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How Safety Knowledge and Work Environment Affect Workplace Accidents: Uncovering the Role of Safety Behaviors

Marcia[1*], Rokiah Kusumapradja[2], Intan Silviana Mustikawati[3]
Universitas Esa Unggul, Jakarta, Indonesia
Email: drmarcia@student.esaunggul.ac.id[1*], rokiah.kusumapradja@esaunggul.ac.id[2], intansilviana@esaunggul.ac.id[3]

ABSTRACT
Workplace accidents in hospitals can arise from human or environmental factors, highlighting the necessity of implementing Hospital Occupational Safety and Health (HOSH) measures. Preliminary study at X Hospital shows that work-related accidents persist, with the majority leading to physical injuries. This study aims to observe the impact of HOSH knowledge and the work environment on nurse workplace accidents, with safety behaviors serving as a mediating factor. The research utilizes a quantitative survey method with a cross-sectional design. A total of 123 nurses participated in the study. An analysis using Structural Equation Modeling (SEM) was conducted to assess the statistical impact. The findings indicate that improving Occupational Safety and Health (OSH) knowledge and enhancing the work environment can significantly reduce workplace accidents. The mediating role of safety behaviors further amplifies this effect. Both HOSH knowledge and the work environment have a positive significant impact on safety behaviors, while HOSH knowledge, the work environment, and safety behaviors each have a negative significant impact on workplace accidents

Keywords: Hospital Occupational Safety and Health Knowledge, Work Environment, Safety Behaviors, Workplace accidents, Structural Equation Modelling

Introduction

Workplace accidents in hospitals remain a significant concern despite efforts to implement Hospital Occupational Health and Safety (HOHS) programs. The application of HOHS is essential for minimizing workplace accidents. Understanding OHS and the work environment are capable to impact safety behaviors, with the expectation that these factors will reduce the frequency of workplace accidents. Previous studies also highlight that knowledge, attitudes, and safety practices are crucial components of a safety culture (Jung et al., 2020).

Data from various studies show a high prevalence of work-related injuries among healthcare workers, especially nurses, who are frequently exposed to risks such as needlestick injuries, musculoskeletal injuries, infections, and other hazards (Nayak et al., 2016; Arifuddin et al., 2023). Preliminary studies at X Hospital revealed that 53.3% of respondents reported workplace accidents, with common injuries including muscle strains, allergies, airborne infections, and sharp objects injuries. Based on this circumstantial, this study aims to analyze

the influence of OHS knowledge and the work environment on nurses' workplace accidents, with safety behaviors as a mediating factor at X Hospital.

Research Methods

This study is a quantitative cross-sectional study. The sample size is determined using a saturated sampling technique, where all members of the population are included as samples, comprising all 123 nurses at Hospital X. Data were collected using a questionnaire instrument with a Likert scoring system, and distributed to the respondents for completion. Thus, this study employs SEM analysis using the SmartPLS® software to address the research hypothesis. The research had acknowledged an ethical approval from the Ethics Administration Board of Esa Unggul University, Research Ethics Committee. The approval document is 0924-06.023/ DPKE-KEP/ FINAL-EA/ UEU/ VI/ 2024.

The independent variables are HOHS Knowledge (X1) and Work Environment (X2). The dependent variable is Workplace Accidents (Y). The mediating variable is Safety Behaviors (Z). The research model is illustrated in Figure 1. Based on the research model, the hypotheses generated in this study are:

H1: There is a significant influence of HOHS knowledge and the work environment on workplace accidents, mediated by safety behaviors.

H2: There is a significant influence of HOHS knowledge on safety behaviors.

H3: There is a significant influence of the work environment on safety behaviors.

H4: There is a significant influence of safety behaviors on workplace accidents.

H5: There is a significant influence of HOHS knowledge on workplace accidents.

H6: There is a significant influence of the work environment on workplace accidents.

