

Analysis Of Risk Faktors For Work Occupational Accidents In Fishermen On Lae-Lae Island

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ABSTRACT

Background: Indonesia's expanding fishing sector poses serious occupational dangers because of dangerous working conditions, erratic weather patterns, and insufficient safety procedures, all of which have an adverse effect on the productivity and health of fishermen.

Research Objectives: The purpose of this study is to examine the risk factors that influence the frequency of work-related accidents among Lae-Lae Island fishermen.

Methods: There were 68 controls and 34 cases (work-related accidents) among the 102 fisherman who participated in this case-control research. Questionnaires and in-depth interviews were used to gather data, which looked at factors such age, duration of service, working hours, weariness, PPE use, and slippery floor conditions. The chi-square test and logistic regression were used for the analysis.

Results: Bivariate analysis revealed that work accidents were significantly correlated with age (OR=3.125; p=0.028), duration of service (OR=2.731; p=0.048), weariness (OR=12.436; p=0.000), usage of personal protective equipment (OR=11.200; p=0.000), and slippery floor conditions (OR=5.018; p=0.000). However, there was no significant correlation between accidents and length of service (p=0.119). The most significant factors, according to multivariate analysis, were weariness (p=0.000) and not wearing personal protective equipment (p=0.000).

Conclusion: The two biggest risk factors for mishaps among fisherman on Lae-Lae Island are occupational exhaustion and failure to wear personal protective equipment. Accident hazards are also increased by young age and slick flooring. Reducing accidents in the fishing industry requires rules that encourage the use of personal protective equipment (PPE), OHS training, and increased awareness.

Keywords: Occupational accidents, risk factors, fishermen, Personal Protective Equipment (PPE), work fatigue

1. INTRODUCTION

The majority of Indonesia's land is submerged in water, making it a maritime nation. Thus, the fishing industry is one of the current advancements. With the advancement of various sectors, Indonesia has also undergone significant technological and industrial development. However, this progress has both positive and negative effects, particularly for its employees (1). Because of this circumstance, some people in Indonesia are compelled to work as fishermen (2). According to the Republic of Indonesia's Ministry of Maritime Affairs and Fisheries, there are approximately 2.7 million fishermen in Indonesia, according to data from the Republic of Indonesia's Ministry of Maritime Affairs and Fisheries. Because people don't want to work in the maritime industry, this number keeps falling. Paradoxically, the majority of fishermen have financial constraints and fall below the poverty line (3).

A work accident is any circumstance or incident that occurs at work that is neither wanted nor anticipated. Because fishing contains 3D job qualities like being hazardous, filthy, and challenging, working as a fisherman can also increase the chance of occupational accidents (4). The primary cause of workplace accidents is a lack of understanding among communities and industries regarding the significance of implementing OHS (5).

Workplace accidents and occupational diseases (PAK) are on the rise, according to Indonesia's National OSH Profile for 2022. 6,552 worker or laborer deaths and 234,370 cases were reported in 2021, a 5.7% increase over 2020 (6). Indonesian records show that between 2002 and 2018, 26 fisherman were involved in accidents. Consequently, 564 persons were reported missing and 248 fisherman were killed. In 2019, 25 incidents involving fishermen were looked into by the National Transportation Safety Committee (KNKT) (7).

Fishermen's income is determined by the quantity of fish they catch as well as the market price, making it a career with unpredictable earnings and a high degree of occupational risk. Naturally, we also know that market prices for fish frequently fluctuate in response to both public demand and economic situations. (8) Small-boat fisherman typically sail for two to three weeks throughout their operations, while large-boat fishermen typically sail for two to three months. They run the danger of suffering an occupational accident at sea throughout this extended sailing time. (9)

Participants & Methods

The two groups in this study—the case group and the control group—are what distinguish it as a case control study. The study's sample consisted of 34 cases and 68 controls, following a 1:2 ratio. with the requirement of having been involved in a work-related accident between November 2023 and November 2024. Interviews and questionnaires were used to gather data. Univariate, bivariate, and multivariate analyses were used to examine the data.

