

## **Factors Related To Occupational Accidents Of Woodworkers At Furniture Manufacturers In Larantuka Sub-District Of East Flores Regency**

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### **ABSTRACT**

*Occupational accident is an unexpected accident in a work place, which is a direct result of performing a job or the work environment or an accident that occurs while the job is performed. Occupational accidents are caused by various factors, such as age, gender, educational level, working period and knowledge of the workers. The occupational factors include working hours, working units, workload, fatigue and wearing PPE. The working environment includes room temperature, lighting and noise. The purpose of this study was to analyze the relationship between age, working period, working hours, workload, fatigue, wearing PPE and noise to the incidence of occupational accidents of woodworkers in furniture manufacturers in Larantuka Sub-district of East Flores Regency. This was an analytical survey using a cross sectional study design. The population in this study were 40 woodworkers in furniture manufacturers in Larantuka Sub-district of East Flores Regency. The sample of this study was selected using total sampling technique, in which the number of samples was the same as the population (40 people). The findings indicated a significant relationship among working period, workload, fatigue, wearing PPE and noise with occupational accidents of woodworkers at furniture manufacturers where the p.value was < alpha (0.05). There was no significant relationship among age, working hours and the incidence of occupational accidents of woodworkers in furniture manufacturers where p.value was > alpha (0.05). It is expected that the furniture manufacturers have to monitor and control risk factors in the workplaces, so that the woodworkers are avoided from the occupational accidents.*

*Keywords: Occupational Accidents, Woodworkers, Furniture Manufactures.*

### **INTRODUCTION**

One of the growing industries in Indonesia is the wooden processing industry, which includes wooden furniture manufacturers. The furniture manufacturer is one of the informal businesses that produces household needs such as chairs, tables, cabinets, beds, doors, windows, frames and other household items. In terms of occupational health and safety, this industry has the risk of injury and accidents because the woodworkers perform their jobs using dangerous machines and work equipment. Ramdan in his research indicated that the occupational health and safety issues on informal sectors were awareness and knowledge of the potential hazards of work, conditions, materials, and minimum equipment at the workplaces so that it is very vulnerable to occupational accidents and occupational diseases (Ramdan, 2012)

According to (Suma'mur PK, 2009), an occupational accident is an unexpected accident which is a direct result of work or the work environment or an accident that occurs while the job is being carried out. There are several factors that cause occupational accidents; individual/worker factors, occupational factors, and environmental factors (Suwardi, 2018). According to a recent report released by International Labour Organisation (ILO) in 2018, 2.78 million workers die every year due to

occupational accidents and occupational diseases. 2.4 million (86.3 percent) of the deaths were due to occupational diseases while more than 380,000 (13.7 percent) cases were due to accidents at the workplaces. Every year, there are nearly more than a thousand non-fatal occupational accidents compared to fatal occupational accidents. It is estimated that 374 million workers are suffered from non-fatal accidents each year, and many of these accidents have serious impacts on workers' income (ILO, 2018).

The findings of a research (Hudayana, 2013) regarding the identification of hazardous risks of occupational health and safety of woodworkers at UD Mita Furniture indicated that using machine to saw wood may hurt fingers (the saw hits fingers) and feet (the wood hits feet). In the production activities, starting from the preparation of raw materials to the assembly process, the risk of workplace accidents includes fingers exposed to a saw machine, a wood cutting machine, a wood-forming machine, a drilling machine and a hammer. At the end of the process (finishing), one of the risks is fingers expose to grinders. A research (Jumali MA, 2013) on woodworkers at a furniture manufacturer in Sidoarjo city showed that 72.5% of 70 respondents got occupational accidents. A research (Egriana, Agung and Suryani, 2010) on rustic workers in Yogyakarta revealed a relationship between age and the incidence of occupational accidents. Most of the accidents at the workplaces happened to 23 workers aged between 23 to 35 years old. A research (Jumali MA, 2013) on woodworkers in a furniture manufacturer in Sidoarjo city indicated a relationship among working period (working experience), working hours (length of work), and the incidence of occupational accidents where 72.5% of 69 respondents got workplace accidents. A research ((Kurniawan and Kurniawan, 2018) indicated that there was a relationship between fatigue and occupational accidents, in which 34 workers were suffered from fatigue and 8 of them felt mild fatigue.