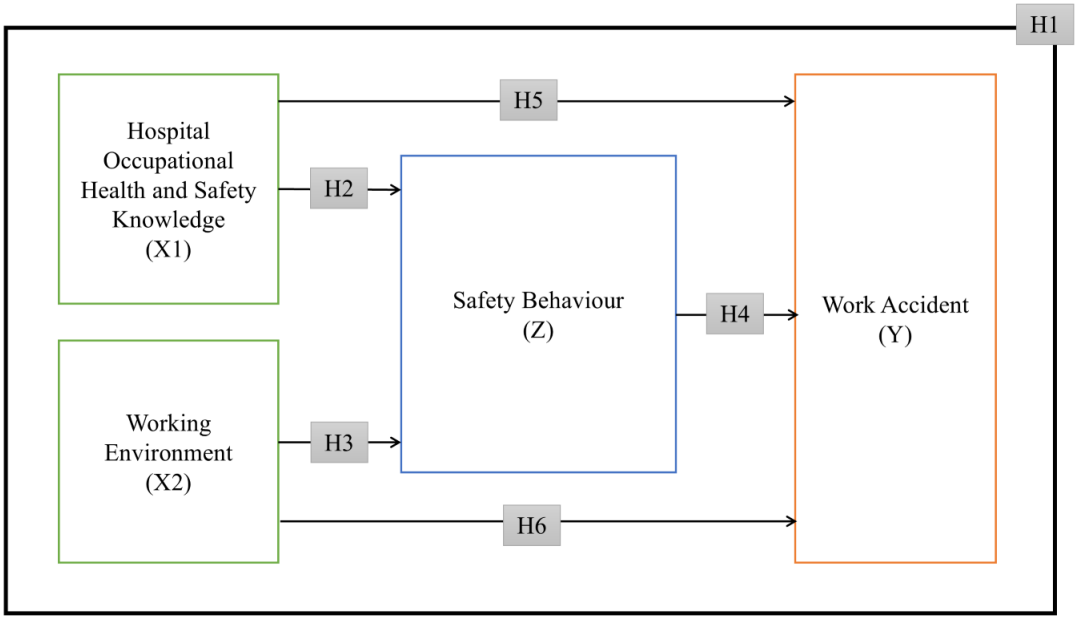

Figure 1. Research Model

Results and Discussion

The respondent characteristics data can be seen in Table 1, and the descriptive results based on calculated Likert score can be seen in Table 2.

Tabel 1. Respondent Characteristics

Respondent Characteristics		N	%	N Total (%)
Gender	Male	26	21.14%	123(100%)
	Female	97	78.86%	
Age (years old) Mean: 26.86	20 – 25	65	52.85%	123(100%)
	26 – 30	33	26.83%	
	31 – 35	16	13.01%	
	36 – 40	9	7.32%	
Education Background	Diploma 3	81	65.85%	123(100%)
	Diploma 4	5	4.07%	
	Undergraduate	4	3.25%	
	Profession	33	26.83%	
Employment (years)	< 5	30	24.39%	123(100%)
	5 – 10	44	35.77%	
	10 – 15	31	25.20%	
	> 15	18	14.63%	

Source: Primary data from questionnaires (2024)

Based on the respondent characteristics presented in Table 1, the majority are female, totaling 97, compared to 26 males. Most respondents are within the 20 to 25-year age range, by 65 individuals. The educational background of the majority is a diploma, with 81 respondents. The largest group by length of employment consists of 44 respondents who have been working for 5 to 10 years.

Tabel 2. Variable Matrix

No.	Variable	Average Likert Index	Respondent's Outcome	Attitude
1	HOHS Knowledge	98.88	High/Good	Expert
2	Work Environment	96.55	High/Good	Safety
3	Safety Behaviors	95.56	High/Good	Obedient
4	Workplace accidents	42.60	Low/Good	Aware

Source: Primary data from questionnaires (2024)

According to the average descriptive index results presented in the table 2, all variables in this study are classified as good. The variables of knowledge, work environment, and safety behaviors are rated as high or good. Likewise, the variable of workplace accidents is rated as low or good.

Structural Equation Modeling (SEM) Analysis

Outer Model Analysis

The results of the outer model testing, as depicted in Figure 2, indicate that all loading factor values exceed 0.70, and the Average Variance Extracted (AVE) values are above 0.5, confirming the validity of all indicator items in this study. Reliability testing further demonstrates that the Composite Reliability and Cronbach's Alpha values are above 0.7, establishing that all questionnaire indicators are reliable and consistent in measuring the variables. Moreover, the multicollinearity test shows that the Variance Inflation Factor (VIF) values for all variables fall between 1 and 10, signifying that the study has successfully passed the multicollinearity test, allowing it to proceed to the next stage.

