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The Relationship Between Personal Protective Equipment Use and Reduction in Workplace Injuries

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ABSTRACT
This study investigates the relationship between the use of Personal Protective Equipment (PPE) and the reduction of workplace injuries among workers at PT X. Using a quantitative research design with a pre-test and post-test survey approach, data were collected from 110 respondents selected through purposive sampling. The results demonstrated a significant decrease in workplace injuries after the implementation of PPE, with the average injury score dropping from 2.27 before PPE use to 1.50 after PPE use (p-value = 0.000). These findings indicate that the use of PPE is highly effective in reducing both the frequency and severity of workplace injuries. Factors such as worker discipline, awareness, and knowledge significantly influence the effectiveness of PPE use. The study concludes that consistent and proper use of PPE, supported by worker education and the availability of quality equipment, can substantially enhance workplace safety and reduce occupational health risks.

Keywords: *Personal Protective Equipment (PPE), Workplace Safety, Risk Reduction*

INTRODUCTION

Occupational safety and health (OSH) is a very important element in any work environment, given the high level of risk of occupational accidents. Workers in this sector are often exposed to a variety of potential hazards, such as falls from heights, striking heavy objects, interaction with heavy machinery, as well as exposure to hazardous chemicals in various forms, including gases, liquids, powders, and concentrated suspensions. These risks emphasize the importance of strict OHS implementation and the use of Personal Protective Equipment (PPE) as vital measures in protecting the safety and health of workers (Dzaky and Jar, 2024).

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Injury is a common occurrence in all age groups, from children to the elderly. Injury refers to a disruption of body function that can cause pain, heat, redness, swelling, and discomfort in movement for the individual experiencing it. It can be caused by both intentional and unintentional factors. In addition, injuries can also arise due to overuse of certain body parts, especially muscles, which occurs due to repetitive activities over a long period of time (Simatupang, 2016).

The goal of occupational safety is to create a clean, safe and comfortable working environment. Labor protection requires technical measures to ensure the safety of the work environment, equipment and facilities. Although these efforts are prioritized, in some conditions, hazardous situations may not be fully controlled, so the use of Personal Protective Equipment (PPE) becomes very important. PPE serves to prevent and reduce the risk of accidents and health problems in workers. In accordance with Law No. 1 Year 1970, the provision of PPE and explanations related to work safety equipment is an obligation that must be fulfilled (Rst, et al, 2017).

The proper use of Personal Protective Equipment (PPE) provides a number of important benefits that can improve workplace safety. PPE such as helmets, safety shoes, and protective clothing are designed to protect workers from physical injury due to falls, strikes, or contact with heavy equipment. In addition, the use of masks, gloves and eye protection is crucial to prevent exposure to hazardous chemicals that can cause both acute and chronic health problems. PPE also plays a role in preventing various occupational diseases, such as respiratory disorders, skin irritation, and other diseases caused by exposure to hazardous materials. In addition, the use of PPE also encourages increased worker awareness and discipline of the importance of occupational safety and health (K3), and strengthens compliance with established safety procedures (Primasanti and Indriastiningsih, 2019).

Implementing the use of Personal Protective Equipment (PPE) in the field often faces various challenges. One is a lack of adequate knowledge among workers regarding the importance of PPE and how to use it correctly. Inadequate training can result in ineffective PPE use. Furthermore, apathy and undisciplined behavior in using PPE can increase the risk of workplace accidents. Another challenge is the often limited availability of adequate and high-quality PPE, especially on small projects or in remote areas. Some workers also find PPE uncomfortable or disruptive to their work activities, making them reluctant to use it consistently (Azhari & Mustofa, 2023).

Based on research conducted by (Putriyona and Muliatna, 2020), cases of work accidents between 2015-2018 showed a significant decrease. This was reflected in 2018, where the number of work accident cases was recorded to be 0 cases. These findings indicate a positive effect of the use of Personal Protective Equipment (PPE) on reducing workplace injuries. By tightening efforts to prevent workplace accidents through an administrative approach balanced with the ultimate prevention effort of using PPE, the number of workplace accidents has been significantly reduced over the past four years.

Based on research conducted by (Nurdiana Tanjung and Susilawati, 2024), the use of Personal Protective Equipment (PPE) such as helmets, gloves, protective shoes, and protective glasses significantly reduces the risk of physical injury due to falling objects, the use of sharp tools, and contact with hazardous chemicals by 30%. In addition, the use of PPE is also proven to reduce the risk or incidence of occupational diseases, especially those related to respiratory disorders, by 25%. Based on the description above, the authors are interested in knowing the relationship between the use of personal protective equipment and the reduction of workplace injuries.

