

ANALYSIS OF AFFECTING FACTORS OF WORK ACCIDENTS AND USE OF PERSONAL PROTECTIVE EQUIPMENT IN WELDERS IN A. YANI STREET BANJARBARU 2016

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Abstract: *The welding industry is a workplace with high-risk activity that can cause health problems and fatigue that have an impact on accidents. One of the risk control of workplace accidents is the use of personal protective equipment (PPE). This study aims to identify and analyze the factors that affect workplace accidents and the use of PPE in welders in A. Yani Street, Banjarbaru. The study design was observational analytic using cross sectional method. The sample is 31 respondent, who taken using quota sampling technique.*

Results and conclusions show that there is no correlation between age and work accidents ($H_0 > 0.05$), there was no correlation between tenure with work accidents ($H_0 > 0.05$), there was no correlation between working time with work accidents ($H_0 > 0.05$), there is no correlation between knowledge and work accidents ($H_0 > 0.05$), and there is a correlation between the use of PPE with work accidents ($H_0 < 0.05$). In addition, there is no correlation between age and use of PPE ($H_0 > 0.05$), there was no correlation between tenure with the use of PPE ($H_0 > 0.05$), there was no correlation between the working time with the use of PPE ($H_0 > 0.05$), and there is no correlation between knowledge and use of PPE ($H_0 > 0.05$). Recommendations to this research is to the Banjarbaru Government, the results of this research can be used as input in making local regulations for labor protection. For the welding industry is expected to complete the inventory completeness of PPE, both the type and amount. In addition, the provision of PPE needed a comfortable, convenient, and economical in order to increase the interest of workers in the use of PPE.

Keywords: *work accidents, affecting factors, PPE*

INTRODUCTIONS

Occupational safety and health issues (K3) is generally in Indonesia is still often overlooked. This is indicated by the high number of accidents. In 2014, there was 24.910 cases of occupational accidents in Indonesia. A total 1.651 cases in South Kalimantan (Anonymous, 2011).

Most of the cases of occupational accidents occur in the productive age group. Occupational accidents can result in death or lifelong disability. In addition, also

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resulted in the loss of non-material and material that is very large (Reini, 2014). In general, there are two classes of causes of accidents are unsafe human actions and unsafecondition. Of the few studies, the human factor occupies a very important position against occupational accidents is between 80-85% (Suma'mur, 1993). One of the main causes of workplace accidents caused by humans is stress and fatigue. Work fatigue contributed 50% of accidents (Setyawati, 2007).

The welding industry is a workplace with high-risk activity that can cause health problems and fatigue that have an impact on occupational accidents. In Indonesia, the welding industry easy to find in a side street (Azir, 2014). Some of the welding industry is located on a traffic highway by the general public such as those found along the A. Yani Street Banjarbaru which is the main route between the provinces of South Kalimantan. Activities can cause noise on the highway traffic that can cause discomfort that interferes with concentration at work so that workers can experience fatigue and cause accidents. In addition, work accidents can be caused by many factors such as older age, working period is not long, working time exceeds the load, less knowledge and noncompliance use of personal protective equipment (PPE) (Suma'mur, 1995).

Zulfina (2015) research results that 63% of welders experiencing severe fatigue that can result in the incidence of occupational accidents (Mia, 2015). This study aimed to determine factors which affectingthe occupational accidents on welders along the A. Yani Street Banjarbaru. The importance of the use of PPE at work in welding industry required by the workers and the owners of the industry that is an integral obligation. Also with the age factor, tenure, length of working, the level of knowledge is also an important part to prevent accidents (Husaini, 2014).

Benefits of research in the future is a matter for further study and information to various stakeholders, especially industry owners and local governments, such as for the welder, that when the work is absolutely necessary PPE, the treatment of shift work according to the rules, tenure, working age, and increase knowledge in the field so that all workers remain healthy, productive, and avoid the various types of accidents. Other benefits can be used to support the government in making local regulations relating to labor protection.

METHODS

The method used is analytical observation. The sample is calculated by quota sampling (n-1) 30 respondents. Instruments used in the study was a questionnaire. A questionnaire was used to determine occupational accidents, welder age, tenure, length of working, the level of knowledge and use of personal protective equipment (PPE). The independent variable in the study was of welder age, tenure, length of working, the level of knowledge, while the dependent variable in this study is a occupational accident at welders and use of PPE. However, PPE also be the independent variable in relation to the incidence of occupational accidents.

The data were analyzed using univariate and bivariate. Univariate analysis to determine the frequency and distribution of the variables studied. While the bivariate analysis to determine the relationship between each independent variable and the dependent variable.