In 2018, Employment Social Security Agency (BPJS Ketenagakerjaan) recorded 175,105 cases of occupational accidents in Indonesia (BPJS Ketenagakerjaan, 2019). According to health profile of Indonesia in 2018, the number of victims of health crisis for industrial accidents showed that 23 people died, 70 people were seriously injured/hospitalized and 2 people were slightly injured or outpatient (The Ministry of Health of the Republic of Indonesia, 2018).

The data on the number of occupational accidents in the Province of East Nusa Tenggara (NTT) recorded by Employment Social Security Agency (BPJS Ketenagakerjaan NTT) both from formal and non-formal employment sectors are as follows; there were 145 cases of occupational accidents in 2017 and 18 cases of occupational accidents in 2018. In 2019, it increased to 132 cases of occupational accidents (BPJS ketenagakerjaan propinsi NTT, 2019).

The furniture manufacturer is an informal work sector that grows and develops in Larantuka Sub-District of East Flores Regency. This business develops due to the needs of the community for furniture such as cabinets, beds, tables, shelves, chairs, frames, doors, windows and so on for household, offices and schools needs. According to the data on a preliminary survey, it was found that each of 8 furniture

manufacturers operating in Larantuka Districts has 2 to 6 workers. The observations on several furniture manufacturers revealed that the woodworkers did not wear personal protective equipment (PPE) at workplaces, there was no SOP on the operation of work equipment/machinery, work equipment was not properly stored while working, the workplaces were not neatly arranged, and there was no socialization about occupational health and safety either from health workers or from the Employment Department. The results of interviews with the owners of furniture manufacturers revealed that some woodworkers got workplace accidents such as cut fingertips when chopping wood using a cutting machine so they underwent mild treatment. The results of interviews with 12 woodworkers regarding occupational accidents revealed that they got workplace injuries, such as cut fingertips, scratched and cut hands, and feet crushed by wood. This study aims at analyzing the relationship among age, working period, working hours, workload, fatigue, wearing PPE and noise and the incidence of occupational accidents of woodworkers at furniture manufacturers in Larantuka Sub-District of East Flores Regency.

## METHOD

This was a research with an analytical survey using a cross sectional approach where the variable of risks and variable of effects were measured concurrently. This research was conducted on 13 furniture manufacturers in Larantuka Sub-District for one month. The population in this study were 40 woodworkers at furniture manufacturers in Larantuka Sub-District of East Flores Regency. The sample in this study was selected using a total sampling technique, in which all populations were selected as research samples, specifically all 40 woodworkers at furniture manufacturers in Larantuka Sub-District.

The technique of data collection used in this study was interviews, observation and measurement. The interviews were conducted using questionnaires to find out the identity of the respondent, the characteristics of the respondent (age, working hours, working period), the occupational accident experiences and the type of occupational accidents experienced. The interview on fatigue felt by the woodworkers used the Subjective Self Rating Test questionnaire from the Industrial Fatigue Research Committee (IFRC) which consisted of 30 questions in which each question has two options, Yes (2) and No (1). Measurements were made to determine the workload in which the pulses of woodworkers were measured manually using a stopwatch with the 10-pulse method. Sound Level Meter (SLM) was used to measure noise level per woodworker and it was done once only during woodworking. A checklist was used during observations to determine the use of Personal Protective Equipment (PPE). This research already passed ethical review conducted by the commission of health research ethics of the Faculty of Public Health of Nusa Cendana University. The data were analysed using non-parametric statistics with the chi square test ( $\chi^2$ ) to reveal the relationship between independent and dependent variables using the 2X2 table with 95% confidence level and significance p value of  $<0.05$ . The data analysis was done using a computerized system which interpreted and presented in tables and narrations (Adu A Apris, Misnadin and Hinga, 2016)

**RESULTS AND DISCUSSION**

The findings revealed that 19 out of 40 respondents (47.5%) got occupational accidents and 21 woodworkers at furniture manufacturers have never experienced workplace accidents.

