

The Relationship Between Occupational Health and Safety Knowledge and Workplace Accidents

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ARTICLE INFORMATION	ABSTRACT
Article history Received (8 May 2026) Revised (28 June 2026) Accepted (29 June 2026) Keywords Knowledge, Occupational Health and Safety (OHS), Workplace Accidents.	<i>Work-related accidents and illnesses result in approximately 2.78 million deaths annually, accompanied by around 374 million non-fatal incidents that lead to prolonged absences, permanent disabilities, and significant economic losses. These figures reflect the immense global health burden borne by the labor sector, while underscoring the urgency of implementing comprehensive OHS systems across various industrial sectors. According to Heinrich's theory, One of the dominant factors contributing to workplace accidents is workers' knowledge regarding occupational health and safety. This indicates that workers who have a good understanding of occupational health and safety tend to exhibit safer work action and are better able to prevent workplace accidents. This study aims to analyze the association between occupational health and safety knowledge and workplace accident among workers at CV. X Banyuwangi. This research used an Cross-sectional analytical study. 75 workers selected from 300 using simple random sampling, questionnaire-based data collection, and Chi-square analysis. The study findings revealed that the majority of respondents – 47 people (62,7%) from 75 selected workers – had insufficient knowledge. And 39 people (52%) reported having experienced a workplace accident within the past year. The results of the Chi-square test showed a significant association between the level of occupational health and safety knowledge and workplace accidents ($p < 0.001$), with a strong effect size (Cramer's $V = 0.80$). Occupational health and safety knowledge was significantly associated with workplace accident history, but causal inference cannot be made due to the cross-sectional design</i>

Introduction

Occupational Health and Safety (OHS) is a fundamental aspect of workforce management aimed at protecting workers from the risk of accidents and work-related illnesses, as well as ensuring productivity and well-being in the workplace (Bhowmik et al., 2024). Globally, the International Labour Organization (ILO) reports that work-related accidents and illnesses result in approximately 2.78 million deaths annually, accompanied by around 374 million non-fatal incidents that lead to prolonged absences, permanent disabilities, and significant economic losses (International Labour Organization, 2024). These figures reflect the immense global health burden borne by the labor sector, while underscoring the urgency of implementing comprehensive OHS systems across various industrial sectors.

In Indonesia, the trend in workplace accidents shows a consistent increase year over year. BPJS Ketenagakerjaan recorded 221,740 cases in 2020, rising to 234,370 cases in 2021, 297,725 cases in 2022, and 370,747 cases in 2023. Throughout the full year of 2024, the number of cases reached 462,241, indicating an upward trend that has persisted over the past five years (Kementerian Ketenagakerjaan Republik Indonesia, 2024). At the provincial level, East Java recorded the highest number of workplace accident cases nationally in 2024, accounting for 80,771 cases or approximately 17.5% of the national total, with the manufacturing, construction,



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and mining sectors among the largest contributors (Kementerian Ketenagakerjaan Republik Indonesia, 2024). This data indicates that workplace accidents remain a serious issue requiring systemic attention, including in the fisheries industry.

One of the dominant factors contributing to workplace accidents is workers' low level of knowledge regarding occupational health and safety (OHS), where lower levels of OHS knowledge among workers are associated with higher rates of workplace accidents (Oktaviani, 2023). According to Heinrich's domino theory, 88% of workplace accidents are caused by unsafe acts stemming from workers' weak understanding and skills, while only 10% are due to unsafe conditions and 2% by other factors (Kurniasari, 2026).