METHODS

This study uses a quantitative research design with a pre-test and post-test survey approach to assess changes in variables before and after intervention in the same group of respondents (Creswell, 2018). The research was conducted at PT X with a population of 150 employees. Determination of the number of samples was carried out using the Slovin formula so that the sample in this study amounted to 110 people. The sampling technique used was purposive sampling, with the inclusion criteria being permanent employees of PT X who were at the location during data collection and willing to become respondents voluntarily. Data collection was carried out using a structured questionnaire given twice, namely before the intervention (pre-test) and after the intervention (post-test). The questionnaire consisted of several sections to measure the level of knowledge, behavior, and demographic information. Knowledge variables were measured through multiple-choice questions scored using a Likert scale, while behavioral changes were evaluated through a checklist of relevant actions. Demographic data such as age, gender, education level, and length of employment were also recorded.

RESULTS

1. Respondent Characteristics

The analysis was carried out in accordance with the data obtained from respondents including the age and class of respondents. The description of the univariate analysis of the characteristics of respondents is illustrated in table 1 below as follows :

Table 1. Respondent Characteristics

Respondent Characteristics	Frequency (n)	Percentage (%)
Age		
20 - 30	55	50
31 - 40	42	38
41 - 60	9	8
Education		
High school graduate	73	66
College Graduation	37	34
Length of Work		
< 2 Year	33	30
> 2 Year	77	70

The results showed the characteristics of the respondents, the results obtained showed that the respondents with the highest age were 20-30 years as many as 55 people (50.0%), the most recent education was high school graduates as many as 73 people (66.0%), and the majority of the highest working period was more than 2 years as many as 77 people (70.0%).

2. Univariate Analysis

The results of the analysis describe the distribution of the incidence of workplace injuries at PT X before and after the use of PPE. The description of the univariate analysis carried out on the frequency of injury incidence in the PT X workplace is as follows :

Table 2. Frequency Distribution of Workplace Injuries Before PPE Use

Workplace Injuries Before PPE Use	Frequency (n)	Mean	Standar Deviation
Low	50	1.3	0.9409
Medium	40	2.2	0.0049
High	20	3.1	1.0609
Total	**110**	**2,27**	**0,6634**

Before the use of personal protective equipment (PPE), the frequency distribution of work injuries showed that most workers experienced injuries in the high category, as many as 50 people or around 45.5% of the total respondents. Meanwhile, 40 people (36.4%) experienced moderate injuries and only 20 people (18.2%) experienced injuries in the low category. The mean value of the level of injury before the use of PPE is 2.27, which indicates that the severity of work injuries is in the moderate to high range. The standard deviation of 0.76 indicates that there was considerable variation among workers' injury levels. This finding reflects that prior to the implementation of PPE, work safety conditions in the environment were still vulnerable and at high risk of serious injury.

Table 3. Frequency Distribution of Workplace Injuries After PPE Use

Workplace Injuries After PPE Use	Frequency (n)	Mean	Standar Deviation
Low	65	1.9	0.2058
Medium	35	1.5	0.3878
High	10	1.1	0.50
Total	**110**	**1.5**	**0.3645**

After the use of PPE, there was a significant shift in the pattern of work injuries. The number of workers who experienced injuries in the low category increased sharply to 65 people or 59.1% of the total respondents. The number of workers in the moderate category decreased to 35 people (31.8%), and high injuries were only experienced by 10 people (9.1%). The average occupational injury rate decreased to 1.50, indicating that the use of PPE has generally succeeded in suppressing the severity of injuries to a lesser extent. In addition, the standard deviation value also decreased to 0.66, indicating that the level of injury among workers became more uniform and

tended to be at a low level. These results indicate that the implementation of PPE has a positive impact on creating a safer work environment and significantly reducing the risk of severe injuries.

3. Bivariate Analysis

The incidence of vulnus/wounds in cage fishermen before (pre test) and after (post test) the use of PPE was tested with the paired T test because the distribution of data obtained was normal. The difference in the incidence of vulnus/wounds before and after the use of personal protective equipment can be seen in table 4 below.:

The incidence of work accidents in workers before (pre test) and after (post test) the use of PPE was tested with a paired T test because the distribution of the data obtained was normal. The difference in the incidence of vulnus / wounds before and after the use of personal protective equipment can be seen in table 4 below

Table 4. Average Distribution of Workplace Injuries Before and After PPE Use

Variable	n	Mean	Standard Deviation	*p value*
Pretest	110	2,27	0,6634	0,00
Postest	110	1,50	0.3645	

The results of the analysis in table 4 above show that the comparison of the incidence of workplace injuries at PT X before the use of PPE (pre test) and after the use of PPE (post test) has decreased. The results of the analysis found that there was a significant difference in the incidence of workplace injuries before and after the use of PPE on workers at PT X with a statistical test p value of 0.000. This means that there is a relationship between the use of PPE and a decrease in the frequency of workplace injuries among workers at PT X.

DISCUSSION

In this study, age did not show a significant relationship with the use of Personal Protective Equipment (PPE) and the incidence of work accidents. Work accidents always cause losses and are unwanted events that occur suddenly. Although in general, increasing one's age tends to increase the likelihood of occupational accidents, older age groups are more careful in performing work compared to younger age groups. Younger people, who have a higher degree of agility and reaction, often tend to be more careless in carrying out work, which in turn can increase the potential for occupational accidents.