RESULT

Univariate Analysis

1. **Welder Age:** The frequency and distribution of welder age on the A. Yani Street Banjarbaru is as follows.

Table 1.
Welder Age on the A. Yani Street Banjarbaru City 2016

<i>Welder Age</i>	<i>N</i>	<i>%</i>
Young (<40 years old)	28	93,33%
Old (>40 years old)	2	6,67%

Based on Table 1 it can be seen as many as 28 people (93.33%) of welders are young (<40 years). While older welders aged (> 40 years) for 2 persons (6.67%).

2. **Tenure:** The frequency and distribution of tenure of welder on the A. Yani Street Banjarbaru is as follows.

Table 2.
Tenure of Welder on the A. Yani Street Banjarbaru City 2016

<i>Tenure</i>	<i>N</i>	<i>%</i>
Less than 5 years	20	66,67%
More than or equal to 5 years	10	33,33%

Based on Table 2 can be seen as many as 20 people (66.67%) of welders have tenure <5 years. While as many as 10 people (33.33%) have tenure ≥5 years.

3. **Length of working:** The frequency and distribution of length of welder working on the A. Yani Street Banjarbaru is as follows.

Table 3
Length of Welder Working on the A. Yani Street Banjarbaru City 2016

<i>Length of working</i>	<i>N</i>	<i>%</i>
6-8 hours per day	4	13,33%
8-10 hours per day	26	86,67%
10 hours per day	0	0,00%

Based on Table 3 can be seen as many as 4 welders (13.33%) work for 6-8 hours per day and 26 welders (86.67%) work for 8-10 hours per day. As for the welders who work more than 10 hours per day, none (0.00%).

4. The level of knowledge: The frequency and distribution of the level of welders knowledge on the A. Yani Street Banjarbaru is as follows.

Table 4
The Level of Welder Knowledge on the A. Yani Street Banjarbaru City 2016

<i>The level of knowledge</i>	<i>N</i>	<i>%</i>
Good	26	83,97%
Poor	4	13,33%

Based on Table 4 it can be seen as many as 26 welders (83.97%) have a good level of knowledge. While as many as 4 welders (13.33%) had a poor level of knowledge.

5. **Use of PPE:** The frequency and distribution of use of PPE of welders on the A. Yani Street Banjarbaru is as follows.

Table 5
Use of PPE of Welders on the A. Yani Street Banjarbaru City 2016

<i>Use of PPE</i>	<i>N</i>	<i>%</i>
Use at least 4 major PPE	0	0,00%
Not use at least 4 major PPE	30	100%

Based on Table 5 it can be seen no welders using PPE at least 4 major PPE. This means that as many as 30 welders (100%) not use the 4 main PPE. PPE is used mostly only welding goggles and gloves (76%). Here are the types of PPE distribution and frequency used by welders in A. Yani Street Banjarbaru 2016.

Table 6
Type of PPE used by Welders in A. Yani Street Banjarbaru 2016

<i>Type of PPE</i>	<i>N</i>	<i>%</i>
Safety glove	23	76,67
Face shield	8	26,67
Safety shoes	14	46,67
Goggles	23	76,67
Safety helm	6	20,00
Apron	2	6,67

Major PPE in welders has 6, ie safety helmet, welders goggles, face shield, apron, safety glove, and safety shoes. Based on Table 6 it can be seen as many as 23 welders

(76.67%) use safety glove. Safety glove is used to protect the fingers and skin from heat and electrical shock cold, electromagnetic radiation, ionizing, chemicals, impact and blows, cuts, abrasions and infection, then the welder must wear heat resistant glove and are insulation against electric (Vitriyansyah & Benny, 2012).

A total of 8 welders (26.67%) use face shield. It used to protect against fire across the face of the skin as a result of the light arc, spark and others, which can not be protected simply by eye alone. The shape of the face shield assortment, can be shaped welding helmets and handshielddwelding (Vitriyansyah & Benny, 2012).

A total of 14 welders (46.67%) use safety shoes. The function of it is to protect the feet and skin from sharp objects, the fall of sharp objects and metal splashes and scratches sharp objects. Terms of safety shoes are strong and fire-resistant, high-end shoes from steel and materials from the skin (Vitriyansyah & Benny, 2012).

A total of 23 welders (76.67%) use goggles. Goggles is used to avoid the influence energy radiation such as ultraviolet light, infrared light and others which can damage the eyes. The welders are likely to be exposed to the danger of blinding light, like light pieces using gas welding and sparks from welding rays which anneal can use special eye protection. Welding work also produce radiation depends on the particular temperature (Vitriyansyah & Benny, 2012).