Fish processing work exposes workers to a wide range of physical hazards, including sharp tools used in filleting and cutting, wet and slippery floors, operation of processing machinery, repetitive manual movements, prolonged cold exposure in cold storage and freezing areas, contact with chemical substances such as cleaning agents and preservatives, and manual handling of heavy loads (Amalia et al., 2025). These hazards inherently increase the risk of workplace accidents within this sector. Workplace accidents are generally understood to result from a sequential chain of causal factors, in which unsafe acts such as bypassing safety procedures, improper use of tools, or non-compliance with PPE requirements and unsafe conditions such as poorly maintained equipment, inadequate housekeeping, or insufficient hazard signage serve as the immediate antecedents of an accident (Kurniasari & Lestari, 2026). Within this framework, limited OHS knowledge among workers has been shown to be significantly associated with a higher tendency toward unsafe action, as demonstrated in a cross-sectional study in (Lubis et al., 2024; Pawening & Martiana, 2023). This suggests that a lack of hazard awareness reduces workers' ability to recognize risks and comply with PPE use, thereby increasing the likelihood of unsafe acts. Conversely, improving OHS knowledge through structured training, routine safety briefings, and consistent supervision is expected to interrupt this causal chain by strengthening hazard awareness and PPE compliance, thereby reducing unsafe behavior and lowering the overall risk of work place accidents (Beś & Strzałkowski, 2024).

Although the association between OHS knowledge and workplace accidents has been widely studied in manufacturing and construction sectors, evidence from medium-scale fish-processing companies in Banyuwangi remains limited. The unique combination of sharp tools, wet floors, machine use, and seafood-processing hazards makes this sector important for occupational safety research.

Methods

Study Design and Setting

This study used a quantitative approach with a cross-sectional design. This design was selected to examine the association between occupational health and safety (OHS) knowledge and workplace accidents among workers. The study was conducted at one of the fish processing factories located within the fisheries industrial area of Banyuwangi, East Java, Indonesia. The company's core production activities include fish cutting and filleting using hand-held sharp tools, material handling using forklifts and conveyor systems, and continuous work on wet and slippery production floors, exposing workers to mechanical hazards such as entrapment, cutting injuries, and slips, as well as physical fatigue resulting from repetitive manual tasks. Data collection was carried out over a two-month period, from June to July 2025. with formal approval from company management. To avoid disrupting ongoing production activities and to comply with research ethics, data collection was conducted during workers' scheduled break time, with the consent of each respondent. Questionnaires were administered in the company's designated rest area, an access-controlled space within the factory premises, which provided a reasonably



private setting for respondents to complete the questionnaire while maintaining the confidentiality of their responses.

Research Subject

The population in this study consisted of all employees working at the fish processing factory, totally 300 workers, distributed across six operational units: cutting (150 workers), filling (70 workers), quality control (30 workers), staff (21 workers), cleaning (19 workers), and maintenance (10 workers). The workforce comprised a mix of permanent, piece-rate, and daily casual employees. The sample size was determined using Slovin's formula with a 10% margin of error, resulting a sample size of 75 respondents. Respondents were selected using a probability sampling technique, specifically simple random sampling, in which every member of the population had an equal opportunity of being selected (Wu & Thompson, 2020). The inclusion criteria were: 1) workers currently employed at the company 2) workers with a minimum of one year of service 3) workers who were willing to participate in the research process 4) workers who were physically and mentally healthy at the time of the study 5) workers who were present and accessible during the data collection period 6) workers who were able to read, write, and communicate adequately 7) and workers who voluntarily agreed to participate by completing the questionnaire in full. The exclusion criteria were: 1) workers on extended leave (due to illness, maternity, or personal reasons) during the study period 2) workers holding managerial or directorial positions, given their differing job characteristics compared to the target population 3) workers still undergoing orientation or specialized training and therefore not yet familiar with standard operating procedures 4) workers who experienced a sudden health problem during data collection 5) and respondents who completed the questionnaire incompletely or provided inconsistent responses.

Instruments

The research instruments were:

1. Demographic Data Questionnaire

This questionnaire collected respondents' demographic data, including Initial, gender, age, education level, and length of employment.