2. RESULTS

There were 102 participants in this study from Lae-lae Island, 34 of whom were in the case group (work accidents) and 68 of whom were not (control group). The majority of the 34 fisherman on Lae-lae Island who had work-related incidents were hurt (10 individuals) and struck by marine life (8 people); the remaining fishermen suffered sprains, slips, and falls into the ocean. Ten people had hand injuries in the majority of the accidents, however several also included the feet and hands.

Table 1. Frequency distribution based on age, tenure, length of service, fatigue, PPE use and slippery floor.

Factor	Case		control	
	Frekuensi (n)	Presentase (%)	Frekuensi (n)	Presentase (%)
Age				
25-34 Year	10	9.8	8	7.8
35-64 Year	24	23.5	60	58.8
Years of service				
> 6 Year	24	23.5	59	57.8
≤ 6 Year	10	9.8	9	8.8
Lama Kerja				
>7 Hours/day	10	9.8	11	10.8
≤ 7 Hours/day	24	23.5	57	55.9
Length of service				
Tired	24	33.5	11	10.8
Not Tired	10	9.8	57	55.9
Use of PPE				
Did not use	28	27.5	20	19.6
Use according to standard	6	5.9	48	47.1
Slippery floor				
Slippery	24	23.5	22	21.6
Not slippery	10	9.8	46	45.1

Source: Primary Data 2024

According to the respondents' age distribution, the case group was predominately composed of 24 individuals aged 35–64, whereas the control group consisted of 8 individuals aged 25–34. The bulk of respondents (24 cases, 59 controls) had tenures longer than six years. The majority of the case group (24 individuals) worked ≤ 7 hours per day, whereas the control group (11 individuals) worked more than 7 hours per day. In terms of fatigue, 24 respondents in the case group reported feeling fatigued, whereas 57 respondents in the control group reported not feeling fatigued. In terms of PPE use, 48 members of the control group utilized it in accordance with the standard, but 28 members of the case group did not. A total of 24 members of the case group reported that the floor was slick, whereas 46 members of the control group claimed that it was not.

Bivariate Analysis

- **Relationship between Age and Work Accidents in Fishermen on Lae-lae Island.**

Table 2. Relationship between Age and Work Accidents

Age	Work accident				OR	CI (95%)	<i>p-value</i>
	Case		Control				
	n	%	n	%			
25-34 year	10	29.4	8	11.8	3.125	1.101-8.870	0.028*
35-64 year	24	70.6	60	88.2			

Source: Primary Data 2024

Table 2 shows that 24 respondents (70.6%) in the case group and 60 respondents (88.2%) in the control group were aged 35–64 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 fishermen on Lae-lae island.

- **Relationship between Working Period and Work Accidents in Fishermen on Lae-lae Island.**

Table 3. Relationship between Period of Work and Work Accidents

Years of service	Work accident				OR	CI (95%)	<i>p-value</i>
	case		control				
	n	%	n	%	2.731	0.987-7.559	0.048*
> 6 year	24	70.6	59	86.8			
≤ 6 year	10	29.4	9	13.2			

Source: Primary Data 2024

According to Table 3, the majority of employees with a working time longer than six years, or 59 individuals, did not have any work-related accidents. In contrast, the majority of employees with a working term shorter than six years, or 10 individuals, in the case group did. The OR value is 2.731 (95% CI = 0.987-7.559), and the p-value is 0.048 (< 0.05), indicating that this finding is statistically significant. Thus, the likelihood of occupational accidents among fisherman on Lae-lae Island is significantly influenced by length of employment.

- **Relationship between Length of Work and Work Accidents in Fishermen on Lae-lae Island.**

Table 4. Relationship between Length of Work and Work Accidents

Length of working	Work accident				OR	CI (95%)	<i>p-value</i>
	case		control				
	n	%	n	%	0.463	0.174-1.234	0.119*
>7 hour/day	10	29.4	11	16.2			
≤7 hour/day	24	70.6	57	83.8			

Source: Primary Data 2024

According to Table 4, the majority of employees who worked fewer than seven hours a day—57 in the control group and 24 in the case group—had work accidents. With a p-value of 0.119 (>0.05) and an OR of 0.468 (95% CI = 0.174-1.234), this result was not statistically significant. Therefore, the likelihood of occupational accidents among fisherman on Lae-lae Island is not greatly impacted by the duration of employment.