The types of occupational accident are presented in table 1.

Table 1. Types of Occupational Accidents

No	Types of occupational accidents	Total	%
1	Being cut	4	21.1
2	Being hit by falling object	5	26.3
3	Being stabbed	3	15.8
4	Being scratched	7	36.8
<b>Total</b>		<b>19</b>	<b>100</b>

Table 1 shows that 19 respondents got occupational accidents. Being scratched was the most common accident happened at the workplace, it was followed by being hit by falling objects, being cut or stabbed by tools or wood. The distribution of respondents based on age, working period, working hours, workload, fatigue, wearing PPE and noise is presented in table 2.

Table 2. The distribution of respondents based on age, working period, working hours, workload, fatigue, wearing PPE and noise of woodworkers at furniture manufacturers.

Characteristic	Category	Total	%
Age	Non-risk (< 30 years old)	15	37.5
	Risk ( $\geq$ 30 years old)	25	62.5
Working Period	New ( $\leq$ 3 years)	16	40
	Old (> 3 years)	24	60
Working Hour	Non-risk	29	72.5
	Risk	11	27.5
Workload	Mild ( $\leq$ 100 beats/minute)	17	42.5
	Heavy (>100 beats/minute)	23	57.5
Fatigue	Not fatigue	19	47.5
	Fatigue	21	52.5
Wearing PPE	Wearing	5	12.5
	Not Wearing	35	87.5
Noise	Non-risk	14	35
	Risk	26	65

25 woodworkres (62,5%) were in the category of risk age and 24 (60%) had the longest working period. According to working hours, the highest number of woodworkers was 29 people (72.5%) and they were are at the categoryof non-risk working hour. Woodworkers with the heaviest workload were 23 people (57,5%). According to level fatigue, the highest number of woodworkers was 21 people (52,5%) and they were at the categoryof fatigue. 35 woodworkers (87,55) did not wear PPE and 26 people (65%) were exposed to risk noise.

The research indicated that age and working hours did not related to occupational accidents. While, there was a relationship among working period, workload, fatigue, wearing PPE, noise and accidents at workplaces. The complete data is presented in table 3.

Tabel 3. The relationship among age, working period, working hour, workload, fatigue, using PPE, noise and the occupational accidents of woodworkers at furniture manufactures.

Variable	Category	Occupational Accidents				Total		P.value
		Never		Ever		n	%	
		n	%	n	%			
Age	Non-Risk	9	22,5	6	15	15	37,5	0,683
	Risk	12	30	13	32,5	25	62,5	
Working Period	New	12	30	4	10	16	40	0,045
	Old	9	22,5	15	37,5	24	60	
Working Hour	Non-Risk	18	45	11	27,5	29	72,5	0.107
	Risk	3	7,5	8	20	11	27,5	
Workload	Light	13	32,5	4	10	17	42,5	0,022
	Heavy	8	20	15	37,5	23	57,5	
Fatigue	Non - Fatigue	14	35	5	12,5	19	47,5	0,025
	Fatigue	7	17,5	14	35	21	52,5	
Wear PPE	Wearing	0	0	5	12,5	5	12,5	0,018
	Not Wearing	21	52,5	14	35	35	87,5	
Noise	Non-Risk	11	27,5	3	7,5	14	35	0,037
	Risk	10	25	16	40	26	65	