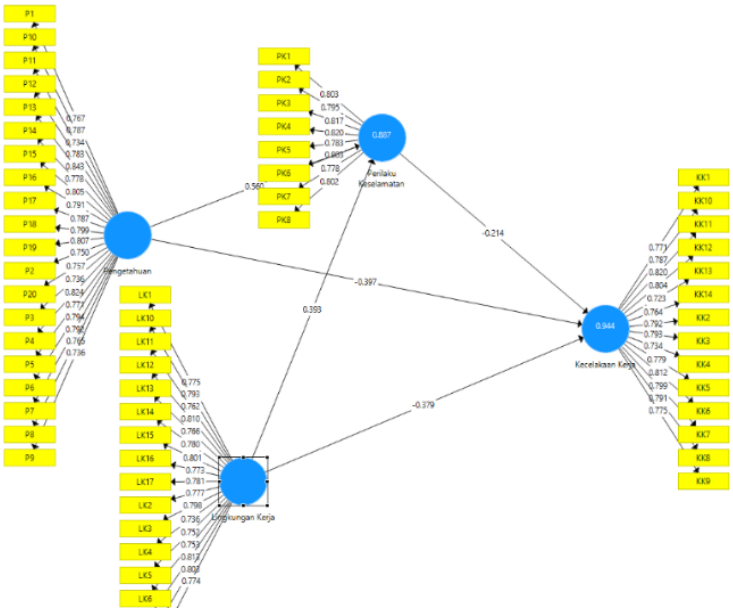

Figure 2. PLS Algorithm Outer Model

Source: SmartPLS® Versi 3.3 Outcome (2024)

Inner Model Analysis

In this study, inner model testing (structural model analysis) was conducted using bootstrapping techniques in SmartPLS® version 3.3, with a significance level set at 0.05. The results of the inner model testing are presented in Figure 3. The R-squared value for workplace accidents is 0.944, indicating that the variables of knowledge, work environment, and safety behaviors collectively explain 94.4% of the variance in workplace accidents, leaving the remaining 5.6% attributable to external factors. Additionally, the R-squared value for safety behaviors is 0.887, suggesting that knowledge and the work environment account for 88.7% of the variance in safety behaviors, with the remaining 11.3% influenced by other factors. Furthermore, the Q-Square calculation yielded a result of 0.993, indicating strong predictive relevance as the Q^2 value approaches one (1). The f-square values also reveal a strong effect of hospital occupational health and safety (HOHS) knowledge on workplace accidents, while the effect of safety behaviors on workplace accidents is weak. The influence of OHS knowledge and the work environment on safety behaviors is moderate, as is the influence of the work environment on workplace accidents. Additionally, a Standardized Root Mean-square Residual (SRMR) test was

conducted to evaluate model fit. With an SRMR value of 0.041, which is below the 0.08 threshold, the model demonstrates a good fit and is suitable for further analysis.

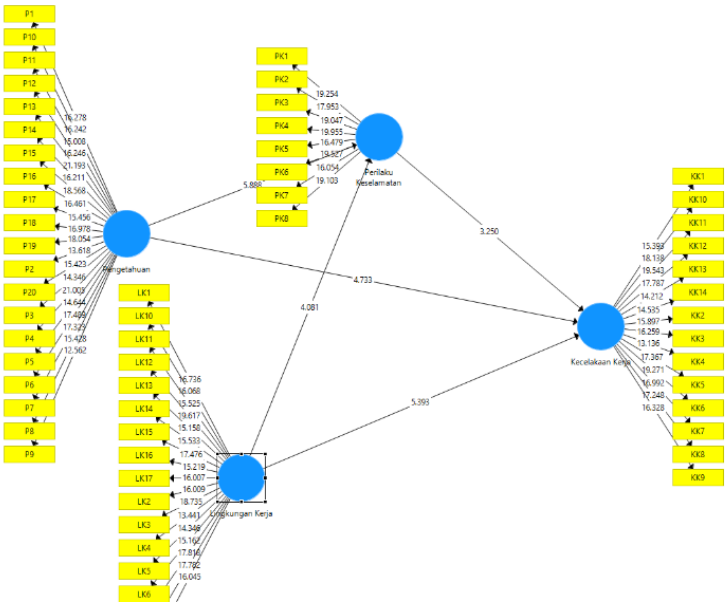

Figure 3. Bootstrapping (Inner Model)

Source: SmartPLS® Versi 3.3 Outcome (2024)

The next step comprises hypothesis analysis, with the results for path coefficient estimates and T-statistics detailed in Table 3 and Table 4.

