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The Relationship Between Occupational Safety and Health Management and Workplace Accidents in the Laboratory at Wahidin Sudirohusodo General Hospital, Makassar

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Abstract: Clinical laboratory services are crucial for public health, requiring adequate facilities, modern technology, and well-trained personnel to meet safety standards. In line with the Indonesian Minister of Health Regulation No. 66 of 2016, Occupational Safety and Health (OSH) systems are essential to safeguard hospital staff, patients, visitors, and the environment by preventing accidents and illnesses. **Objective**: This study aims to investigate the relationship between Occupational Safety and Health Management components (K3 Promotion, Training, Supervision, Investigation, Reporting) and workplace accidents in the laboratory at Dr. Wahidin Sudirohusodo General Hospital, Makassar. **Methodology**: A descriptive analytical approach with a cross-sectional design was used, involving 110 laboratory staff selected through total sampling. Data were collected using structured questionnaires and analyzed with the Chi-Square statistical test. **Findings**: A significant relationship was found between Training and workplace accidents ($\rho = 0.041$), while K3 Promotion ($\rho = 0.141$), Supervision ($\rho = 0.153$), Investigation ($\rho = 0.575$), and Reporting ($\rho = 0.078$) did not show significant associations. **Implications**: This study emphasizes the need to re-socialize OSH practices to all hospital staff, highlighting that work accidents should include all incidents, not just needle-stick injuries, and must be reported for preventive measures. **Originality**: This research offers new insights into the importance of training in improving OSH outcomes in hospital laboratories, providing valuable guidance for optimizing OSH management in healthcare settings.

Keywords: K3 Promotion; Training; Supervision; Investigation; Work accidents.

INTRODUCTION

The implementation of an effective Occupational Safety and Health Management System (OSHMS) is crucial in hospital laboratories, where high-risk environments are common due to potential hazards such as hazardous chemicals, fire risks, and ergonomic challenges. Although hospitals are generally considered safe, workplace accidents and occupational diseases remain prevalent, posing significant risks to staff, patients, and visitors (Kemenkes, 2016). Despite the existence of regulations, including the Indonesian

Minister of Health Regulation No. 66 of 2016, which outlines OSHMS guidelines, many hospitals face difficulties in effectively applying these standards. These shortcomings, particularly in areas like risk management and training, have led to ongoing accidents, thus affecting the safety and quality of healthcare services, patient satisfaction, and hospital reputation (Ismail, 2018). This gap underscores the importance of research to identify the factors influencing the effectiveness of OSHMS and explore strategies for its optimization.

Medical laboratories in hospitals are particularly vulnerable to workplace accidents due to the frequent exposure of laboratory personnel to biological, chemical, physical, and ergonomic hazards. Studies highlight that laboratory workers face risks such as needle-stick injuries, exposure to infectious diseases like Hepatitis and HIV, and physical injuries from improper equipment handling (Mahasih Pramusiwi et al., 2021; Ntinyari Tait et al., 2018). Despite the establishment of regulatory frameworks like the Occupational Safety and Health Act (OSHA), the implementation of effective OSH systems in these settings has been inadequate. Inadequate training, insufficient safety equipment, and poor adherence to safety protocols contribute to ongoing risks. Globally, healthcare environments continue to report high numbers of work-related injuries and diseases, impacting both healthcare workers and patients (Ntinyari Tait et al., 2018). Strengthening OSH practices in medical laboratories is critical to mitigating these risks and ensuring the safety of all involved.

Previous research on systematic OSH management in hospital laboratories has emphasized the importance of identifying, assessing, and controlling risks to maintain a safe working environment. Studies such as those by (Pawłowska, 2010; Santoso et al., 2019) demonstrate the value of structured OSH management systems, such as ISO 45001, in mitigating risks like exposure to hazardous chemicals and biological pathogens in hospital laboratories. While these systems provide clear procedures for risk management and continuous improvement (Manni et al., 2023; Rahmadani & Modjo, 2021) challenges persist, particularly with insufficient training and inconsistent supervision, which impact the overall effectiveness of OSHMS (Fitriah, 2019). Although these systems are essential, gaps remain in fully integrating all OSH elements, signaling the need for further research to optimize their implementation and improve safety in hospital laboratories (Faller et al., 2018; Suharni, 2024).

In Indonesia, the implementation of OSH regulations in hospitals has been insufficient, despite the existence of several key policies such as the Health Law No. 36 of 2009 and the

National Social Insurance System (NSIS), which were designed to improve healthcare quality and safety (Hermawan & Blakely, 2017). Studies have shown that while adherence to OSH standards is critical for mitigating risks, challenges such as limited infrastructure, insufficient resources, and weak enforcement hinder the effective implementation of OSH systems (Damayanty et al., 2022). Moreover, the commitment of hospital management and involvement from all stakeholders are key to ensuring the successful application of OSH practices (Lamba et al., 2019). Despite these efforts, gaps remain in ensuring comprehensive compliance with OSH regulations, particularly in smaller, under-resourced hospitals, highlighting the need for improved infrastructure, stronger law enforcement, and better stakeholder engagement to enhance safety outcomes in hospital settings.

