

# The impact of knowledge, perception, and safety training on fishermen's safety behavior in Semarang

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**Abstract.** Fishing is among hazardous occupations, especially in coastal areas where environmental conditions and occupational risks are heightened. This study aims to address the critical research problem of understanding the factors that influence safety behavior among fishermen in Semarang City, with a specific focus on education level, knowledge, perception, and occupational health and safety training. A cross-sectional quantitative study was conducted with a sample of 116 fishermen, selected through accidental sampling. The study examined several variables, including knowledge, perception, and safety behavior. Data were collected using a structured questionnaire and analyzed using chi-square tests to assess the associations between these variables. The results show no significant relationship between education level and safety behavior ( $p = 0.317$ ), but a significant relationship was found between knowledge and safety behavior ( $p = 0.003$ ), perception and safety behavior ( $p = 0.000$ ), and safety training and safety behavior ( $p = 0.000$ ). These findings suggest that safety knowledge, perceptions, and training play a critical role in shaping safe practices among fishermen. The study underscores the importance of enhancing educational efforts and promoting positive safety perceptions to improve safety behavior in this high-risk occupation.

## 1 Introduction

Fishing is recognized as one of the most hazardous occupations globally, with a significant proportion of accidents attributed to human error. The International Maritime Organization (IMO) reports that human error accounts for approximately 43.06% of fishing vessel accidents. Additionally, the Center for Vocational Occupation Injury (CFOI) data, as reported by the Bureau of Labor Statistics (BLS), indicate that fishermen face a risk of accidents that is 20 to 30 times higher compared to other occupations[1,2].

In Semarang, a coastal city in Indonesia, fishing is a primary livelihood for many local residents. The safety of these fishermen is critically important due to the inherent risks associated with their occupation. Data from the Fisheries Department of Semarang City's insurance division reveal that from 2019 to 2022, 12 out of 20 fishing accidents

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representing 60% resulted in fatalities. These incidents were primarily caused by environmental factors such as unpredictable weather, strong winds, and high waves, as well as a lack of safety equipment usage by fishermen [3].

Despite the recognition of these risks, safety behavior among fishermen can be inconsistent. Studies have shown that while fishermen may be aware of safety guidelines, they do not always implement them in practice. Based on research conducted by Amrulloh, as many as 58.3% of fishermen do not understand the Occupational Safety and Health (OSH) culture, although 83.3% of them are aware of the importance of using safety equipment when going to sea. However, most fishermen (58.3%) still do not bring safety equipment when working. This inconsistency is often attributed to factors such as lack of enforcement, perceived invulnerability, and financial pressures that prioritize productivity over safety [4,5].

In addition to the occupational hazards mentioned, the informal nature of the fishing industry in Semarang exacerbates the risks faced by local fishermen. The absence of formalized safety protocols and limited access to structured health and safety training contributes to an environment where accidents are more likely to occur. According to the International Labor Organization (ILO), workers in the informal sector, including fishermen, often operate without adequate protective measures, resulting in higher accident rates. Many fishermen may prioritize immediate income over long-term safety, neglecting the use of safety gear to save on costs. Implementing risk assessment methodologies can help identify hazards faced by fishermen and promote safer practices. According to research, understanding the risks associated with fishing activities is crucial for developing effective occupational health and safety interventions [6,7].

This study aims to analyze the relationship between education level, knowledge, perception, and safety training as the main determinants of safety behavior among fishermen in Semarang. The findings will provide valuable insights into occupational safety and public health, as well as guide strategies to improve safety practices in the fishing industry.

## **2 Materials and Methods**

### **2.1 Time and Place**

Data collection for this study is scheduled in March 2024. Primary data will be gathered from fishermen in the eastern region of Semarang City, specifically in the Semarang Utara District. This location was chosen due to its proximity to Semarang City's extensive maritime area within Central Java.

### **2.2 Research Design and Type**

This study employs a quantitative cross-sectional research design. All variables will be measured simultaneously at a single point in time to assess their relationships.

