role conflict usually occurs in individuals when the company's expectations are high for themselves. However, the high expectations make it difficult to achieve the tasks assigned. Role conflict is a general form of stressors that occur in the workplace. This conflict usually arises when workers are required to behave in ways that are contrary to themselves. Role conflict used to be found in individuals when the company's expectations were high for themselves. However, the high expectations made it difficult to achieve the tasks assigned. Role conflict was a general form of stressors which occurred in the workplace. This conflict used to arise when workers were required to behave in ways which contrary to themselves. According to Pomaki et al (2007) role conflict were directly associated with emotional exhaustion, depressive symptoms, and somatic complaints [19]. Workers who suffer from more role conflict had lower job satisfaction and higher job tension [18].

Overload physically or mentally by having to do too many things, a possible source of job stress. The element that gives rise to this quantitative overload is the pressure of time. Time in industrial society is a very important element. Each task is expected to be completed as quickly and accurately as possible. Time is a measure of efficiency [18]. Based on this study, quantitatively overload related to workplace accidents.

However, it was a protective factor because most respondents did their work on time so they did not need to take them home. Some respondents also handle work projects in accordance with their respective responsibilities. The threat will be the quantitatively excess load has negative effect on the workers. During the analysis of the motion times for workers, they showed a sense of calm and suspicion. The workers were not happy with the management's perception of telling them to do work mode in a shorter period of time. In some cases such an analysis resulted in a slowdown in work and sabotage. However, the pressure of time is a stress generator of organizations which in most cases must be accepted. This seems to be one aspect of organizational life [18]. Qualitatively overload, with advances in technology made life is felt to be more diverse. The work done by humans increasingly shifts its emphasis to the work of the brain. Work is increasingly diverse. This diversity of work results in qualitatively overload. The higher the diversity of work the higher the stress is. The diversity of work that must be done by a workforce can easily develop into a qualitative overload if the diversity requires higher technical and intellectual abilities than those possessed. Based on the results of the study, qualitative overload related to workplace accidents, but work stress items qualitative overloads were protective factors because some respondents were trained and had experience to carry out tasks adequately. The results of this study are in accordance with Setyowati's research, 2015 which found that perceptions of workload were not related to work stress [20]. According to Everly & Girdano (1980) in Munandar (2008), job diversity usually increases due to factors, such as increasing the amount of information, sophistication of information, expansion of alternatives to work methods and introduction of contingency plans. At some point the plurality of jobs is no longer productive, but destructive. At that point we have passed our ability to solve problems and reason in constructive ways. There is mental fatigue and emotional and physical reactions. This is all a form of stress [18].

Career development refers to work activities carried out over time, which can involve several jobs and various jobs over time. Everly & Girdano in Munandar (2008), considers that to generate job satisfaction and prevent frustration in the workforce (which is a form of reaction to stress), it is necessary to pay attention to important elements in career development. Based on the results of the study it was found that work stress items in career development were related to workplace accidents, but work stress items in career development were protective factors because respondents felt they were not harmed by settling on the organization currently underway. The respondent also considered that he still had adequate opportunities to advance in the organization currently underway [14]. This was in line with Nugraha's research (2013), there was a relationship between career development and work stress. Respondents considered that they were less likely to get a promotion, They worked as temporary employees who getting paid according to the results of the stitches made. This condition could lead to feelings of job insecurity or

uncertainty which eventually become career development stressors [21]. Career development is a potential stress generator that includes job uncertainty, over promotion and lack of promotion. Fear of losing a job, the threat that his job is deemed unnecessary is an ordinary thing that happens in working life. Environmental changes create new problems that can have an impact on the company. Reorganization is felt necessary to be able to deal with environmental changes in better way. As a result, there are old lost jobs and new jobs [18].

Responsibility is a source of stress that comes from the role in the organization. Responsibility in the work is divided into two, responsibilities for objects and towards others. According to Wardwell et al (1964) in Munandar (2008) holding responsibility for other people could significantly trigger coronary heart disease compared to holding responsibility for objects [18]. Based on this study, it was found that work stress responsibility items toward other people related to workplace accidents. However, it was a protective factor since some respondents assumed that guiding and helping subordinates in completing their tasks is not a responsibility that must be undertaken. Respondents also considered that other people's careers were not their responsibility. This was in line with the research conducted by Karima (2014), the variable responsibility for others were negatively related to work stress experienced by workers at PT. XXX. This showed that the amount of responsibility carried out by workers did not affect the increase in work stress experienced by workers [17]. According to Karasek and Theorell (1990) in Munandar (2008), responsibility usually always goes hand in hand with the ability of workers to control their work. High responsibility would be accompanied by the ability to control. It would be able to reduce work stress experienced by workers [22].