Effective OSH management involves several key components: management leadership and employee involvement, training, accident reporting and investigation, OSH promotion, and the use of technology (Coble, 2005). Research indicates that well-implemented OSH systems, including consistent risk assessments, training, and safety promotion, significantly reduce accidents in various sectors, including health (Abidin et al., 2021; Arocena & Núñez, 2009). In manufacturing, for instance, the application of OSH principles led to a 76.5% compliance rate, which contributed to a reduction in workplace accidents (Abidin et al., 2021). Additionally, OSH committees have been shown to improve safety outcomes by fostering stronger safety standards without negatively impacting productivity (Boudreau, 2024). However, issues such as negligence, inadequate training, and underreporting of incidents continue to hinder the effectiveness of OSH systems (Palacios, 2010). Addressing these challenges through better planning, management commitment, and enforcement is essential for enhancing OSH practices and reducing workplace accidents in hospital laboratories.

This research aims to address the gaps identified in previous literature by exploring the factors that influence the implementation of OSHMS in hospital laboratories, particularly in Indonesia. Although existing regulations mandate OSH in hospitals, their implementation remains suboptimal, especially in areas such as risk management, supervision, and training (Damayanty et al., 2022; Rahmadani & Modjo, 2021). The study will investigate the effectiveness of OSH training programs, evaluate the role of management leadership, and assess the accident reporting and investigation systems. This research aims to provide practical recommendations to optimize OSHMS in hospital laboratories, improving safety and reducing workplace accidents.

The hypothesis is that the implementation of an effective OSHMS in hospital laboratories is influenced by three key factors: management commitment, training effectiveness, and the presence of a robust accident reporting and investigation system. It is expected that strong leadership and commitment from management will positively impact the integration of OSH components, leading to a safer working environment and reduced workplace accidents. Additionally, the study hypothesizes that well-executed training programs will increase safety awareness among staff, thereby reducing occupational hazards. Finally, the presence of a comprehensive reporting and investigation system will facilitate effective corrective actions and continuous improvements, ultimately minimizing workplace accidents in hospital laboratories. This study will test these hypotheses by analyzing the relationships between these variables and evaluating their impact on safety outcomes in hospital laboratories, particularly within the context of Indonesian healthcare.

RESEARCH METHOD

Study Design and Setting

The relationship between Occupational Safety and Health (OSH) management components and workplace accidents among laboratory personnel at Dr. Wahidin Sudirohusodo General Hospital, Makassar, is the focus of this research. The analysis includes all healthcare workers employed in the medical laboratory department, totaling 110 laboratory personnel. The research aims to evaluate how effectively OSH management systems are implemented and their impact on safety outcomes within the hospital laboratory setting.

Population and Sampling Technique

The study population consisted of all medical laboratory healthcare workers employed at Dr. Wahidin Sudirohusodo General Hospital, Makassar. A total sampling technique was applied, involving all 110 eligible laboratory healthcare workers. This technique was chosen to ensure comprehensive representation of the study population, minimize sampling bias, and enhance the external validity of the findings. Given the relatively small and accessible population size, total sampling allowed for a more accurate depiction of OSH management implementation and workplace accident occurrences in the laboratory setting.

Instrument Development and Validation

Data were collected using a structured questionnaire developed based on relevant OSH regulations, previous empirical studies, and hospital OSH guidelines. The questionnaire covered key OSH management components, including OSH promotion, training, supervision, investigation, and reporting, as well as the occurrence of workplace accidents.

Prior to data collection, the questionnaire was tested for validity and reliability. Content validity was assessed through expert review involving OSH and public health specialists to ensure the relevance and clarity of each item. Construct validity was evaluated using correlation analysis, while reliability testing was conducted using Cronbach's alpha to assess internal consistency. Only items that met acceptable validity and reliability criteria were included in the final instrument.

Data Collection Procedure

Primary data were obtained through self-administered questionnaires distributed to all laboratory healthcare workers who met the inclusion criteria. Respondents were provided with clear instructions, and confidentiality was assured to encourage honest responses. Secondary data related to accident reporting were collected from the Occupational Health and Safety (K3) unit of Dr. Wahidin Sudirohusodo General Hospital to support data triangulation and enhance the credibility of the findings.

Data Analysis

Data analysis was performed using statistical software (SPSS).

1. Univariate analysis was conducted to describe the frequency distribution and percentages of each independent variable (OSH promotion, training, supervision, investigation, and reporting) and the dependent variable (workplace accidents).
2. Bivariate analysis was conducted to examine the relationship between OSH management components and workplace accidents. The Chi-Square test was used for hypothesis testing, with a significance level set at $p < 0.05$.