A total of 6 welders (20.00%) use safety helmet. While as many as 2 welders (26.67%) use apron. Apron used on welding time serves to protect the body from the dangers on welding time. While the chest is a very sensitive to the effects of heat and light are sharp. Rays of light electric welding include very sharp (Vitriyansyah & Benny, 2012).

Most welders not comply use of PPE at work for a variety of reasons, including inconvenience in the use of PPE during work. Discomfort here including the hot, heavy, sweat or moisture, pain, dizziness, tightness, and so on. Another reason was that job retention is not dangerous or affect the safety and health. Especially for workers who have many years of doing the job. A misunderstanding of the function of PPE due to lack of knowledge of the functionality and usability PPE, PPE disturb the smoothness and speed of work is another reason workers do not comply use of PPE in the workplace.

Linkage the importance of a worker to protect him from any potential hazards and risks of employment, particularly the use of PPE is absolutely necessary as a necessity. This is consistent with the opinion of Mark et al. (2007) that the PPE for a worker is absolutely necessary in order to protect from health problems and the potential for accidents. PPE used must qualify the easy and convenient to use, security / protection is assured, cheap and easy to get, and easy in maintenance and storage (Mark *et al.*, 2007).

DISCUSSION

Bivariate Analysis

1. Correlation Between Welder Age with Occupational Accident: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.419, which means > 0.05 . This shows that there is no correlation between age and accidents. Age does have an influence on the incidence of workplace accidents. Old age group has a higher propensity for occupational accidents compared to younger age bracket since a young age has a reaction and agility higher (ILO, 1989). In some cases, older workers tend to be injured at work as a result of a decrease in physical quality (Munira, 2011).

Based on table 1, the respondent have young age more than older age. The young age also often encounter cases of occupational accidents, this may be due to carelessness and attitudes like hasty. From the results of research in the United States revealed that more younger workers have an accident compared with older workers. Younger workers are usually less experienced in their work (ILO, 1989).

There are many reasons why young workers have a tendency to suffer from occupational accidents is higher than the older age group. Some of the factors that affect the high incidence of occupational accidents in younger age, due to lack of attention, lack of discipline, tend to be impulsive, careless and hasty (ILO, 1989).

2. Correlation Between Tenure with Occupational Accident: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.324, which means > 0.05 . This shows that there is no correlation between tenure with accidents. Tenure directly related to the work experience, the longer a person tenure, so the workers experience is higher. So workers will be able to understand more about how to work safely to prevent themselves from accidents. The new labor generally do not know about their job. In contrast with the increase in working period then increased the knowledge and skills possessed the workers and safety aspects of work performed (Suma'mur, 2009).

The results are respondent have tenure < 5 years have more than ≥ 5 years (Table 2). It is consistent with Hernawati and Hikmawan research where the high tenure does not guarantee a person safe from accidents, things like ignoring unsafe conditions and unsafe acts as well as exposure to toxic substances that persist can be fatal for the worker himself (Hernawati, 2007). The work unit is a part that has the specific task of a larger organization. The correlation between work units with occupational accidents more related with type of work, where this type of work have a substantial risk of an accident. The number and kinds of work-related accidents vary across the various units operating in a process (Suma'mur, 1995).

3. Correlation Between Length of Working with Occupational Accident: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.933, which means > 0.05 . This shows that there is no correlation between the length of working with occupational accident. A person can work well in a day for 8 hours or 40 hours in a week. The rest of the time in one day (16 hours) is used to life in the family and society, rest and others (Suma'mur, 1993).

Working hours may affect the work accident, for long hours can cause fatigue and increase the risk of accidents at work (Suma'mur, 1993). But in this study, duration of work not related to workplace accidents because only one of the factors that may influence the occurrence of accidents. Workers with long work that many had the same risk for accidents to workers who work more briefly.

4. Correlation Between Length of Working with Occupational Accident: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.236, which means > 0.05 . This shows that there is no correlation between the level of knowledge with occupational accidents. In this study, some welders have good knowledge (Table 4). Only 4 respondent who have less knowledge. Workers who have less knowledge about how to work and safety at work can lead to workplace accidents (Cecep, 2014). In addition, a person's behavior is often influenced by the level of knowledge (Soekidjo, 2007). However, in this study the level of knowledge is not associated with the incidence of workplace accidents. This is due to the level of knowledge of most of the respondents either. In addition, a person's behavior is not only influenced by knowledge alone, but can be influenced by the environment and conditions in the workplace.