According to Suwardi, age influences the incidence of occupational accidents significantly. Young people are relatively more prone to occupational accidents than older people, which may be due to careless and haste behaviours. The risk of occupational accidents is lower for older woorkers than younger workers, but the severity of injury is more sirous and it takes longer time to recover (Suwardi, 2018). The results of this research showed that there was no significant relationship between age and occupational accidents of woodworkers in furniter manufacturers. Most of the woodworkers in Larentuka are in the category of risk age (> 30 years old), which are between 30-59 years old. Even though most of the workers are at risk age, they work with caution because they are more aware of the

dangers that will occur, so the risk of getting a work accident is small or even non-existent. The woodworkers who are at risk or non-risk age are still in their productive age so that they are capable of performing their jobs well. The woodworkers who are both at risk age or non-risk age feel capable of doing their jobs and do not experience difficulties at work. They are also responsible for their work and they know the risks. Occupational accidents experienced by woodworkers in furniture manufacturers both at the risk and non-risk age groups might be due to other more dominant factors such as workload, fatigue, wearing PPE or environmental factors which. These are the roots of work accidents. This research is in line with a research conducted by (Purna and Aryana, 2018) where the results of the study obtained the  $p$ -value of  $(0.301) > \alpha (0.05)$ , which means that there was no relationship between age and occupational accidents for Gong craftsmen.

The working period is a factor that contributes to the incident of occupational accidents. The longer the working period, the more experienced and skilled workers are in performing their jobs. In addition, their level of awareness of the risk of accidents is higher which may reduce the risk of getting a work accident. A long working period has negative effect because the workers are familiar with their work especially on monotonous work. According to Suwardi, the more experience a person in performing their job, the less likely to get workplace accidents. An awareness of work accidents increases along with the age, working period and years of service in the respected workplace (Suwardi, 2018). The results of the study showed that there was a significant relationship between working period and occupational accidents of woodworkers in furniture manufacturers. Most of the workers (60%) are in the category of long working period. Workers with long working period have ever gotten occupational accidents such as being scratched, being stabbed, being cuts and being hit by falling objects. Because they have been working for a long time, it becomes a habit. They ignore the dangers that exist and think that work accidents such as being stabbed, being scratched and being hit by falling objects are normal. This is in accordance with the theory introduced by MA Tulus (1992) (in Sulhinayatullah, 2017) which claimed that working period can affect performance both positively and negatively. It has positive effect when the workers get better in performing their jobs year by year. On the other hand, it will impose a negative effect when their jobs become their habits (Sulhinayatillah, 2017). Occupational accidents experienced by woodworkers with short working periods happen when they do not understand the ins and outs of their work, underestimate the dangers and also behave unsafe. In addition, new workers or young workers are relatively prone to occupational accidents because of their careless and haste attitude. This research is in line with a research conducted by (Khaqiqudin, Wahyuni and Kurniawan, 2019) where the data analysis generated  $p$ .value of  $(0.030) < \alpha (0.05)$ , which means that there was a relationship between working period and the incidence of occupational accidents of employess at the production division.

Working hours play an important role in the incidence of workplace accidents. Working hours also play a crucial role in preventing workers from the risk of having a work accident. If working hours

are long and violate the rules, it will drain a lot of energy, which may lead to health problems such as muscle complaints, and fatigue due to having a fairly heavy workload which ultimately cause workplace accidents. According to Tarwaka, it was decided that the maximum length of working day is 8 hours and the rest is time off for family and social life in Indonesia. Working hours play an important role in avoiding workers from the risk of having a work accident, if the working hours are long and not in accordance with the rules, it will cause health problems such as problems with muscle complaints, and fatigue due to having a fairly heavy workload. Extending working hours will only reduce working efficiency, increase fatigue, workplace accidents and occupational diseases (Tarwaka Sudiajeng, 2004). The results showed that there was no significant relationship between working hours and workplace accidents for furniture workers. A total of 29 workers have no risk working hours ( $\leq 8$  hours/day). These are normal working hours in which 7-8 hours/day and this is in accordance with the policies and regulations in the furniture business or their workplaces. Working for  $\leq 8$  hours per day is an optimal condition. Nonetheless, it still needs a break during those 8 working hours. Furniture workers who have risky working hours ( $> 8$  hours / day) are only 11 people and this extra working hour only occurs at certain times when they have to complete a furniture order within the grace period that has been agreed with the customers. However, this is not an issue because the owner concerns their welfare so that they feel responsible for completing their work. Workplace accidents that occur to furniture workers might be caused by other dominant factors not due to working hours. This research is in line with research conducted by (Aswar, Pitrah, 2016), where the results of the chi-square statistical test obtained the  $p$ -value of  $(0.361) > \alpha (0.05)$ , which means that there was no relationship between working hour and workplace accidents for workers in the car workshop in Kendari city.