- **Relationship between Work Fatigue and Work Accidents in Fishermen on Lae-lae Island.**

Table 5. Relationship between Work Fatigue and Work Accidents

Work fatigue	Work accident				OR	CI (95%)	<i>p-value</i>
	case		control				
	n	%	n	%			
Tired	24	70.6	11	24	12.436	4.666-33.143	0.000*
Not tired	10	29.4	57	83.8			

Source: Primary Data 2024

According to Table 5, 24 individuals (70.6%) in the case group reported feeling tired. In contrast, 57 individuals (83.8%) in the control group did not feel fatigued. The OR test analysis yielded a p-value of 0.000 and a result of 12.438 (95% CI = 4.666-33.143), both of which are below the significance level of 0.05. The OR value suggests that fatigue is a risk factor for occupational accidents among fisherman on Lae-Lae Island because both the lower and upper boundaries of the 95% CI interval are over 1.

- **Relationship between Personal Protective Equipment (PPE) with Work Accidents in Fishermen on Lae-lae Island.**

Table 6. Relationship between Personal Protective Equipment (PPE) and Work Accidents

PPE	Work accident				OR	CI (95%)	<i>p-value</i>
	case		control				
	n	%	n	%			
Did not use	28	83.4	20	29.4	11.200	4.021-31.199	0.000*
Use according to standard	6	17.6	48	70.6			

Source: Primary Data 2024

Table 6 demonstrates that 48 individuals (70.6%) in the control group utilized PPE in accordance with requirements, but 28 individuals (83.4%) in the case group did not wear PPE. The analysis's findings show that the p-value is 0.000, the OR value is 11,200 (CI 95% = 4,021-31,199), and the significance level is less than 0.05. Lack of personal protective equipment (PPE) is a risk factor for accidents among fisherman on Lae-lae island, as indicated by the OR value greater than 1.

- **Relationship between Slippery Floors and Work Accidents in Fishermen on Lae-lae Island**

Table 7. The Relationship of Slippery Floors with Work Accidents

Slippery floor	Work accident				OR	CI (95%)	<i>p-value</i>
	case		control				
	n	%	n	%	5.018	2.049-12.290	0.000*
Slippery	24	70.6	22	32.4			
Not slippery	10	29.4	46	67.6			

Source: Primary Data 2024

Table 7 demonstrates that while 46 individuals (67.6%) in the control group did not experience work accidents as a result of

slick floors, 24 individuals (70.6%) in the case group did. The analysis's findings show that the p-value is 0.000, the OR value is 5.018 (95% CI = 2.049-12.290), and it is less than the significance level of 0.05. A slick floor is a risk factor for accidents among fisherman on Lae-lae island, according to the OR value of greater than 1.

Multivariate analysis

	Variabel	Model Log Likelihood	Change in-2 Log Likelihood	Df	Sig. Of the Change
Step 1	Age	-35.623	3.657	1	.056
	Period of Work	-33.927	.264	1	.608
	Work Fatigue	-43.305	19.019	1	.000
	PPE	-45.211	22.831	1	.000
	Slippery Floor	-34.985	2.380	1	.123
Step 2	Age	-36.495	5.136	1	.023
	Work Fatigue	-43.644	19.434	1	.000
	PPE	-45.324	22.793	1	.000
	Slippery Floor	-35.208	2.562	1	.109
Step 3	Age	-37.595	4.775	1	.029
	Work Fatigue	-48.653	26.890	1	.000
	PPE	-48.175	25.933	1	.000

Source: Primary Data 2024

Although age ($p = 0.056$), duration of service ($p = 0.608$), and slippery flooring ($p = 0.123$) were not significant, the variable test findings at the initial stage indicated that work weariness ($p = 0.000$) and personal protective equipment (PPE) had a significant influence on work accidents. When the variables were re-entered into the model in the second stage, the results of the significant factors altered. While slick flooring ($p = 0.109$) continued to exhibit insignificant effects, age ($p = 0.023$), job weariness, and fixed PPE ($p = 0.000$) all had a significant impact on work accidents. The model was re-estimated in the third stage, yielding significant findings for PPE ($P = 0.000$), occupational tiredness ($p = 0.000$), and age ($p = 0.029$). Job tiredness had the most impact (26.890), followed by PPE (25.933) and age (4.775), according to the change in -2 log likelihood. This result validates that the probability of occupational accidents among fisherman on Lae-lae island is significantly influenced by age, job weariness, and personal protective equipment.