## 2.3 Population and Sample

The population for this study consists of fishermen working in the eastern part of Semarang City, totaling 839 individuals. To determine an appropriate sample size, Slovin's formula was used, resulting in a minimum sample size of 116 individuals. Sampling will be conducted using accidental sampling (convenience sampling), where participants are selected based on their availability and willingness to participate.

## 2.4 Variables Examined

### 2.4.1 *Dependent Variable: Safety behavior*

Measurement: This will be measured using a structured questionnaire, with items designed to assess safe practices and adherence to safety protocols among fishermen.

### 2.4.2 *Independent Variables*

The measurement of various variables in this study is categorized as follows: Education Level is assessed by recording the highest level of formal education completed by the fishermen, categorized into primary, secondary, or tertiary education. This variable is analyzed to determine its relationship with safety behavior. Knowledge is evaluated through a series of questions designed to measure the fishermen's awareness and understanding of safety procedures and potential hazards in their work environment. Perception is measured by exploring participants' attitudes toward safety practices and the perceived importance of these practices in their daily fishing activities. Lastly, Safety Training is examined by asking participants whether they have attended any safety training programs, with responses categorized dichotomously. Additional questions focus on the frequency, duration, and content of the training to provide deeper insights into its impact on safety behavior.

## 2.5 Measurement Tools

Data will be collected using a structured questionnaire designed to assess the fishermen's knowledge, perception, and safety behavior. The questionnaire will be validated for reliability and accuracy before administration.

## 2.6 Statistical Analysis

The collected data will be analyzed using chi-square tests to determine the associations between knowledge, perception, and safety behavior.

## 3 Result and Discussion

The determinants of safety behavior in this study include education level, knowledge, perception, and safety training, which are presented in Table 1. Education level refers to the fishermen's formal educational background, while knowledge encompasses their

understanding of occupational safety. Perception relates to how fishermen view risks and the importance of safety in their work, while safety training includes their participation in safety-related training programs. All these variables were analyzed to assess their influence on safety behavior in the context of fishermen's work in Semarang City.

**Table 1.** Frequency Distribution of Respondents

Variables	Category	Frequency (f)	Percentase (%)
<b>Level of Education</b>	Primary School	60	51.7
	Middle School	34	29.3
	High School	22	19
<b>Knowledge</b>	Good	83	71.6
	Poor	33	28.4
<b>Perception</b>	Positive	85	73.3
	Negative	31	26.7
<b>Safety Training</b>	Attend Training	65	56
	Not Attend Training	51	44
<b>Total</b>		<b>116</b>	<b>100</b>

The table presents the distribution of variables related to education, knowledge, perception, and safety training among fishermen. For the level of education, 51.7% of the respondents have completed primary school (60 individuals), 29.3% have completed middle school (34 individuals), and 19.0% have completed high school (22 individuals). Regarding knowledge, 71.6% of the respondents (83 individuals) have good knowledge, while 28.4% (33 individuals) have poor knowledge. In terms of perception, 73.3% (85 individuals) hold a positive perception, whereas 26.7% (31 individuals) have a negative perception. For safety training, 56% (65 individuals) have attended safety training, while 44% (51 individuals) have not attended. The total sample size consists of 116 individuals, representing 100% of the respondents.

**Table 2.** Relationship Between Education Level and Safety Behavior Among Fishermen in Semarang City

Level of Education	Safe Behavior				Total		p-value
	Safe		Unsafe		f	%	
	f	%	f	%			
<b>Primary School</b>	32	29.5%	28	30.5%	60	51.7%	0.317
<b>Middle School</b>	13	17.7%	21	17.3%	34	29.3%	
<b>High School</b>	12	10.8%	10	11.2%	22	19%	
<b>Total</b>	57	58%	59	59%	116	100%	

The table illustrates the relationship between education level and safety behavior among 116 fishermen in the coastal area of Semarang City. Among the fishermen, 32 primary school graduates (29.5%) demonstrate safe behavior, while 28 (30.5%) exhibit unsafe behavior, making this group the largest in the sample, representing 51.7% of the total. For middle school graduates, 13 fishermen (17.7%) engage in safe practices, and 21 (17.3%) show unsafe behavior, accounting for 29.3% of the total sample. High school graduates comprise the smallest group, with 12 fishermen (10.8%) practicing safe behavior and 10 (11.2%) engaging in unsafe behavior, representing 19% of the total. The p-value of 0.317 indicates that there is no statistically significant relationship between education level and safety behavior among these fishermen.