Workload is the burden borne by workers to complete their work. Workload is one of the factors contributed to workplace accidents. Heavy workload drains energy and causes fatigue which can lead to occupational accidents. Meanwhile, light workloads have little or no risk of workplace accidents or even it does not relate to occupational accidents. Based on the theory of Loss Causation Model in Kurniawan (2018), it is said that workload is one of the factors contributing to workplace accidents. Frequently, physical activities use muscle strength and muscle movement requires oxygen carried by blood to the muscles for the process of burning substances to produce energy (Kurniawan and Kurniawan, 2018). The results showed that there was a significant relationship between workload and workplace accidents of woodworkers at furniture manufacturers. 23 woodworkers admitted that they have heavy workload. The workers perform their jobs without taking breaks. Although the distribution of tasks is based on the abilities and skills of each worker, the workload is still heavy because they do not take frequent breaks. They only have a lunch break during the day. In addition, the additional working hours to achieve production target causes heavy workload. The heavy workload makes workers feel tired quickly, which in turn leads to work accidents. This is in accordance with the theory expressed by Suma'mur which stated that workload determines how long a person can work according to his

working capacity. It is revealed that a person productivity decreases after 4 hours of work even though they perform an easy task. This is mainly due to a decrease in the blood sugar level. To overcome this, the workers should take a rest and eat to increase blood sugar level again which become fuel to produce energy for the body to perform their work. Heavy work requires frequent breaks and short working hours. If not, it might cause fatigue which can lead to occupational accidents (Suma'mur PK, 2009). This research is in line with research conducted by (Kurniawan and Kurniawan, 2018) where the Chi Square test generated p value of  $(0.000) < \alpha (0.05)$ , which means that there was a significant relationship between workload and occupational accidents.

Fatigue is one of the factors that might contribute to occupational diseases, injuries and accidents. Fatigue usually leads to a decrease in work capacity and endurance, which in turn contributes to workplace accidents. Workers who feel fatigue due to work are more prone to occupational accidents, while workers who are not fatigue have a small risk of getting injured or accidents. According to (Astrand & Rodalh, 1977 ; Pulat, 1992) on Tarwaka, the symptoms of fatigue is ranging from mild to severe. Subjective fatigue is usually felt at the end of working hours, when the average workload exceeds 30-40% of the maximum aerobic power (Tarwaka Sudiajeng, 2004). The results of this study on the work fatigue indicated that there was a significant relationship between work fatigue and occupational accidents of woodworkers at furniture manufacturers. The results of the interviews in the field revealed that 21 out of 40 woodworkers at furniture manufacturers felt fatigue after completing their jobs at the manufacture. Fatigue complained by woodworkers after completing their jobs are stiffness in the shoulders, back pain, feeling thirsty and want to lie down. The fatigue experienced by furniture workers was mostly due to the heavy workload and the additional working hours when they have to finish wooden furnitures within a certain grace period. In addition, based on observations, when the woodworkers were busy they did not drink water or eat food to replace the energy lost due to activities, which causes them to tire easily. The fatigue will lead to lower work capacity and endurance. When the workers have minimum capacity and endurance, it will increase errors in performing jobs, which in turn will increase the risk of workplace accidents. Workers who are not fatigue may also get occupational accidents due to other factors such as poor health condition when performing their jobs. This research is in line with a research conducted by (Kurniawan and Kurniawan, 2018) which revealed p.value of  $(0.003) < \alpha (0.05)$ . This means that there was a significant relationship between fatigue and work accidents.