2. Occupational Health and Safety (OHS) Knowledge Questionnaire

The independent variable, OHS knowledge, was measured using five indicators commonly used in prior OHS knowledge studies: basic OHS concepts, hazard and risk awareness, knowledge of workplace accidents, personal protective equipment (PPE) use, and OHS culture (Andi Adwan. T, Nurlaela Latief, 2021). The instrument consisted of 15 multiple-choice items, with three items representing each indicator. Each correct answer was scored, and the total score was converted into a percentage using the formula adapted from (Arikunto, 2020): $\text{percentage} = (\text{number of correct answers} / \text{maximum score}) \times 100$. Based on this percentage, respondents' OHS knowledge was categorized into four levels: very good (76–100%), good (51–75%), insufficient (26–50%), and very insufficient (0–25%). The instrument's validity was tested using Pearson product-moment correlation on 30 respondents, with a critical value (*r*-table) of 0.361 at a 5% significance level. All 15 items were found valid, with corrected item-total correlation coefficients ranging from 0.519 to 0.776. Reliability was assessed using Cronbach's alpha, yielding a coefficient of 0.893, indicating consistency.

3. Workplace Accident Questionnaire

The dependent variable, workplace accident occurrence, was measured using a second questionnaire consisting of 12 items addressing the frequency and characteristics of workplace accidents experienced by respondents over the preceding 12 months. The items covered four indicators commonly used in occupational accident assessment: type of



accident, cause of accident, nature of injury, and location of injury on the body, with three items per indicator, an approach consistent with accident classification used in prior occupational studies (Arifatunnahriyah et al., 2024). Unlike the knowledge questionnaire, responses were recorded using the actual number of incidents reported by each respondent (e.g., 0, 1, 2, 3, ...). Validity testing using Pearson correlation on the same 30 respondents (r -table = 0.361) confirmed that all 12 items were valid, with coefficients ranging from 0.629 to 0.889. Reliability testing produced a Cronbach's alpha of 0.925, also indicating very high internal consistency.

Data Analysis

This study used univariate and bivariate analyses. Univariate analysis was used to describe the frequency distribution and percentage of each variable, including respondents' demographic characteristics, OHS knowledge level, and workplace accident occurrence. Bivariate analysis was conducted to examine the association between OHS knowledge and workplace accident occurrence using the Chi-Square test, a non-parametric statistical method suitable for analyzing categorical data measured on a nominal or ordinal scale (Sugiyono, 2024). The Chi-Square test was applied under the assumption that no more than 20% of the cells in the contingency table had an expected frequency of less than 5. All statistical analyses were performed using SPSS version 28.0, with a significance level (α) of 0.05. A relationship between variables was considered statistically significant if $p < 0.05$.

Results

Table 1 Frequency Distribution of respondents by Age

Age (years)	Frequency	Percentage (%)
15 – 20	15	20
21-59	55	73,3
>60	5	6,7
Total	75	100

According to Table 1, It can be observed that the majority of the 75 respondents fall within the age range of 21-59 years (73,3%)

Table 2 Frequency Distribution of respondents by Gender

Gender	Frequency	Percentage (%)
Male	26	34,7
Female	49	65,3
Total	75	100

Table 3 Frequency Distribution of respondents by Education

Education	Frequency	Percentage (%)
Diploma/Bachelor	10	13,3
Secondary School	42	56
Primary School	23	30,7
Total	75	100

According to Table 3, it shows that the majority of respondents had a low Education, with a total 42 people (56%)

Table 4 Frequency Distribution of respondents by Period of work

Period of Work (Years)	Frequency	Percentage (%)
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>10	5	6,7
6-10	30	40
1-5	40	53,3
Total	75	100

Based on Table 4, it can be concluded that majority of 75 respondents have period of work within range 1-5 years, 40 People (53,3%)

Table 5 Frequency Distribution of Occupational Health and Safety Knowledge Levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Good (76–100%)	14	18,7	18,7	18,7
	Good (51–75%)	14	18,7	18,7	18,7
	Insufficient (26–50%)	26	34,7	34,7	34,7
	Very Insufficient (0–25%)	21	28,0	28,0	28,0
	Total	75	100,0	100,0	

Based on Table 5, it can be seen that the majority of respondents—26 people (34.7%)—fall into the “insufficient” category in terms of their knowledge of occupational health and safety, followed by 21 people (28.0%) in the “very insufficient” category. This indicates that more than half of the respondents do not yet have sufficient knowledge.