The findings of this study, which show no significant relationship between education level and safety behavior, align with several previous studies conducted over the past decade. A study found a positive correlation between the educational level of workers and their safety performance. Workers with higher education levels demonstrated better safety behaviors and were more likely to engage in practices that enhance workplace safety. This suggests that education plays a critical role in shaping attitudes towards safety. The results of the study are in line with research conducted by Lana that workers with low levels of education have a higher tendency to experience work accidents compared to workers with high levels of education. Overall, there is a positive relationship between education level and safe behavior in the workplace. Workers with high levels of education tend to show better safe behavior and comply with safety procedures [8,9].

However, The study found that workers with lower levels of education were more likely to engage in unsafe behaviors than those with higher levels of education, suggesting that education can contribute to a better understanding and implementation of safety practices [10].

This inconsistency across studies highlights the complex nature of safety behavior among fishermen, suggesting that practical training and hands-on experience may play a more critical role in shaping safety practices than educational attainment alone.

**Table 3.** Relationship Between Knowledge and Safety Behavior Among Fishermen in Semarang City

Knowledge	Safe Behavior				Total		p-value
	Safe		Unsafe		f	%	
	f	%	f	%			
<b>Good</b>	48	40.8%	35	42.2%	85	71.6%	0.003
<b>Poor</b>	9	16.2%	24	16.8%	31	28.4%	
<b>Total</b>	57	57%	59	59%	116	100%	

The relationship between knowledge and safety behavior among 116 fishermen in the coastal area of Semarang City reveals notable patterns. Of the fishermen with good knowledge, 48 individuals (40.8%) exhibit safe behavior, while 35 individuals (42.2%) demonstrate unsafe behavior. This group accounts for 71.6% of the total sample, suggesting a strong representation of individuals with higher knowledge levels. In

contrast, among those with poor knowledge, only 9 fishermen (16.2%) engage in safe behavior, while 24 fishermen (16.8%) exhibit unsafe behavior, making up 28.4% of the sample. The statistical analysis, with a p-value of 0.003, demonstrates a significant relationship between knowledge and safety behavior, indicating that fishermen with better knowledge are significantly more likely to adopt safe practices compared to those with lower knowledge levels.

The results align with findings from various studies conducted over the past decade, which emphasize the critical role of knowledge in influencing safety behavior, especially in high-risk occupations such as fishing. A study conducted showed that fishermen's understanding of occupational health and safety is very important for their safety behavior. Fishermen who have better knowledge of safety practices are more likely to use personal protective equipment (PPE) and make the right decisions when faced with dangerous conditions, such as bad weather. Many fishers rely on traditional knowledge passed down from generation to generation, which may not always be in line with modern safety standards. While this empirical knowledge can inform their practices, it often lacks the technical depth necessary for comprehensive safety compliance. Fishermen who are well-informed about the hazards associated with their profession tend to have a higher risk perception, which influences their decision-making process. The study showed that after participating in an awareness program, fishers demonstrated better understanding and practices regarding occupational health hazards. For example, those who were aware of the importance of using safety equipment were more likely to take precautions before going out to sea, thereby reducing the likelihood of accidents. This indicates that when employees perceive their workplace as prioritizing safety, they are more likely to engage in safe behaviors and adhere to safety protocols [11,12,13].

Research shows that knowledge of OHS is a strong predictor of safety behavior among individuals, particularly in educational settings. In one study, it was found that knowledge of OHS had the greatest influence on safety behavior, indicating that more informed individuals tend to engage in safer practices. This is consistent with the knowledge-attitude-behavior model, which suggests that increased knowledge leads to improved attitudes and subsequently safer behavior [14].