Wearing personal protective equipment (PPE) is the last alternative of all technical efforts to prevent accidents at work. PPE cannot protect the body completely against exposure to potential hazards, but it can minimize the risk of accidents at work or can reduce the severity of a possible occupational accident or disease (Suma'mur PK, 2009). Workers who wear PPE while working have a lower risk of occupational accidents compared to workers who do not wear PPE. The results of this research indicated that there was a significant relationship between wearing PPE and occupational



accidents of woodworkers at furniture manufacturers. The field observations revealed that 35 out of 40 woodworkers did not wear PPE while working. 14 (35%) of them got occupational accidents. Woodworkers did not wear PPE because they are used to work without wearing PPE and they feel uncomfortable to wear it. Besides, most of furniture manufacturers did not provide PPE for woodworkers. They also did not supervise the woodworkers to wear PPE. There were 21 (52.5%) woodworkers who did not wear and they have never had a work accident. This might happen because the woodworkers were cautious and aware of the risks. When the woodworkers have limited knowledge of workers on risks of work hazards and supported by unsafe behaviour or actions such as not wearing PPE at work, it will increase the probability of getting occupational accidents. On the other hand, all workers who wore PPE ever got accidents at work but this may due to other factors such as carelessness and haste behaviour at work, fatigue or other dominant factors. This research is in line with a research conducted by (Sulhinayatillah, 2017) where the results of statistical tests obtained  $p$ .value of  $(0.000) < \alpha$  (0.05). This means that there was a relationship between wearing PPE and the incidence of workplace accidents for workers at the production division.

The higher the noise level in a workplace, the higher the probability of woodworkers to get accidents at work. While, the lower the noise level, the less risk for workers to get work accidents. (Suma'mur PK, 2009) stated that 85dBA is the agreed noise intensity as a guideline for hearing aid protection so as not to lose hearing power for 8 hours-exposure in a day and 5 working days or 40 hours of work in a week in Indonesia. In addition, noise in the workplace can also affect workers because noise can cause emotional disturbances, communication problems which lead to misunderstandings, misheard signals, and can lead to occupational accidents. The results of this research indicated that there was a significant relationship between noise and occupational accidents of woodworkers at furniture manufacturers. It was revealed that there were 14 workers exposed to noise with an intensity below the threshold value ( $\leq 85$  dBA). This means that they were not at risk for getting a work accident. However, they may get occupational accidents due to other factors such as workload, use PPE or other factors. 26 (65%) woodworkers were at risk for getting accidents at work due to exposure to noise with an intensity above threshold value ( $> 85$ dBA), which was between 89.45dBA and 98.60 dBA. The observation indicated that the woodworkers were fine with the noise produced by machines at the workplaces. However, workers found it difficult to communicate so that they misunderstood the information. If this condition is sustained, it will increase the probability of occupational accidents. This is in accordance with the theory expressed by Suma'mur which stated that noise can affect workers, performance, such as verbal communication problems. Such communication problems cause work disruption and will possibly lead to errors or occupational accidents, especially for new workers which may misunderstood the conversation that lead to occupational accidents (Suma'mur PK, 2009). The results of this study are in line with research conducted by (Purna and Aryana, 2018) where the statistical test obtained the  $p$ .

value of (0.010)  $< \alpha$  (0.05), which means that there was a relationship between noise and occupational accidents for gong craftsmen workers.

### CONCLUSION

The results of this research indicated that age and working hours were not related to occupational accidents of woodworkers at furniture manufacturers. While, there was a relationship among working period, workload, fatigue, wearing PPE, noise and occupational accidents of woodworkers at furniture manufacturers in Larantuka Sub-District of East Flores Regency.

### CONFLICT OF INTEREST

This research does not have a conflict of interest with any party. This Research has received approval by the Local Government of East Flores Regency with a research permit number of KESBANGPOL 070./ 57 / Sekret / 2020.

### THANK-YOU NOTE

Thank you to the Local Government of East Flores Regency, 13 owners of furniture manufacturers in Larantuka sub-District and all respondents of this research.

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