Tabel 3. Path Coefficient Estimation and Statistical Analysis.

	Path Coefficients	***T-Statistics***	***P-Values***	**Annotation**
HOHS Knowledge → Safety Behaviors	0.560	5.888	0.000	Significant
Work Environment → Safety Behaviors	0.393	4.081	0.000	Significant
HOHS Knowledge → Workplace accident	-0.397	4.733	0.000	Significant
Work Environment → Workplace accident	-0.379	5.393	0.000	Significant
Safety Behaviors → Workplace accident	-0.214	3.250	0.001	Significant

Source: SmartPLS® Outcome (2024)

Tabel 3. Total Effect, Path Coefficient Estimation and Statistical Analysis

	Path Coefficients	Total Effect	*T-Statistics*	*P-Values*	Annotation

HOHS Knowledge → Safety Behaviors → Workplace accident	-0.120	-0.517	2.863	0.004	Significant
Work Environment → Safety Behaviors → Workplace accident	-0.084	-0.463	2.504	0.013	Significant

Source: SmartPLS® Outcome (2024)

DISCUSSION

Based on the aforementioned data and analysis, the following discussions are presented:

The Influence of Hospital Occupational Health and Safety (HOHS) Knowledge and Work Environment on Workplace Accidents: The Mediating Role of Safety Behavior

Hypothesis 1: There is a significant effect of Hospital OHS knowledge and the work environment on workplace accidents through safety behaviors as a mediating variable: Accepted. his hypothesis is substantiated by p-values less than 0.05 and t-statistics exceeding the critical value of 1.96. The findings demonstrate that HOHS knowledge and the work environment significantly contribute to the reduction of workplace accidents, with respective impacts of 39.7% and 37.9%. When safety behaviors are incorporated as a mediating factor, these effects increase to 51.7% and 46.3%. These results align with Benner's (1975) epidemiological model and corroborate previous studies, including those by Hermanto et al. (2023) and Faller et al. (2018), which suggest that safety behaviors had an important role in the relationship between the work environment, OHS knowledge, and workplace accidents.

Descriptive analysis indicates that HOHS knowledge, the work environment, and safety behaviors are all highly regarded, whereas the incidence of workplace accidents is rated as low. This reflects a favorable condition within the hospital. However, the ultimate objective remains the achievement of zero accidents across all areas. Overall, the study provides a comprehensive overview, revealing that respondents possess expert OHS knowledge, operate in a safe work environment, and adhere to safety behaviors, all of which contribute to the low incidence of workplace accidents

The Influence of Hospital Occupational Health and Safety (HOHS) Knowledge on Safety Behaviors

Hypothesis 2: The Impact of HOHS Knowledge on Safety Behaviors: Accepted. The hypothesis is validated by a p-value of 0.000, well below the 0.05 threshold, and a t-statistic of 5.888, which surpasses the critical value of 1.96. These results indicate a significant positive correlation between higher Hospital Occupational Health and Safety (HOHS) knowledge and improved safety behaviors. Statistical analysis reveals that an increase in HOHS knowledge can enhance safety behaviors by 56%. Mansdrof (2019) and Vimercati (2022) describe OHS knowledge as the understanding and application of safety and health principles to prevent accidents. Similarly, studies by Peterson and Mayhew (2018) and Prihantini et al. (2022) suggest that OHS knowledge is integral in fostering a safety culture that mitigates workplace accidents.

Descriptive data further indicate that both HOHS knowledge and safety behaviors are rated as good. This positive assessment highlights the influence of strong OHS knowledge on

safety behaviors, which is crucial in establishing a safety culture within hospitals that prioritizes safety and health. This culture fosters collective behaviors that support safety and health initiatives. Equipped with adequate OHS knowledge, medical personnel and hospital staff are better prepared to implement proper safety procedures and practices. Ultimately, OHS knowledge plays a crucial role in shaping safety behaviors within hospitals, contributing to a safer environment for all involved.