However, the presence of 33 respondents (28.4%) with poor knowledge suggests that gaps still exist, which is consistent with the challenges identified in recent research. A study highlighted a significant correlation between knowledge of OHS and unsafe acts. The findings revealed that individuals who have a better understanding of OHS are less likely to engage in unsafe behaviors, thereby reducing the risk of accidents. For example, studies have shown that increased knowledge of OHS correlates with fewer occurrences of unsafe acts. Educational interventions focused on OHS have been shown to significantly improve the quality of the learning environment and increase safety behaviors. A survey showed that those who received structured OHS education reported higher awareness and compliance with safety protocols compared to those who did not receive such training [15,16].

The workplace safety climate also plays a crucial role in mediating the relationship between knowledge and safety behavior. A positive safety climate enhances the effectiveness of safety knowledge, leading to better adherence to safety protocols [17,18].

In conclusion, the findings demonstrate a relatively high level of knowledge among respondents, which is a positive indicator of potential safety behaviors. However, attention must also be given to the subset of individuals with poor knowledge, as they represent a vulnerable group that could benefit from additional support and resources. The results resonate with the trends observed in the last ten years of research, highlighting the ongoing need for comprehensive and inclusive educational initiatives to improve safety behavior across all segments of the population. Future research should continue to explore the factors influencing knowledge levels and develop strategies to enhance the overall safety behavior of fishermen in the region.

**Table 4.** Relationship Between Perception and Safety Behavior Among Fishermen in Semarang City

Perception	Safe Behavior				Total		p-value
	Safe		Unsafe		f	%	
	f	%	f	%			
<b>Positive</b>	52	41.8%	33	43.2%	83	73.3%	0.000
<b>Negative</b>	5	15.2%	26	15.8%	33	26.7%	
<b>Total</b>	57	57%	59	59%	116	100%	

Table 4 presents the relationship between perception levels and the safety behavior of fishermen. The data demonstrates a significant association, with a p-value of 0.000, indicating that perception is a crucial factor influencing safety behavior.

Among those with a positive perception, 52 respondents (41.8%) exhibited safe behavior, while 33 respondents (43.2%) demonstrated unsafe behavior. Conversely, among those with a negative perception, only 5 respondents (15.2%) engaged in safe behavior, with the majority, 26 respondents (15.8%), showing unsafe behavior. This stark contrast suggests that a positive perception is strongly linked to safer practices, whereas a negative perception is associated with a higher likelihood of unsafe behavior.

Implementing behavioral safety techniques, such as positive reinforcement for safe behaviors, can further encourage compliance with safety protocols. Recognizing safe practices helps internalize these behaviors, creating a culture of safety within the organization. Specifically, those with a positive safety culture report up to 70% fewer workplace accidents compared to those with weaker safety cultures. This correlation underscores how a supportive environment encourages compliance with safety guidelines and improves overall safety performance. Workers who feel safe in their work environment are more likely to comply with safety procedures, which in turn increases their job satisfaction. A positive work environment can influence safe behavior by creating a supportive atmosphere [19,20,21].

According to the ABC model, individuals often engage in behaviors based on their perceptions of the consequences of those actions. If they perceive immediate and positive outcomes (e.g., saving time or increasing comfort), they may prioritize these over safety, potentially leading to unsafe practices. Workplace safety perceptions are closely linked to the concept of safety climate, which encompasses workers' shared perceptions regarding safety policies, procedures, and practices within an organization. A positive

safety climate is associated with better safety behaviors and lower accident rates, while negative perceptions can lead to increased unsafe acts and higher accident involvement [21,22].

However, the data also reveals that even among those with positive perceptions, a significant portion (43.2%) still engage in unsafe behavior. This indicates that while perception is a critical factor, it may not be sufficient on its own to ensure safe practices. Other factors, such as individual attitudes, knowledge, and external influences like peer pressure or working conditions, might also contribute to unsafe behavior. However, the data also reveals that even among those with positive perceptions, a significant portion (43.2%) still engage in unsafe behavior. This indicates that while perception is a critical factor, it may not be sufficient on its own to ensure safe practices. Other factors, such as individual attitudes, knowledge, and external influences like peer pressure or working conditions, might also contribute to unsafe behavior. Research indicates that risk perception can act as either a job hindrance or a challenge, depending on the context. When perceived as a hindrance, it negatively impacts safety behavior; conversely, when viewed as a challenge, it can motivate safer practices. This dual perspective suggests that enhancing workers' understanding of risks can lead to improved safety outcomes [23].