Table 6 Frequency Distribution of Workplace Accidents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never Experienced a Workplace Accident	36	48,0	48,0	48,0
	Ever Experienced a Workplace Accident	39	52,0	52,0	52,0
	Total	75	100,0	100,0	

Table 6 shows that the majority of respondents—39 people (52.0%)—reported having experienced a workplace accident, while 36 people (48.0%) reported never having experienced a workplace accident.

Table 7 Analysis of the Relationship Between Occupational Health and Safety Knowledge and the Incidence of Workplace Accidents at CV. X Banyuwangi

Occupational Health and Safety (OHS) Knowledge	Workplace Accident				Total		P- value
	Ever Experienced		Never Experienced				
	n	%	n	%	n	%	
Very Good	1	1,3	13	17,3	14	18,7	0,000
Good	0	0,0	14	18,7	14	18,7	
Insufficient	17	22,7	9	12,0	26	34,7	
Very Insufficient	21	28,0	0	0,0	21	28,0	
Total	39	52,0	36	48,0	75	100	

According to Table 7, the Chi-Square test result (p-value) was 0.000 (< 0.05). This indicates a significant association between the level of occupational health and safety (OHS) knowledge and the incidence of workplace accidents among workers. It suggests a strong linear relationship between the two variables, wherein an increase in the level of knowledge is directly proportional to a decrease in the risk of accidents.

Discussion

Knowledge of Occupational Health and Safety at CV. X Banyuwangi in 2025

The results show that workers' knowledge of occupational health and safety at CV. X Banyuwangi is predominantly in the "insufficient" and "very insufficient" categories, with 26 respondents (34.7%) and 21 respondents (28.0%) falling into these categories, respectively. Meanwhile, only 14 respondents (18.7%) demonstrated "good" knowledge and another 14 (18.7%) demonstrated "very good" knowledge. These findings indicate that, although a portion of workers possess adequate knowledge, the majority have not yet developed sufficient understanding of basic OHS concepts, workplace hazards, accident prevention methods, and proper PPE use procedures.

Within Lawrence Green's behavioral framework, as applied in a recent study on predisposing factors and safe worker behavior (Pradana & Paskarini, 2025), knowledge is classified as a predisposing factor that shapes the development of workplace safety behavior. The relatively low proportion of workers with adequate knowledge suggests that OHS education, socialization, and training have not been optimally delivered to or absorbed by the entire workforce. This is consistent with the characteristics of respondents in this study, many of whom have a secondary education background and relatively short tenure, both of which may limit access to OHS information.

This finding aligns with previous research showing that structured OHS training can meaningfully reduce the risk of workplace accidents (Irpan et al., 2025), and that insufficient knowledge combined with limited OHS socialization contributes to higher accident rates in the processing industry (Darmayani et al., 2023). A related cross-sectional study among food-industry production workers in Indonesia similarly found that limited OHS knowledge was significantly associated with a greater tendency toward unsafe action (Pawening & Martiana, 2023). It should be noted, however, that knowledge alone does not fully determine workers' behavior; it interacts with other enabling and reinforcing factors, such as supervision, PPE availability, and management commitment, which are explored further in the following sections. Based on these findings, the relatively low level of OHS knowledge among workers at CV. X Banyuwangi suggests that the internalization of OHS values in the workplace has not been fully optimized. This may be attributed to limited educational activities, such as OHS training, safety procedure briefings, and the ongoing dissemination of information about workplace hazards. Inadequate knowledge can lead workers to underestimate workplace risks and the importance of consistent PPE use. If left unaddressed, this condition may increase the likelihood of unsafe acts and, consequently, the risk of workplace accidents.