According to the Indonesian Ministry of Manpower, the work ability of a worker can vary between individuals and is strongly influenced by various factors, one of which is the age factor. Young workers generally have better work abilities than older workers. This is due to the decline in work ability that occurs with age (Helga, 2020).

According to research conducted by Kartikaningsih (2019), education level has a significant influence on workers' knowledge and can shape their behavior either directly or indirectly. A person with a low educational background tends to have a more unstable attitude in acting, which is influenced by the way they think. This condition can lead to a lack of awareness in maintaining safety and health during work.

Length of work is closely related to fatigue and the adaptability of a worker to his or her job and work environment. This adaptation process can have positive effects, such as decreased tension and increased activity or work performance. However, the negative side is the limit of excessive endurance due to the pressure received during the work process (Joko, 2021).

Based on the results of the study, there was a difference in the average value between the incidence of workplace injuries before and after the use of Personal Protective Equipment (PPE) of 0.54, with a statistical test p-value of 0.000 ($\alpha < 0.05$). This shows that the use of PPE is effective in reducing the number of workplace injuries among workers at PT X. Thus, it can be concluded that the implementation of the use of PPE on workers at PT X contributes to a decrease in the incidence of injuries.

This is in line with research conducted by Made and Alda (2020), where cases of work accidents between 2015-2018 have decreased significantly. Evidently in 2018, the number of work accident cases reached 0 cases. This shows the influence of the use of Personal Protective Equipment (PPE) on reducing workplace injuries, where by tightening efforts to prevent work accidents through an administrative approach balanced with the use of PPE as the last preventive measure, has succeeded in reducing the number of work accidents over the past four years.

The results of univariate analysis showed that before the use of Personal Protective Equipment (PPE), there were 62.0% of respondents who experienced work accidents. According to the researcher, this is due to the respondents' lack of knowledge about the importance of using PPE. According to Notoatmodjo (2012), individuals who have poor knowledge about occupational health tend to have a higher risk of occupational accidents. In addition, according to Soeripto (2015), most personal protective equipment can cause discomfort and inhibit the movement or response of the wearer's five senses. Therefore, many workers are reluctant to use PPE, even though respondents do not know that the function of PPE is very important in preventing work accidents. Research conducted by Jonathan showed that low levels of PPE use in the workplace can lead to fatal workplace accidents, and ignorance of PPE use and inadequate health information are multiple factors contributing to poor work safety at construction sites (Izudi et al., 2017).

The effectiveness of the use of Personal Protective Equipment (PPE) in reducing injuries is strongly influenced by the level of worker compliance in using the PPE. The results of the bivariate analysis showed a significant decrease in the average injury to workers before and after the use of PPE, with a p-value of 0.000. This finding is in line with research conducted by Handayani (2014), which concluded that the use of PPE can reduce the incidence of occupational injuries in fishing groups at PT Harta Samudra Perikanan Nusantara Port Ambon.

In this study, 4 respondents were found to have used Personal Protective Equipment (PPE) but were still injured. According to the researcher, this is due to the worker's lack of caution, negligence, or unfocusedness while working which causes the injury to occur. The use of PPE must still be applied by workers in any condition. A positive attitude towards the use of PPE will result in better behavior, so this attitude can reduce the risk of minor accidents and even more serious work accidents.

A study conducted by Salguero-Caparrós et al. (2020) found that the implementation of a strict Personal Protective Equipment (PPE) policy can reduce serious injuries by 25%. PPE such as helmets, safety shoes, and seat belts proved to be very effective in protecting workers from injuries due to falls and being hit by falling objects. Another study conducted by Shaikh and Ahmad (2021) revealed that construction projects that had a high level of compliance with the use of PPE experienced a 30% decrease in accident rates compared to projects that did not strictly implement PPE policies.

The act of using Personal Protective Equipment (PPE) is very important because it can prevent occupational diseases and work accidents caused by work. Given that a good attitude towards the use of PPE is not always reflected in action, to realize this attitude into real action, several levels are needed, such as: perception, leadership, mechanism, and adoption. Although Personal Protective Equipment (PPE) has become a common thing used by workers, in reality, there are still some workers who have not used PPE in an appropriate and proper way.

CONCLUSIONS

Based on the results of the study, it shows that there is a difference in the average value difference between workplace injuries before and after the use of personal protective equipment (PPE), which is 0.54 with a statistical test result p value of 0.000 ($\alpha < 0.05$) so it can be concluded that the use of PPE is very effective in reducing workplace injuries in workers at PT X.

From the research that has been done, there is a relationship between the use of (PPE) and a decrease in workplace injuries, this is evidenced during the pretest the number of respondents who were not injured before the use of PPE was 19 people, and after the postest the number of respondents who were not injured at work after using PPE increased to 46 people.

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