

Analysis Of Risk Factors for Occupational Accidents in Loading and Unloading Workers at Ahmad Yani Port, Ternate City

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Running title: Risk Factors for Occupational Accidents in Loading and Unloading Workers

KEYWORDS

risk factors,
occupational
accidents, loading
and unloading
workers, port

ABSTRACT:

Background: Workers at container ports face high risks, such as collisions, injuries from heavy equipment, falling materials, slippery surfaces, and structural problems with containers. Other risks include manual injuries, exposure to hazardous substances, cramped spaces, fire, bad weather, noise, fatigue, and security threats. This combination of hazards emphasizes the importance of safety protocols and training to protect workers.

Objective: This study aims to analyze the risk factors that contribute to the incidence of occupational accidents in loading and unloading workers at Ahmad Yani Port, Ternate City

Methods: This study is a case-control study, this study is distinguished based on two groups, namely the case group and the control group. The sample of this study amounted to 67 samples with a ratio of 1: 1, and the total sample consisted of 67 case groups and 67 control groups, bringing the total sample to 134. With the criteria of having experienced a work accident in the period August 2023 - August 2024. Data were collected through questionnaires and interview guidelines. Data were analyzed using univariate, bivariate, multivariate analysis.

Results: Age, behavior, attitude, and use of PPE are significant risk factors for work accidents based on the odds ratio (OR) test with respective values of OR = 0.170 (p = 0.000), OR = 30.635 (p = 0.000), OR = 14.116 (p = 0.000), and OR = 23.333 (p = 0.000). Multivariate analysis showed that the variables of age (p = 0.001), attitude (p = 0.000), behavior (p = 0.000), and PPE use (p = 0.007) remained significant, while knowledge was not significant (p = 0.231).

Conclusion: Age, tenure, knowledge, behavior, attitude and use of PPE have a significant relationship with the incidence of accidents, while tenure does not have a significant relationship with the incidence of work accidents. Through the Multivariate test, only age, behavior, attitude and use of PPE have a significant value so that it is said to be very influential on work accidents at Ahmad Yani Port, Ternate City.

Introduction

Work accidents are events that occur unplanned, uncontrolled, and unwanted while working, caused either directly or indirectly by unsafe actions or conditions, causing the cessation of work activities.(1) . Work accidents are a serious problem for companies because of the impact of the losses they cause. The impact of work accidents includes material damage, loss of working hours, and especially loss of life. The losses caused by fatalities are very large because of the large number of casualties. The direct impact of work accidents includes medical expenses and compensation, while the indirect impact includes damage to production equipment and the impact of poor safety management.(2)

Risk factors for work accidents during loading and unloading activities can vary, starting from human factors, and equipment factors. The impact caused by human factors is the lack of use of safety equipment for loading and unloading workers during the loading and unloading process at the port, which has the potential to cause the risk of work accidents that can result in death. The lack of use of safety equipment for workers during the loading and unloading process at the port can affect worker safety by increasing the risk of work accidents and can also reduce the productivity and efficiency of the port loading and unloading process due to the lack of injured workers.(3)

The risk of work accidents is influenced by several factors as in the results of the study that age has a significant influence on work accidents. The adult age group (26-45 years) experienced the most minor accidents, which accounted for 47% of the total cases. The adolescent age group (18-25 years) and the elderly age group (44-60 years) also experienced minor accidents, 42.9% and 44.0 respectively.(4) Workers with negative attitudes are more at risk of occupational accidents compared to respondents with positive attitudes who are not at risk of occupational accidents.(5) The equipment factor has a significant relationship with work accidents.(6)

These potential hazards are classified by source into 6 work processes: crane placement, loading and unloading equipment preparation, sling and hook attachment to the crane, workers entering the barge, transport truck direction, and loading and unloading process. From the six work processes, 2 main sources of hazards were identified, namely crane placement, and loading and unloading process. (7)

Occupational safety efforts aim to ensure the safety of workers by preventing accidents and occupational diseases and controlling hazards in the workplace. The main objectives of work safety are to protect the safety of the workforce while performing their duties, to protect everyone in the workplace, and to keep equipment and production resources safe so that they can be utilized efficiently. Relevant laws and regulations include Law No. 13 of 2003 on Manpower and the 1945 Constitution of the Republic of Indonesia.(8)