Workplace Accidents at CV. X Banyuwangi in 2025

The results show that 39 of the 75 respondents (52.0%) reported having experienced a workplace accident, while 36 (48.0%) reported never having experienced one. This indicates that more than half of the workforce at CV. X Banyuwangi has been exposed to some form of workplace accident, suggesting that the overall risk level at the company remains relatively high.

Based on respondents' descriptions, the most commonly reported accidents included cuts from sharp tools, being pinched or trapped by machinery and work materials, slipping on wet floors, collisions with work facilities, and falls while carrying loads or moving through production



areas. Several respondents also reported minor incidents such as eye irritation from dust exposure and skin irritation from contact with processing substances. These patterns are broadly consistent with hazard profiles documented in other fisheries and fish-processing settings internationally, where mechanical hazards from cutting tools and machinery, wet and slippery work surfaces, and chemical exposure are recognized as leading contributors to occupational injury (Barrow et al., 2022; Nazarihighipashaki et al., 2024; Soykan, 2023)

While the descriptive pattern of accidents in this study may appear to align with workers' OHS knowledge levels, it would be overly simplistic to attribute workplace accidents to knowledge alone. International literature consistently shows that occupational accidents typically arise from the interaction of multiple organizational and operational factors beyond individual knowledge. Production-related time pressure and high workload have been identified as significant contributors to unsafe behavior, as workers under pressure to meet output targets are more likely to bypass safety procedures or remove machine guards to save time (Ranganathan & Sujatha, 2022). Inconsistent availability and use of personal protective equipment (PPE) has similarly been shown to substantially increase injury risk independent of workers' knowledge level (Sehsah et al., 2020). The adequacy of machine guarding and engineering controls is also a critical determinant, as risk control measures within the OHS hierarchy—ranging from elimination and engineering controls to PPE as a last resort—must be properly implemented to be effective (Ermiyati et al., 2021).

Organizational factors are equally important. Safety climate, reflecting workers' shared perception of how much priority management places on safety relative to production, has consistently been found to predict safety behavior and accident rates across industries, including in the Indonesian context (Hertanto et al., 2023; Lestari et al., 2020). Management commitment, supervisory quality, and the extent to which workers feel safe reporting near-misses without fear of blame are likewise recognized as key determinants of workplace safety performance, as weak reporting cultures tend to obscure early warning signs that could otherwise prevent more serious accidents (Ranganathan & Sujatha, 2022). Training history also plays a role distinct from general OHS knowledge: structured, practice-based training has been shown to improve safety outcomes more effectively than passive knowledge transfer alone (Barati Jozan et al., 2023).

In the context of CV. X Banyuwangi, several of these organizational factors are plausible contributors to the relatively high accident rate observed. The nature of fish processing work, characterized by repetitive cutting tasks, fixed production targets, and continuous exposure to wet floors and machinery, creates conditions in which fatigue, shift duration, time pressure, and inconsistent supervision could plausibly compound the effect of limited OHS knowledge. However, this study did not directly measure these organizational variables, and therefore their specific contribution to the observed accident rate cannot be statistically confirmed within the scope of this research. Future studies incorporating variables such as workload, shift duration, supervision intensity, safety climate, and management commitment are needed to determine the relative contribution of organizational versus individual factors to workplace accidents in this setting.