3. DISCUSSION

Relationship between Age and Work Accidents in Fishermen on Lae-Lae Island

Fishermen between the ages of 25 and 34 are more likely to be involved in work-related accidents than employees between the ages of 35 and 64. With a p-value of 0.028, the analysis revealed an odds ratio (OR) value of 3.125 (95% CI: 1.101-8.870). Age is therefore one of the risk variables for work-related injuries among Lae-lae Island fisherman.

This finding is consistent with a study that found that young people had a 1.8-fold higher accident rate ($p < 0.01$) than those between the ages of 30 and 39. The study involved 300 fishermen in Latin America (It is believed that this judgment is mostly the result of insufficient training and experience. (10)

Due to their inexperience and lack of expertise, younger fishermen are more likely to be involved in accidents, whereas older workers—those over 34—are more vulnerable because of their deteriorating physical capabilities. Therefore, it is crucial that local governments or organizations offer age-appropriate safety instruction.

Relationship between Working Period and Work Accidents in Fishermen on Lae-Lae Island

Compared to people who had worked for less than six years (29.4%), those who had worked for more than six years had a greater percentage of occupational accidents (70.6%). In contrast, the proportion of employees in the control group who had worked for more than six years was larger (86.8%) than that of employees who had worked for less than six years (13.2%). The results of the analysis revealed a p value of 0.048 and an odds ratio (OR) of 2.731 with a 95% CI of 0.987-7.559.

Therefore, employees who work longer hours are more likely to be involved in workplace accidents than employees who work fewer hours.

These findings are consistent with research on fisherman in Wewangriu Village, Malili Regency, which found a substantial correlation between tenure and fatigue-related occupational accidents (11).

These findings highlight how crucial it is to take a comprehensive approach to comprehending the elements that lead to workplace accidents. Regardless of an employee's length of service, implementing more thorough safety training, particularly for new hires, and making the workplace safer can be calculated steps to lower the probability of workplace accidents.

Relationship between Length of Service and Occupational Accidents in Fishermen on Lae-Lae Island

Employees who worked more than seven hours a day had ten work accident cases (29.4%) and a control group of eleven (16.2%); employees who worked fewer than seven hours a day had twenty-four work accident cases (70.6%) and a control group of fifty-seven (83.8%). The analysis's findings revealed an Odds Ratio (OR) value of 0.463 with a 95% CI = 0.174-1.234, suggesting that employees who worked more than seven hours a day were less likely to be involved in occupational accidents than those who worked fewer than seven hours, though this difference was not statistically significant (p -value = 0.119). Therefore, there is no discernible link between fishermen's occupational accident rates and their term of employment.

This finding is consistent with a study that found no link between the duration of employment and workplace accidents among workers in the tofu sector in Jomblang Village, Candisari District, Semarang. According to the available data, the variable of length of work on work accidents has a p -value of 0.845 (p -value > 0.05), which suggests no significant relationship (12). There is no discernible link between safe work practices and length of service. A p value of 1.000 from the chi-square test indicates that there is no correlation between respondents' safe work practices and tenure (13).

Stated differently, the findings of this study indicate that while length of service is frequently seen as a risk factor for workplace accidents, its impact is not necessarily statistically significant. To provide a safe working environment, a number of elements must be taken into account, including workplace circumstances, work experience, safety training, and supervision.

Relationship between Occupational Fatigue and Work Accidents in Fishermen on Lae-Lae Island

In the case group, 70.6% of workers who experienced work accidents had a high level of fatigue, while in the control group, only 24% experienced high fatigue. Odds Ratio (OR) = 12.436 (95% CI = 4.666-33.143) with p -value = 0.000. Thus, high fatigue can be considered as a major risk factor in the incidence of occupational accidents in fishermen on Lae-Lae Island.