According to the ILO, every year there are more than 250 million accidents at work and more than 160 million workers become ill due to workplace hazards. Moreover, 1.2 million workers die from accidents and illnesses at work.(9) . Factors that have a relationship with the occurrence of work-related accidents include the level of knowledge that produces a Pvalue of 0.001 (<0.05), unsafe actions produce a p-value of 0.000 (<0.05), the use of PPE produces a p-value of 0.002 (<0.05) and the work environment produces a p- value of 0.004 (<0.05), while . 0.05), while factors that are not related or not related to the occurrence of work-related accidents include the age factor which has a p-value of 1.000 (>0.05), the level of education produces a p-value of 0.888 (>0.05) and the length of service produces a p-value of 0.163 (>0.05).(10)

Data obtained from One Data of the Indonesian Ministry of Manpower In 2023, the number of cases of work accidents in Indonesia was recorded at 370,747 cases. About 93.83% were cases of wage earner participants, 5.37% were cases of non-wage earner participants, and 0.80% were cases of construction service participants. In the period January to May 2024, the number of cases of work accidents in Indonesia was recorded at 162,327 cases with details of 91.83% including wage recipient participants, 7.26% of non- wage recipient participants and 0.91% of cases of construction service participants, in North Maluku alone the number of cases of work accidents in the period January to May was recorded as many as 246 cases with details of wage recipients of 222 cases with a percentage of 90.24%, wage recipient participants, non-wage recipients of 21 cases 8.54%, cases of construction service participants 3 cases with a percentage of 1.22%.(11)

According to data obtained from the Office of Manpower and Transmigration (Disnakertrans) of North Maluku Province in 2022, there were 148 cases of work accidents in companies, with 7 of them resulting in deaths due to traffic accidents. Of the total 7 death cases, 6 occurred in Central Halmahera Regency (Halteng). Overall, there were 155 work accidents in the industrial sector in North Maluku Province during 2022, with the highest number occurring in Central Halmahera Regency with 131 cases. The remaining 24 accidents occurred in four other regions in North Maluku, namely 14 cases in South Halmahera Regency (Halsel), 6 cases in Ternate City, 3 cases in North Halmahera (Halut), and 1 case in Taliabu Island.(12)

Several factors play a role in increasing the risk of occupational accidents among port workers. These factors include age, length of working hours, and workload.(13) , the importance of using safety equipment and proper lifting techniques(14) . The use of cranes in the cargo handling process is high risk, with potential hazards such as falling objects and equipment failure.(15) Occupational safety and health is a very important aspect in the industry. By ensuring protection for workers, it not only improves

their well-being but also the overall quality of the company. Labor protection is a responsibility that every company must fulfill towards their employees, so that the employees can work safely, comfortably, and help the company achieve their production targets.(16)

Based on the above, this study focuses on analyzing the risk factors that contribute to work accidents in stevedoring workers at Ahmad Yani Port in Ternate City. By knowing these factors in depth, it is hoped that an effective solution can be found to reduce the number of work accidents and improve the safety of loading and unloading workers at the port. Therefore, research on what risk factors affect work accidents in loading and unloading workers is very relevant to be carried out, with the hope that solutions can be found to overcome the challenges faced by workers in carrying out their work.

Participation & Methods

This study is a *case control* study, this study is distinguished based on two groups, namely the case group and the control group. The sample of this study amounted to 67 samples with a ratio of 1: 1, and the total sample consisted of 67 case groups and 67 control groups, bringing the total sample to 134. With the criteria of having experienced a work accident in the period August 2023 - August 2024. Data were collected through questionnaires and interview guidelines. Data were analyzed using univariate, bivariate, multivariate analysis.

Findings

This study involved 134 respondents from Ahmad Yani Port, consisting of 67 respondents who experienced work accidents (case group) and 67 who did not (control group). Respondents had various levels of education: 24 people had elementary school education, 57 junior high school, and 53 senior high school. During the period August 2023-August 2024, work accidents were recorded in 50% of the respondents. Of the 67 workers at Ahmad Yani Port who experienced workplace accidents, most experienced slips (14 people) and cuts (22 people), while the rest experienced broken legs, sprains, falls, or strikes. The majority of accidents occurred to the hands (36 people), with some also involving hands and feet.