5. Correlation Between Use of PPE with Occupational Accident: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.000, which means < 0.05 . This shows that there is a correlation between the use of PPE with occupational accident. PPE is one of the risk management control accidents. The use of PPE can reduce the risk of accidents.

The welding process has the danger and risk of accidents. Some of the hazards that potentially occur in the welding process is the danger of radiation (light), the dangers of smoke and fumes, sparks hazards, fire hazards, fall hazards, and electrical hazards (Yasari, 2008). Therefore we need some welding PPE to protect workers in welding.

6. Correlation Between Welder Age with Use of PPE: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.272, which means > 0.05 . This shows that there is no correlation between age with use of PPE. Behavior depends on the characteristics or other factors of labor, one of which is a factor of a person's age (Soekidjo, 2012). The results of this study showed no correlation between working age with the use of PPE. This is in line with research conducted by

Ahyar (2001) which states that there is no relationship between age and adherence using PPE (Ahyar, 2001). Both workers younger or older have the same percentage of compliance in the use of PPE (Kartika, 2014).

7. Correlation Between Tenure with Use of PPE: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.528, which means > 0.05 . This shows that there is no correlation between tenure with the use of PPE. Tenure is one of the factors on the characteristics of workers who shape behavior. So workers will be able to understand more about how to work safely to prevent themselves from accidents. If workers have to know the condition of the workplace environment and the dangers of the job, the workers would be subservient to use PPE (Soekidjo, 2012).

This study does not prove a correlation between tenure with the use of PPE. This study is in line with research conducted by Ahyar (2001) that there is no significant correlation between tenure with use of PPE. The proof, workers who have not been working in the company or who has long worked in the company's percentage of use of PPE which is almost the same (Kartika, 2014).

8. Correlation Between Length of Working with Use of PPE: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.933, which means > 0.05 . This shows that there is no correlation between the length of work with the use of PPE. A person can work well in a day for 8 hours or 40 hours in a week. The rest of the time in one day (16 hours) is used to life in the family and society, rest and others (Suma'mur, 1993).

Length of work is not related to the use of PPE. The workers will only use PPE if it has been disturbed by the condition of the workplace. Moreover, they feel familiar with exposure to hazards that exist and consider that exposure to danger only slightly so that the body is still able to accept it.

9. Correlation Between The Level of Knowledge with Use of PPE: Based on the statistical test using Chi Square (X^2) obtained p-value of 0.399, which means > 0.05 . This shows that there is no correlation between the level of knowledge with the use of PPE. Knowledge is the result of the process out after going through the sensing process to a particular object. Knowledge has important role for the formation of behavior (Soekidjo, 2007). The study found that there was no correlation between the level of knowledge with the use of PPE. This is in line with the results of research conducted by Asriyani (2011) who found that there was no significant correlation between the level of knowledge with the use of PPE (Asriyani, 2011).

Most of the workforce is already having a good knowledge but in fact does not guarantee a good knowledge docile workforce using PPE. There was no guarantee that the workers have a high knowledge to be noncompliant use PPE for knowledge workers only to the first level of knowledge. The first level

of knowledge is knowledge that is merely considering the information received. Knowledge of high labor on PPE for labor only remember information about APD but has not reached the level of understanding and applying the use of PPE (Soekidjo, 2003).

In general, workers have known the dangers that exist in the workplace as well as the importance of using PPE when working. However, not all workers with high knowledge they show good behavior PPE use each perform the welding process. The workers will only use PPE if it has been disturbed by the condition of the workplace. Moreover, they feel familiar with exposure to hazards that exist and consider that exposure to danger only slightly so that the body is still able to accept it.

CONCLUSION AND RECOMMENDATION

There is no correlation between age and work accidents ($H_0 > 0.05$), there was no correlation between tenure with work accidents ($H_0 > 0.05$), there was no correlation between working time with work accidents ($H_0 > 0.05$), there is no correlation between knowledge and work accidents ($H_0 > 0.05$), and there is a correlation between the use of PPE with work accidents ($H_0 < 0.05$). In addition, there is no correlation between age and use of PPE ($H_0 > 0.05$), there was no correlation between tenure with the use of PPE ($H_0 > 0.05$), there was no correlation between the working time with the use of PPE ($H_0 > 0, 05$), and there is no correlation between knowledge and use of PPE ($H_0 > 0.05$).

Recommendations to this research is to the Banjarbaru Government, the results of this research can be used as input in making local regulations for labor protection. For the welding industry is expected to complete the inventory completeness of PPE, both the type and amount. In addition, the provision of PPE needed a comfortable, convenient, and economical in order to increase the interest of workers in the use of PPE. For further research is needed to study other factors that may affect occupational accidents such as fatigue, ergonomics, workers nutrition, job stress, and others.