This result is in line with studies on the connection between work-related weariness and accidents among fisherman in Manado City's Bahu Neighborhood 1 Village. The results show a strong correlation between occupational weariness and work-related accidents among fishermen. Of the 26 fisherman who had workplace accidents, 23 (62.2%) reported feeling fatigued at work. This implies that one of the main factors raising the chance of accidents could be weariness. By reducing their physical and mental ability to cope with challenges at sea, fatigue can increase a fisherman's risk of workplace accidents. (14). Employees who experience high levels of fatigue are 1.7 times more likely to be involved in an occupational accident, as fatigue is a significant risk factor for accidents at work. These results are nevertheless statistically significant and support the link between weariness and workplace accidents, even though the reported OR values are less than the findings (15).

As a result, it's critical to put in place efficient preventive measures like controlled working hours, enough sleep, and occupational safety training. It is anticipated that lowering the risk factors for fatigue will lower the frequency of workplace accidents and enhance the security and well-being of fisherman.

Relationship between Personal Protective Equipment (PPE) and Work Accidents in Fishermen on Lae-Lae Island

The data findings showed that 28 fisherman (82.4%) had encountered workplace accidents out of 48 fishermen who did not wear personal protective equipment. On the other hand, 48 (70.6%) of the 54 fisherman who wore PPE in accordance with the requirement never had an accident at work. This is consistent with the chi-square statistical test's findings, which showed a p -value of 0.000. These findings suggest that wearing personal protective equipment increases the chance of workplace accidents.

Workers who do not wear personal protective equipment are at danger of occupational accidents, according to the statistical test results, which also demonstrate a substantial association between compliance with the usage of PPE and the likelihood of accidents at work (16). The findings of this study are also consistent with studies on traditional fisherman in Latuhalat Village, which indicate that the majority of fishermen wear personal protective equipment (PPE) when working, but some choose not to wear it because they believe it makes their jobs less comfortable (17). The frequency of work accidents and adherence to PPE use were found to be significantly correlated in other studies (18).

The significance of improving work safety program implementation, including PPE use supervision and training, in order to lower the probability of accidents. Thus, one strategy to lower the high rate of workplace accidents is to make the usage of

personal protective equipment (PPE) mandatory.

The Relationship between Slippery Floors and Work Accidents in Fishermen on Lae-lae Island

It was discovered that 32.4% of the control group and 70.6% of the case group had experienced work-related accidents. With a 95% CI of 2.049 to 12.290 and a p value of 0.000, the odds ratio (OR) is 5.018. Consequently, one of the biggest risk factors for workplace accidents is a slick floor.

This study supports a study conducted among fisherman in Kayu Menang Village that discovered a significant relationship between the prevalence of slippery flooring and work-related accidents (19). Indicates that slips and falls are among the most common causes of injuries in the fishing industry. About 28% of incidents involve slips and falls, which can be caused by hazardous or slick floor conditions on vessels. A study found that slick floor surfaces significantly raise the risk of accidents at work (20).

According to research on the relationship between slick flooring and workplace accidents, this issue affects many different industrial sectors worldwide. Environmental elements like high humidity, liquid spills, or materials that don't meet safety regulations are frequently the cause of slippery surfaces. When the activity is carried out on a moving vessel, the danger increases even further since unforeseen movements of the vessel can increase the likelihood of accidents.

4. CONCLUSION

According to the study's findings, labor tiredness and a failure to wear personal protective equipment (PPE) are the primary causes of occupational accidents among fisherman on Lae-Lae Island. Additionally, the risk of accidents is increased by young age and slick flooring. Fatigue had the biggest impact on the frequency of work accidents, according to multivariate analysis. Therefore, in order to lower the frequency of accidents and enhance the welfare of fishery workers, efforts must be made to increase awareness of the significance of implementing occupational safety and health (OSH) among fishermen. This includes safety training, the use of appropriate PPE, and improving working environmental conditions.

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