Table 1. Frequency Distribution based on Age, Tenure, Knowledge, Attitude,

Behavior and PPE Use				
Factor	Case		Control	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age				
25-34 years old	35	26.1	58	43.3
35-64 years	32	23.9	9	6.7
Length of Service				
< 3 Years	9	6.7	7	5.2
> 3 Years	58	43.3	60	44.8
Knowledge				
Low	49	36.6	11	8.2
High	18	13.4	56	41.8
Attitude				
Bad	46	34.3	9	6.7
Good	21	15.7	58	43.3
Behavior				
Bad	54	40.3	8	6.0
Good	13	9.7	59	44.0

Use of PPE				
Not Using	49	36.6	7	5.2
Using	18	13.4	60	44.8

The distribution of respondents showed that in the age factor, the case group was dominant at the age of 35-64 years (32 people), while the control group was at the age of 25-34 years (58 people). For tenure, the majority of respondents had a tenure of ≥ 3 years (58 cases, 60 controls). In the knowledge factor, most of the case group had low knowledge (49 people), while the control group was dominant with high knowledge (58 people). For attitude, 46 people in the case group had poor attitude, while the control group was dominated by respondents with good attitude (58 people).

- **Bivariate Analysis**
- **Age Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, City**

Table 2: Age Factors with Risk of Occupational Accidents

Age	WorkAccidents				OR	CI (95%)	p-value
	Case		Control				
	n	%	n	%			
25-34years old	35	52.2	58	86.6	0.170	0.073-0.397	0.000*
35-64years	32	47.8	9	13.4			

Table 2 shows that 35 respondents (52.2%) in the case group and 58 respondents (86.6%) in the control group were aged 25-34 years. The odds ratio (OR) test = 0.170, (95% CI = 0.073-0.397), with p-value = (0.000), showed a statistically significant association. The OR value < 1 indicates that age 35-64 years is a protective factor against occupational accidents compared to age 25-34 years. Thus, age acts as a protective factor in the risk of occupational accidents in loading and unloading workers at Ahmad Yani Port, Ternate City.

- **Work Period Factors Affecting the Risk of Occupational Accidents in Loading and Unloading Workers at Ahmad Yani Port, Ternate City**

Table 3. Factors of Length of Service with Occupational Accidents

Length of Service	Work Accidents				OR	CI (95%)	p-value
	Case		Control				
	n	%	n	%			
<3years	9	13.4	7	10.4	1.330	0.465-3.807	0.594*
≥3years	58	86.6	60	89.6			

Table 3 shows that most of the workers with a working period of ≥ 3 years, 60 people in the control group did not experience work accidents, while most of the workers with a working period of < 3 years, 9 people, in the case group experienced work accidents. However, the results were not statistically significant where the OR value = 1.330 (95% CI = 0.465-3.807), p-value = 0.594 (>0.05). Therefore, the length of service does not have a significant effect on the risk of occupational accidents in loading and unloading workers at Ahmad Yani Port, Ternate City.

• **Knowledge Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, City**

Table 4. Knowledge Factors with Risk of Occupational Accidents

Knowledge	WorkAccidents				OR	CI(95%)	p-value
	Case		Control				
	n	%	n	%			
Low	49	73.1	11	16.4	13.859	5.969-32.179	0.000*
High	18	26.9	56	83.6			

Table 3 shows that the majority of respondents in the case group, 49 people (73.1%), had low knowledge. While in the control group, 56 people (83.6%) had high knowledge. The results of the OR test analysis = 13.859, (95% CI = 5.969 - 32.179). The p-value = 0.000, which is smaller than the significance level of 0.05. Since the lower and upper limits of the 95% confidence interval are above 1, the OR value indicates that low knowledge is a risk factor for occupational accidents.