The Influence of Work Environment on Safety Behaviors.

Hypothesis 3: There is a significant effect of the work environment on safety behaviors: Accepted. This hypothesis is supported by a p-value of 0.000, well below the 0.05 significance threshold, and a t-statistic of 4.081, which exceeds the critical value of 1.96. These findings suggest a significant positive relationship between an improved work environment and enhanced safety behaviors. Statistical analysis indicates that enhancements in the work environment can lead to a 39.3% increase in safety behaviors. Previous research underscores the critical role of the work environment in influencing safety behaviors. Tamene et al. (2022) emphasized the importance of both the work environment and individual responsibility in reducing unsafe behaviors, highlighting the crucial role of management in providing necessary resources. Similarly, Mei et al. (2020) identified a strong connection between organizational support and improved safety outcomes through safety behaviors. Mohammadfam et al. (2022) also noted that the safety climate within the work environment has both direct and indirect effects on safety behaviors.

Descriptive data further reveal that both the work environment and safety behaviors are rated positively. This finding aligns with previous research indicating that a favorable work environment positively impacts safety behaviors. An environment that promotes a safety culture, where all hospital members are accountable for safety, can enhance adherence to safety procedures and reduce workplace accidents. Support from hospital management, manifested through safety training, provision of personal protective equipment (PPE), and routine supervision, can elevate workers' safety knowledge and awareness. Overall, a supportive and well-maintained work environment plays a crucial role in influencing safety behaviors. By emphasizing these factors, organizations can foster a safer work environment and improve safety behaviors among employees.

The Influence of Safety Behaviors on Workplace Accidents

Hypothesis 4: There is a significant effect of safety behaviors on workplace accidents: Accepted. This hypothesis is supported by a negative path coefficient, a p-value of 0.000 (below the 0.05 threshold), and a t-statistic of 3.250 (exceeding the critical value of 1.96). These results suggest that higher safety behaviors are associated with a reduction in workplace accidents. Statistical analysis indicates that enhanced safety behaviors can decrease workplace accidents by 21.4%. Faller et al. (2018) observed this effect among healthcare practitioners in the Philippines, while Diannita et al. (2020) similarly identified a significant impact of safety behaviors on workplace accidents in their research. Additionally, Lutovska et al. (2021) highlighted that awareness of workplace safety significantly influences working conditions.

Descriptive data show that safety behaviors are rated highly, while workplace accidents are rated as low. This finding is consistent with previous research, which suggests that positive

safety behaviors have a negative impact on the incidence of workplace accidents. Safety behaviors are critical in preventing workplace accidents. Initiatives aimed at promoting positive safety behaviors directly contribute to creating a safer, injury-free work environment. By fostering a safety culture, providing adequate training, ensuring adherence to procedures, and encouraging active participation from all employees, organizations can significantly reduce both the frequency and severity of workplace accidents. Positive safety behaviors ultimately lead to a safer and more productive work environment for everyone.

The Influence of Hospital OHS Knowledge on Workplace accidents.

Hypothesis 5: There is a significant negative effect of HOHS knowledge on workplace accidents: Accepted. This hypothesis is supported by a negative path coefficient, a p-value of 0.000 (below the 0.05 threshold), and a t-statistic of 4.733 (exceeding the critical value of 1.96). These results indicate that an increase in Hospital Occupational Health and Safety (OHS) knowledge is associated with a decrease in workplace accidents. Statistical analysis reveals that improved OHS knowledge can reduce workplace accidents by 39.7%. This finding is consistent with previous studies by Diannita et al. (2020) and Faller et al. (2018), which also reported a significant impact of OHS knowledge on reducing workplace accidents. Similarly, Wahyuni et al. (2022) identified a relationship between OHS knowledge and accident rates among nurses in hospitals.