Soehatman (2010) stated that competency was an important requirement to ensure that work had been done well, followed applicable work standards and met safety requirements. Competency could be obtained through education, training and adequate experience in carrying out tasks or activities. To achieve this, companies ought to have competency standards for each job [22]. Based on this study, it was found that working skill was related to workplace accidents, for the future the author recommends that companies can improve work skills through the provision of education and training. Working skill was a risk factor because some respondents still carried out unsafe actions. Like parking too close and in the blind spot area, placing items in the cabin, operating the unit while doing other activities and operating units in a state of fatigue. The research was in line with Aswadi in drilling workers, showed that partially human factors significantly affect employee work accidents, the higher the human factor the higher the level of workplace accidents. More than 60% of respondents agreed and strongly agreed that workplace accidents were caused by lacking some skills. They also agreed that expertise of employees in carrying out work, and the lack of companies providing education and training to employees affect the

workplace accidents [24]. Even though the skills of workers are high, the possibility of an accident still exists. With skills, the work was carried out reflexively by getting used to it, so the safety aspect was neglected. This was especially true for a repetitive work, especially if the time factor was crucial. As far as possible, the elements of safety could be included in these repetitive work habits. Soehatman (2010) also argued that many accidents occurred because workers did not have sufficient competency in work. This competency included mastery of knowledge and skills and attitudes and behavior in working according to the level of expertise based on the skills possessed. OHSAS 18001, required organizations to ensure that every individual who carries out work or activities that have an impact on K3 has the competence to carry out it [22].

Motivation theory is a core theory of the behavioral science, which is used for dealing with relationship of need, motive, objective and behavior. The behavioral science thinks that the person's motive comes from need and need confirms people's behavioral objective. As a kind of inner activity, motivation plays the function of inspiring, driving and strengthening human behaviors. Therefore, motivation can be defined to a kind of process in which to influence person's innate need or motive for the sake of given purpose, thus strengthen, lead or change people's behavior to be advantageous to the organizational objective development [12]. Safety motivation in Liu, 2012 indicates comprehensively using modern scientific principles and methods of management science, economics and so on, with purpose of preventing accidents and disasters and guaranteeing systems operation at the acceptable safety level, reasonably motivates the person in the system, thus leads and controls its behavior to match safety norms, not only promises an individual safety, but also promise the safety of organization (business enterprise) environment or even social safety [24]. Based on this study, it was found that work motivation was related to workplace accidents, for the future the author recommends that companies can improve work motivation through rewards and sanctions for workers. Work motivation was a risk factor because some respondents considered doing good work only when there was overtime. Some respondents also considered working, not only when their conditions were good, but also when they were tired and lethargic. This research was in line with what was done by Margaretha (2014), that work motivation possessed by each individual also greatly affects the quality of work. Although adequate facilities, good organization and management, and good work procedures, without high motivation, it was difficult to produce good work results. Motivation to do work in accordance with procedures was needed to fit the company's goals and could guarantee safety for the workers themselves [8]. One of the most important things to consider for individuals to behave is motivation. Motivation in a person will affect whether he will do each task properly or vice versa, whether he will behave safely or not. Efforts that need to be made so that workers behave safely are improving the quality of K3 services to all employees, so that wider and more

tangible benefits can be obtained directly by the workforce. This effort can increase the motivation of employees to better understand and implement OSH principles and norms. Then, the final results would be the increasement of the efficiency and productivity of the workforce.

In terms of work, following the procedure is something that is highly expected so that no incidents can be detrimental, but workers still do not care about it. Obedience to do work in accordance with the standards is certainly very expected, if in reality all workers obey it, the risk of incidents will certainly decrease. Jobs carried out by an operator in carrying out their duties are sometimes not separated from the activity of operating the unit to facilitate a job. The condition of the unit being operated certainly has an influence on the course of a job. The condition of a unit that is not good or damaged can create a dangerous condition and when used is included in unsafe actions. Based on this study, it was found that standard operating procedures were related to workplace accidents, for the future the author recommends that companies can improve control and supervision of standard operating procedures. It was a risk factor. Since some respondents at the time of carrying out the work bore a risk, but they continued to do the work individually or even in groups. Sometimes respondents also worked using excessive physical abilities. This was in line with the research conducted by Raja (2018) with the finding of a meaningful relationship between compliance with procedures and workplace accidents. Raja argued that many workers did not follow work procedures. They often conversed while working so they were not focused on working, meanwhile the machines were dangerous such as wood cutting machines and press machines. So that accidents such as being hit by cutting machines or pinched by wood press machines often occur [26].

Information obtained at work is very important if the work carried out carries a high risk of work. Information about hazard risks in the workplace can reduce the impact of workplace accidents if workers really care about workplace accidents. Many workers still set aside to read and recognize Job Safety Analysis (JSA), the work procedures in carrying out their work. It made they would feel less informed about any hazard risks that exist in the workplace, and by not doing work according to applicable procedures. It could have an impact from an accident. A similar study was also conducted by Siregar (2014), there was a relationship between compliance with procedures with minor work accidents where p value was 0.000, this indicated that the more disobedient the respondent the higher the accident would be higher and vice versa [27]. In line with research conducted by Rangga conducted on 78 workers in the Mining Support Division where the results of the study showed that there was a correlation between SOP compliance and the incidence of finger injury ($p = 0.033$). According to him, respondents had been good at adhering to SOPs, but experiencing finger injuries. It could be happened due to situations such as situations that allow a worker to do so. Also do things

that do not fit the SOP so that the risk of incidents is higher [9].

V. CONCLUSION

It could be concluded that the risk factors for the occurrence of mining accidents in the production area of PT. XXX Kutai Timur is work skills, work motivation, and standard operating procedures (SOP).

ACKNOWLEDGMENT

Sources of funding in this study by the author's personal funds and no institution in supported this research.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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