• **Behavioral Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, City**

Table 5. Behavioral Factors with Risk of Occupational Accidents

Attitude	Work Accidents				OR	CI (95%)	p-value
	Case		Control				
	n	%	n	%			
Bad	46	68.7	9	13.4	14.116	5.905-33.745	0.000*
Good	21	31.3	58	86.6			

Based on the results of the analysis in Table 5, 54 people (80.6%) had poor behavior in the case group, while 59 people (88.1%) had good behavior in the control group. The results of the analysis of the OR value = 30.635, (95% CI = 11.789 - 79.605), p-value = 0.000, which is smaller than the significance level of 0.05. It can be concluded that there is a significant relationship between behavior and the incidence of work accidents. The OR value of more than 1 indicates that poor behavior is a risk factor for work accidents.

• **Attitude Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, Ternate City**

Table 6. Attitude Factors with Occupational Accident Risk

Use of PPE	Work Accidents				OR	CI (95%)	p-value
	Case		Control				
	n	%	n	%			
Not Using	49	73.1	7	10.4	23.333	9.014-60.400	0.000
Using	18	26.9	60	89.6			

Presented in Table 6 shows that in the case group, 46 people (68.7%) had a bad attitude, while in the control group, 58 people (86.6%) had a good attitude. The results of the analysis using the OR value test = 14.116, (95% CI = 5.905 - 33.745), p-value = 0.000, which is smaller than the significance level of 0.05, The OR value of more than 1 indicates that poor attitude is a risk factor for work accidents.

- **Factors influencing the use of personal protective equipment (PPE) on the risk of work accidents among loading and unloading workers at Ahmad Yani Port, Ternate City**

Table 7. Factors of PPE Use with Risk of Work Accidents

Use of PPE	Work Accidents				OR	CI (95%)	p-value
	Case		Control				
	n	%	n	%			
Not Using	49	73.1	7	10.4	23.333	9.014-60.400	0.000
Using	18	26.9	60	89.6			

Table 7 presents in the case group, 49 people (73.1%) did not use PPE, while in the control group, 60 people (89.6%) used PPE. The results of the analysis of the OR value = 23.333, (95% CI = 9.014 - 60.400), p-value = 0.000, which is smaller than the significance level of 0.05. The OR value of more than 1 indicates that not using PPE is a risk factor for work accidents.

- **Multivariate Analysis**

Table 8. SPSS Output of Multiple Logistic Regression Test

Variable		Log Likelihood Model	Change in -2 Log Likelihood	df	Sig. of the Change
Step 1	Age	-27.729	11.886	1	.001
	Knowledge	-22.503	1.432	1	.231
	Attitude	-32.341	21.108	1	.000
	Behavior	-39.551	35.530	1	.000
	PPE	-25.487	7.400	1	.007
Step 2	Age	-27.948	10.892	1	.001
	Attitude	-34.879	24.753	1	.000
	Behavior	-46.562	48.119	1	.000
	PPE	-28.293	11.581	1	.001

At the initial stage, the variable test results showed that age ($p = 0.001$), attitude ($p = 0.000$), behavior ($p = 0.000$), and PPE ($p = 0.007$) had a significant influence on work accidents, while knowledge ($p = 0.231$) was not significant. In the second stage, significant variables from the first stage were re-entered into the model, and the results remained significant, namely age ($p = 0.001$), attitude ($p = 0.000$), behavior ($p = 0.000$), and PPE ($p = 0.001$). The change in

-2 log likelihood showed that behavior exerted the greatest influence (48.119), followed by attitude (24.753), PPE (11.581), and age (10.892). This finding confirms that age, attitude, behavior, and the use of PPE have a significant influence on the risk of work accidents among stevedores at Ahmad Yani Port in Ternate City.

- **Discussion**

- **Age Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, Ternate City**

The majority of workers who experienced work accidents were aged 25-34 years, while workers aged 35-64 years were less likely to experience accidents. The odds ratio (OR) test yielded an OR = 5.892 (95% CI = 2,518- 13,788) with a p-value = 0.000, which is less than 0.05. Therefore, age is a risk factor for occupational accidents among loading and unloading workers at Ahmad Yani Port, Ternate City.