Descriptive data indicate that OHS knowledge is rated good, while workplace accidents are rated as low. This aligns with the aforementioned studies, which suggest that strong OHS knowledge has a negative effect on the incidence of workplace accidents. OHS knowledge equips workers with the essential skills to identify and mitigate risks within the work environment. A thorough understanding of safety and health principles enables individuals to recognize potential hazards and prevent accidents. With enhanced knowledge, workers are more likely to follow safety procedures and protocols, thereby contributing to a safer workplace environment.

The Influence of the work environment on workplace accidents.

Hypothesis 6: There is a significant negative effect of the work environment on workplace accidents: Accepted. This hypothesis is supported by a negative original sample value, a p-value of 0.000 (below 0.05), and a t-statistic of 5.393 (exceeding the critical value of 1.96). These findings suggest that an improved work environment is associated with a reduction in workplace accidents. Statistical analysis confirms that enhancements in the work environment can decrease workplace accidents by 37.9%. This result is consistent with theories on workplace accidents proposed by experts such as Heinrich (1959) and Gordon (1949), who asserted that the work environment significantly influences accident rates. Additionally, studies by Tamene et al. (2022) and Widjaja and Abdullah (2021) highlight the critical role of a supportive work environment in mitigating risk factors that contribute to workplace accidents.

Descriptive data reflect that the work environment is rated as high/good and workplace accidents are rated as low. This aligns with the studies mentioned, which indicate that a positive work environment negatively affects the incidence of workplace accidents. A well-maintained work environment significantly influences accident rates. Unsafe or unsupportive environments increase accident risks. By addressing physical aspects, equipment, machinery, organizational practices, and work procedures, and by fostering a strong safety culture, organizations can

create a safer and more productive work environment. Such efforts protect worker health, enhance operational efficiency, and reduce accident-related costs. Properly designed and managed work environments can substantially lower workplace accident rates.

Key Findings and Managerial Implications

The study statistically demonstrates that Hospital Occupational Health and Safety (HOHS) knowledge, the work environment, and safety behaviors are significantly and negatively related to workplace accidents among nurses. It also reveals that hospital OHS knowledge predominantly influences safety behaviors, whereas the work environment primarily impacts the occurrence of workplace accidents. Furthermore, the study shows that safety behaviors mediate the relationship between OHS knowledge, the work environment, and the reduction of workplace accidents.

The hospital has evidently made significant strides in reducing workplace accidents through the enhancement of Hospital Occupational Health and Safety (HOHS) knowledge, continuous improvement of the work environment, and promotion of safety behaviors. Research indicates that hospital staff possess robust OHS knowledge, benefit from a high-quality physical and non-physical work environment, and demonstrate commendable safety behaviors, all of which contribute to the low incidence of workplace accidents. Nevertheless, the ultimate objective remains achieving zero accidents, necessitating sustained efforts from both management and employees. To this end, the study outlines several managerial implications aimed at empowering the Hospital OHS Teams or Unit through comprehensive support from management, encompassing both material and non-material resources. Implementation of tailored strategies may consist of:

- Strengthening Hospital OHS programs to ensure their effective implementation.
- Systematic identification of risks within the hospital.
- Provision of adequate and necessary safety equipment.
- Integration of technology into Hospital OHS initiatives.

These strategies collectively contribute to fostering a safety culture and advancing towards a zero-accident environment in the hospital.

Conclusion

Based on the research results, it can be concluded that workplace accidents can be mitigated by enhancing Hospital Occupational Health and Safety (OHS) knowledge and improving the work environment. Safety behaviors serve as a mediating factor, amplifying the effect of HOHS knowledge and the work environment on the reduction of workplace accidents. To effectively implement these insights, hospital management may adopt a strategic approach aimed at enhancing these areas. The following recommendations are proposed to assist the hospital in cultivating a safer work environment and achieving a sustained reduction in workplace accidents:

a. Establish a Competent OHS Team: The hospital management should form a skilled Hospital Occupational Health and Safety (OHS) team, equip the facility with essential safety support tools, and allocate a dedicated budget to ensure the sustainability of OHS

programs.

b. Promote Safety Behaviors: Hospital management can implement policies and regulations related to safety behaviors. Additionally, regular reminders can be issued through routine text messages or posters displayed in work areas.
c. Utilize Technology: Management should consider leveraging technology, including safety management software or mobile applications, to monitor and enhance safety behaviors.

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