The Relationship Between Occupational Health and Safety Knowledge and Workplace Accidents at CV. X in 2025

Cross-tabulation analysis showed that among the 75 respondents, workers categorized as having very insufficient OHS knowledge accounted for the highest proportion of those who had experienced a workplace accident (28.0% of the total sample), while only a small proportion of workers with very good knowledge had experienced an accident (1.3%). The Chi-Square test yielded a p -value < 0.001 , indicating a statistically significant association between OHS knowledge level and the occurrence of workplace accidents, with a Cramér's V of 0.80, indicating



a very strong association between the two variables. This finding is consistent with Lawrence Green's predisposing-factor framework, which positions knowledge as one of the foundational determinants of health- and safety-related behavior (Purnawinadi, 2025).

However, the strength of this statistical association should not be interpreted as evidence that OHS knowledge is the sole, or even the primary, determinant of workplace accidents. As a cross-sectional design, this study captured knowledge and accident occurrence at a single point in time, meaning the direction of the relationship cannot be firmly established. It remains equally plausible that workers who have previously experienced an accident subsequently acquire more OHS knowledge as a result of post-incident remedial training or closer supervision, rather than knowledge straightforwardly preceding and preventing the accident. Furthermore, several organizational and operational factors that were not measured in this study could plausibly confound or moderate the observed association. Production-related time pressure and excessive workload have been shown to push workers toward unsafe shortcuts regardless of their underlying knowledge (Ranganathan & Sujatha, 2022). Inconsistent availability of personal protective equipment can independently elevate injury risk even among knowledgeable workers (Sehsah et al., 2020), while inadequate machine guarding and engineering controls represent a structural hazard that individual knowledge alone cannot offset (Ermiyati et al., 2021). At the organizational level, a weak safety climate, characterized by limited management commitment and inconsistent supervision, has consistently been found to undermine safety behavior independently of workers' personal knowledge (Hertanto et al., 2023). The quality and format of training delivery, rather than knowledge level per se, may also account for part of the observed association, as more interactive, practice-based training methods have been shown to produce more durable safety outcomes than passive knowledge transfer alone (Barati Jozan et al., 2023). Taken together, these considerations suggest that the relationship between OHS knowledge and workplace accidents observed at CV. X Banyuwangi, although statistically strong, is likely embedded within a broader system of organizational and operational conditions. Workers' knowledge may function less as an independent cause of safety outcomes and more as one node within an interacting set of predisposing, enabling, and reinforcing factors. As this study did not collect data on production targets, shift patterns, supervisory practices, or safety climate, the relative contribution of these factors cannot be statistically partialled out from the present analysis. Future research employing multivariate analysis or structural equation modeling, incorporating these organizational variables alongside individual knowledge, is needed to clarify the relative weight of each factor in shaping accident risk in the fish processing industry.

Conclusion

This study demonstrates a statistically significant and strong association between OHS knowledge and workplace accident occurrence among fish processing workers at CV. X Banyuwangi ($\chi^2 = 47.704$; $p < 0.001$; Cramér's $V = 0.80$), with over 62% of workers classified as having insufficient knowledge and 52% reporting a workplace accident in the past 12 months, supporting the predisposing-factor component of Lawrence Green's framework and confirming that OHS knowledge functions as a meaningful antecedent of safety behavior. However, because enabling factors (PPE availability, engineering controls) and reinforcing factors (supervision, safety climate) were not measured, the framework's broader proposition that all three factor types jointly determine safety outcomes could neither be confirmed nor refuted- rendering the model a useful conceptual entry point but an incomplete analytical guide for this study. The central conclusion is therefore that OHS knowledge represents a necessary but insufficient condition for workplace safety: structured knowledge interventions are warranted given the documented deficits, yet cannot be expected to reduce accident rates without concurrent improvement in enabling and reinforcing conditions.



Ethics approval and consent to participate

This research has undergone a review process and received approval from the Research and Community Service Institute of Universitas Bakti Indonesia Banyuwangi, with approval number No. 064/S-Riset/LPPM/UBI/VIII/2025. Before participation, all respondents were informed about the study's purpose, procedures, and rights, and written informed consent was obtained. Respondent confidentiality and anonymity were strictly maintained throughout the research process

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