These results are in line with research at PT Abadi Prima Inti Karya The Canary Apartment Project, that respondents who experienced work accidents were more in the age group <36 years as many as 23 (63.9%), compared to the age group ≥ 36 years as many as 10 (29.4%). The statistical results of the Chi Square test show that there is a relationship between age and the incidence of work accidents. Where the P value is 0.008 which means the P value > 0.05 indicates that H_0 is rejected. OR value = 4.246 (95% CI = 1.157-11.581), meaning that respondents aged <36 years have a greater chance of experiencing work accidents compared to respondents aged ≥ 36 years. This indicates that young workers have a greater risk of having an accident than older workers.(17)

Younger age groups tend to have more accidents due to inexperience and risk-taking tendencies, while older workers are more at risk due to declining physical capabilities. Therefore, it is important for companies to conduct comprehensive interventions, such as safety training tailored to the age group, adequate use of personal protective equipment, and supervision of work behavior.

- **Work Period Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, Ternate City**

Workers with a working period of ≥ 3 years, in the control group, did not experience work accidents. In contrast, in the case group, workers with < 3 years of service experienced work accidents, with a total of 9 respondents.

This suggests that workers with a shorter working period are more often exposed to the risk of accidents, although it is not statistically significant. The results of the analysis of the odds ratio value OR = 1.330, (95% CI = 0.465-3.807. The p-value = 0.594, which is greater than the significance level of 0.05. These results indicate that the length of service does not have a significant influence on the risk of work accidents in loading and unloading workers at Ahmad Yani Port, Ternate City.

The results of this finding are in line with other studies where the results of the analysis using the Chi Square test results obtained a value of $p=0.614$ ($p>0.05$), this means that H_0 is accepted and H_a is rejected, it can be concluded that there is no relationship between length of service and the incidence of work accidents in production workers of PT Semen Bosowa Maros. (18)

In other words, while tenure is often considered one of the risk factors for occupational accidents, the results of this study show that its influence is not always statistically significant. A combination of factors, such as safety training, supervision, work experience and workplace conditions, need to be considered to create a safe working environment. Therefore, companies need to customize safety management strategies based on the specific needs and characteristics of their workers.

- **Knowledge Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, Ternate City**

The majority of respondents in the case group, 49 people (73.1%), had low knowledge. While in the control group, 56 people (83.6%) had high knowledge. The results of the OR test analysis = 13.859, (95% CI = 5.969 - 32.179). The p-value = 0.000, which is smaller than the significance level of 0.05. The OR value of more than 1 indicates that low knowledge is a risk factor for work accidents.

These results are in line with research on the Relationship between Knowledge, Application of Sop and Installation of Safety Sign with the Incidence of Work Accidents at Mahata Margonda Apartment Project where there is a significant correlation of knowledge with work accidents. From the study results obtained Chi Square p value $0.001 < 0.05$ or the results of a more in-depth analysis obtained a score (OR) = 0.118, meaning that low knowledge has a 0.118 times higher chance of having a work accident than workers with good knowledge. (19). Similarly, the results of an OSH study on work accidents in 31 rice milling centers in Kaway XVI District, West Aceh Regency showed that OSH knowledge has a significant relationship with the incidence of work accidents (P-value = 0.001; OR = 1.70). (20)

The results of this study indicate that there is a significant relationship between the level of knowledge and the incidence of work accidents at Ahmad Yani Port, Ternate City. Workers with low knowledge are more prone to accidents, while those with high knowledge can also face risks if other factors are not considered. Therefore, it is important for management to implement safety training programs on an ongoing basis for all workers to reduce the incidence of occupational accidents and improve overall safety in the workplace.

- **Behavioral Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, Ternate City**

In the case group, 54 people (80.6%) had poor behavior, while in the control group, 59 people (88.1%) had good behavior. The test analysis results of the odds ratio (OR) value = 30.635, (95% CI = 11.789 - 79.605). The p-value = 0.000, which is smaller than the significance level of 0.05. The lower limit and upper limit of the 95% confidence interval are above 1, it can be concluded that there is a significant relationship between behavior and the incidence of work accidents in loading and unloading workers at Ahmad Yani Port, Ternate City.