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References

Ahyar, M. (2011). *Relations Labor Characteristics Against the Use of Personal Protective Equipment Mouth and Nose (Mask)*. Thesis Faculty of Public Health Airlangga University. Surabaya. Indonesia.

- Anonymous. (2011). The Ministry of Health of the Republic of Indonesia. *Data and Information Center of Occupational Health 2011-2014*.
- Asriyani. (2011). *Factors Influencing Attitudes use of Personal Protective Equipment (PPE) to the Labour Section Automated Phone Systems (STO) in PT. Telecommunications, Tbk-Mainland Riau Pekanbaru 2011*. Thesis Veterans National Development University Jakarta. Indonesia.
- Azir A. (2014). Effect of Eye Personal Protective Equipment on Vision Acuity Employees Welding Territory Tourist Bus Terminal Ngabean Yogyakarta. *Respati Journal*. Indonesia.
- Cecelia, DS. (2014). *Occupational Health and Safety*. Goshen Publishing: Yogyakarta. Indonesia.
- Hernawati, Eva. (2008). *Factors Associated with Genesis Accidents Based on Characteristics of Labor and Employment in Mining Area Unit PT. Antam Tbk UBPE Pongkor Bogor, West Java, 2006-2007*. Thesis Syarif Hidayatullah State Islamic University. Jakarta. Indonesia.
- Husaini, (2014). *Relationship Exposure CO, SO₂, NO₂, Fume and Vapor With Lung Function and Immunoglobulin Serum levels of Blacksmith*. Disertation of Doctoral Program - Medicine and Health Sciences Graduate Program of the Faculty of Medicine, University of Gadjah Mada, Indonesia, 54-55.
- International Labour Office. (1989). *Handbook for Accident Prevention*. PT. Pustaka Binaman Pressindo. Jakarta. Indonesia.
- Kartika DSP, and Justin DAW. (2014). Analysis of Factors Associated with Adherence Using Personal Protective Equipment. *The Indonesian Journal of Occupational Safety, Health and Environment 1 (1)*, 24-36.
- Mark, A.F and James, PK. (2007) *Fundamental of Occupational Safety and Health*. Fourth Edition. Government Institutes and Imprint of the Scarecrow Pres Inc. Lanham, Maryland. Toronto. Plymouth. UK.
- Mia Z. (2015). *Relations Fatigue Working with Genesis Occupational Accidents at Welders Along A. Yani Street, Banjarbaru*. Study Program in Public Health Faculty of Medicine, Lambung Mangkurat University.
- Munira, Ulfa. (2011). *Factors Related to Accidents at Genesis Stevedoring (TKBM) in the port of Makassar*. Hasanuddin University, Makassar. Indonesia.
- Reini D W. (2014). *Challenges Safety and Health at Work on Construction Project in Indonesia*. Faculty of Civil and Environmental Engineering. Bandung Institute of Technology. Indonesia.
- Setyawati, LM. (2007). *Promotion of Occupational Health and Safety*. Training The Medical whole Central Java. RSU Soeradji Klaten. Indonesia.
- Soekidjo N. (2003). *Education and Health Behavior*. Jakarta: Rineka Reserved. Indonesia.
- Soekidjo, N. (2007). *Health Promotion and Behavioral Sciences*. Jakarta: PT. Rineka Reserved. Indonesia.
- Soekidjo, N. (2012). *Education and Health Behavior*. Jakarta: Rineka Reserved. Indonesia.
- Suma'mur. (1996). *Industry Higiene and Occupational Health*. CV. Mas Agung. Jakarta. Indonesia.
- Suma'mur. (1993). *Safety and Occupational Accident Prevention*. Jakarta: CV. Haji Masagung. Indonesia.
- Suma'mur. (1995). *Occupational Health and Accident Prevention*. Jakarta: PT. Holy mountain. Indonesia.

- Suma'mur. (2009). *Company Hygiene and Health at Work*. Jakarta: PT. Sagung Seto. Indonesia.
- Vitriyansyah P, and Benny. (2012). *Analysis of Factors Influencing Behavior Welding Industry Workers in the Informal Use of Personal Protective Equipment (PPE) in Jalan Raya Bogor-Pier, the City of Bogor in 2011*. Depok. Faculty of Public Health, University of Indonesia.
- Yasari. (2008). *Behavior and Use of Personal Protective Equipment Occupational Dermatitis incident on Waste Transporters Workers at PT. USB city of Jambi*. Yogyakarta: Graduate Thesis Program at Gadjah Mada University.