The findings suggest that enhancing fishermen's perceptions of safety, through targeted interventions like safety training, leadership engagement, and the promotion of a safety-oriented culture, could be effective in improving safety behavior. However, it is also essential to address the broader array of factors that influence behavior, ensuring a comprehensive approach to safety management.

In conclusion, the significant relationship between perception and safety behavior observed in this study reinforces the critical role of perception in shaping safety practices among fishermen.

**Table 5.** Relationship Between Safety Training and Safety Behavior Among Fishermen in Semarang City

Safety Training	Safe Behavior				Total		p-value
	Safe		Unsafe		f	%	
	f	%	f	%			
<b>Attend Training</b>	44	31.9%	21	33.1%	65	56%	0.000
<b>Not Attend Training</b>	13	25.1%	38	25.9%	51	44%	
<b>Total</b>	57	57%	59	59%	116	100%	

Based on the table, that safety training has a significant relationship with safe behavior, as indicated by the p-value of 0.000. Among the 65 fishermen who attended safety training, 44 (31.9%) demonstrated safe behavior, while 21 (33.1%) still engaged in unsafe behavior. On the other hand, of the 51 fishermen who did not attend training, only 13 (25.1%) practiced safe behavior, while 38 (25.9%) engaged in unsafe practices. These findings emphasize the importance of safety training in promoting safe behavior, yet they also highlight that attending training alone is not sufficient to ensure total adherence to safety protocols.

This study contrasts with the research conducted by Machfud, Julian, and Nurwahidah, which indicated that there was no significant relationship between occupational health and safety (OHS) training and OHS behavior. Although safety training is generally expected to improve safe behavior by providing the necessary knowledge, skills, and understanding to manage risks, their findings suggest otherwise. This may be due to several factors, such as the quality of the training provided, the fishermen's level of understanding and acceptance of the training material, or the presence of other factors that more dominantly influence OHS behavior [24].

The findings highlight the crucial role of safety training in promoting safe workplace behavior. Research consistently demonstrates that well-designed occupational health and safety (OHS) training fosters positive changes in employees' attitudes and beliefs, which are critical precursors to behavioral improvements. Comprehensive safety training programs that include elements such as risk assessment, emergency response, and the proper use of personal protective equipment (PPE) have been shown to significantly enhance compliance with safety regulations. For example, a study found that employees who received thorough training exhibited higher levels of safety compliance and were better equipped to identify hazards [25,26].

The findings underscore the importance of occupational health and safety (OHS) training as a critical determinant of safe behavior in the workplace. Poorly implemented or insufficient training correlates with an increase in unsafe behaviors, emphasizing the need for robust training programs. In Indonesia, the significance of training is reinforced through regulatory frameworks, such as Law No. 13 of 2003 on Manpower (Chapter V) and Government Regulation (PP) No. 50 of 2012 on OHS Management Systems (SMK3). These regulations mandate training as a fundamental element of occupational safety planning and management [27].

Implementing structured training programs, particularly at the recruitment stage, equipping employees with essential knowledge and skills, fostering a safety-oriented workplace culture. Compliance with these regulations not only enhances worker performance but also mitigates risks of workplace accidents and occupational diseases (PAK), contributing to sustainable occupational health and safety practices.

## **4 Conclusion**

The findings of this study underline the important role of knowledge, perception, and safety training in shaping the safety behavior of fishermen in the coastal areas of Semarang City. The positive correlation between these factors and safety behavior suggests that increasing knowledge and perception through targeted safety training can significantly improve compliance with safety practices. Meanwhile, the analysis revealed that the education level of fishermen did not show a significant relationship with their safety behavior, suggesting that practical and context-specific interventions may be more effective than formal education in this situation.

## **5 Recommendation**

Improving fishermen's safety behavior requires comprehensive training programs to enhance knowledge and skills, supported by a safety-oriented culture through leadership, awareness campaigns, and peer support. Targeted education for those with lower knowledge levels and mentorship programs combining training with real-life experience can further reinforce safe practices effectively.

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