These results are in line with research on the relationship between work behavior and the risk of work accidents in employees of PT Bapengkar Pasar Induk Kramat Jati, East Jakarta, showing that there is no significant relationship between the two (p-value = 0.008). The odds ratio (OR) value of 0.280 indicates that respondents with good behavior have 0.280 times less chance of being at risk of work accidents. With a 95% confidence interval (95% CI) that has a lower limit of 0.115 and an upper limit of 0.679, this result strengthens the notion that work behavior contributes as a contributing factor to the risk of work accidents. (21)

This research highlights the importance of building a safety culture in the workplace. By encouraging good behavior through training, supervision, and rewards for workers who comply with safety procedures, companies can significantly reduce the risk of workplace accidents. Overall, the results of this study indicate a significant relationship between worker behavior and the incidence of workplace accidents at Ahmad Yani Port in Ternate City.

- **Attitude Factors Affecting the Risk of Occupational Accidents Among Loading and Unloading Workers at Ahmad Yani Port, City**

Based on the results of the analysis showed that in the case group, 46 people (68.7%) had a bad attitude, while in the control group, 58 people (86.6%) had a good attitude. The results of the analysis using the odds ratio (OR) test = 14.116 (95% CI = 5.905 - 33.745). The p-value = 0.000, which is smaller than the significance level of 0.05. Because the lower limit and upper limit of the 95% confidence interval are above 1. Thus, it can be concluded that the attitude factor affects the risk of occupational accidents in loading and unloading labor workers at Ahmad Yani Port, Ternate City.

This result is in line with the findings of other studies showing that worker attitude is a variable that significantly affects the incidence of work accidents in the production section of PT Indonesian Ship Industry (Persero). With a significance value of 0.002 (below 0.05), it can be concluded that the relationship between attitude and work accidents is statistically significant. The odds ratio (OR) of 4.46 indicates that workers with a bad attitude have a 4.46 times greater chance of having a work accident compared to workers who have a good attitude. (22)

These results underscore the importance of efforts to build positive attitudes towards safety among workers. This can be achieved through educational approaches, safety training that emphasizes the importance of safety, and psychological approaches that encourage workers' sense of responsibility for safety in the workplace. Companies also need to create a work environment that supports positive attitude change, such as leaders who set a good example and incentives for workers with a proactive attitude towards safety.

• **Factors affecting the use of PPE in the risk of work accidents among loading and unloading workers at Ahmad Yani Port, Ternate City.**

The analysis showed that in the case group, 49 people (73.1%) did not use PPE, while in the control group, 60 people (89.6%) used PPE. The results of the analysis using the odds ratio (OR) test = 23.333, (95% CI = 9.014 - 60.400). The p-value = 0.000, which is smaller than the significance level of 0.05. The lower limit and upper limit of the 95% confidence interval are above 1, the OR value of more than 1 indicates that not using PPE is a risk factor for work accidents in loading and unloading workers at Ahmad Yani Port, Ternate City.

Similarly, in the study of Factors Associated with the Incidence of Work Accidents in Panglong Workers in Menes District, Pandeglang Regency. The results of statistical tests with using the Chi Square test at $\alpha = 0.05$, obtained pvalue = 0.032. Where the p value is smaller than the alpha value ($0.032 < 0.05$), it can be interpreted that the use of personal protective equipment (PPE) has a significant relationship with the incidence of work accidents in Panglong workers in Menes District in 2023. With an OR value = 8.4 (95% CI = 0.927-76.151) which means that respondents who use personal protective equipment are less well at risk of

8.4 times greater experiencing occupational accidents than workers who use good personal protective equipment. (23)

These findings underscore the importance of better implementation of work safety programs, including training and supervision of PPE use, to reduce the risk of accidents. Workers who do not use PPE have a higher risk of accidents. Therefore, management needs to implement policies that support the consistent use of PPE, as well as provide the necessary training and resources to maintain workplace safety.

Acknowledgments: Thanks to the colleagues and parties involved in this research process, not forgetting the institution that has received the research location.

Author Contributions: Yuswan R. Ichsan, Yahya Thamrin, Lalu Muhammad Saleh, Atjo Wahyu, Stang: Research concept and design. Yuswan R. Ichsan: Collection and processing of research data. All authors: preparation of manuscript for publication.

Conflict of Interest: There is no conflict of interest in this study.

Funding: All research and publication funding is done independently without funding assistance from other parties.

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