RESULT AND DISCUSSION

Bivariate analysis was conducted to analyze the relationship between occupational safety and health management (K3 promotion, training, supervision, investigation and reporting) and work accidents.

Table 1. Relationship between K3 Promotion and Work Accidents

K3 Promotion	Work Accidents				Total		α = 0,05
	Never		Ever				
	n	%	n	%	n	%	
Never	16	14,5	2	1,8	18	16,4	
ever	63	57,3	29	26,4	92	83,6	ρ = 0,141
Total	**79**	**86,2**	**31**	**13,8**	**110**	**100**	

A total of 18 respondents (16.4%) were never exposed to K3 promotion where there were 16 respondents (14.5%) who had never had a work accident and 2 respondents (5.2%) admitted to having had a work accident. In addition, there were 92 respondents (83.6%) who stated they had been exposed to K3 promotion where there were 63 respondents (57.3%) who had never had a work accident and 29 respondents (26.4%) admitted to having had a work accident. The results of the Chi-Square statistical test obtained a value of ρ = 0.141 > α = 0.05 so that there was no significant relationship between K3 promotion and work accidents.

Table 2. Relationship between K3 training and work accidents

Training	Work Accidents				Total		α = 0,05
	Never		ever				
	n	%	n	%	n	%	
Never	17	15,5	1	0,9	18	16,4	
ever	62	56,4	30	27,3	92	83,6	ρ = 0,041
Total	**79**	**71,8**	**31**	**28,2**	**110**	**100**	

A total of 18 respondents (16.4%) had never received K3 training where 17 respondents (15.5%) had never had a work accident and 1 respondent (0.9%) stated that they had had a work accident. In addition, there were 92 respondents (83.6%) stated that they had received K3 training where 62 respondents (56.4%) had never had a work accident and 30 respondents (27.3%) stated that they had experienced a work accident.

The results of the Chi-Square statistical test obtained a value of ρ = 0.041 <α = 0.05 meaning that there is a significant relationship between K3 training and work accidents.

Table 3. Relationship between K3 Supervision and Work Accidents

K3 Supervision	Work Accidents				Total		α = 0,05
	Never		ever				
	n	%	n	%	n	%	

Never	19	17,3	3	2,7	22	20,0	
ever	60	54,5	28	25,5	88	80,0	ρ = 0,153
Total	**79**	**71,8**	**31**	**28,2**	**110**	**100**	

Regarding occupational health and safety supervision, 19 respondents (17.3%) had never experienced a work accident, and 3 respondents (2.7%) admitted to having experienced a work accident.

Furthermore, 88 respondents (80.0%) stated they had received occupational health and safety supervision, of which 60 respondents (54.5%) had never experienced a work accident, and 28 respondents (25.5%) admitted to having experienced a work accident. The Chi-Square statistical test showed a value of $\rho = 0.153 > \alpha = 0.05$, indicating no significant relationship between occupational health and safety supervision and work accidents.

Table 4. Relationship between K3 Investigations and Work Accidents

Investigation	**Work Accidents**				**Total**		**α = 0,05**
	Never		**ever**				
	n	%	**n**	%	**n**	%	
Not Done	4	3,6	0	0,0	4	3,6	
Done	75	68,2	31	25,5	106	80,0	ρ = 0,575
Total	**79**	**71,8**	**31**	**28,2**	**110**	**100**	

A total of 4 respondents (3.6%) stated that no K3 investigation had ever been conducted, where 4 respondents (3.6%) had never had a work accident and no respondents admitted to having had a work accident. In addition, there were 106 respondents (80.0%) stating that K3 investigations were conducted, where 75 respondents (68.2%) had never had a work accident and 31 respondents (25.5%) admitted to having had a work accident. The results of the Chi-Square statistical test with the alternative Fisher's Exact Test obtained a value of $\rho = 0.575 > \alpha = 0.05$, meaning there was no significant relationship between K3 investigations and work accidents.

Table 5. Relationship between K3 Reports and Work Accidents

Reported	**Work Accidents**				**Total**		**α = 0,05**
	Never		**ever**		**n**	%	
	n	%	**n**	%	108	98,2	
Not Reported	79	71,8	29	26,4	2	1,8	
Reported	0	0,0	2	1,8	**110**	**100**	ρ = 0,078
Total	**79**	**71,8**	**31**	**28,2**	**Total**		

A total of 108 respondents (98.2%) did not report incidents, of which 79 respondents (71.8%) had never experienced a work accident, while 29 respondents (26.4%) admitted to having experienced a work accident. Furthermore, two respondents (1.8%) reported a needlestick injury, a report consistent with the report obtained from the K3RS Installation.

The results of the Chi-Square statistical test using the alternative Fisher's Exact Test obtained a value of $\rho = 0.078 > \alpha = 0.05$, indicating no significant relationship between K3 reports and work accidents.

The analysis revealed that most respondents had been exposed to OSH promotion and training activities. However, workplace accidents were still reported, indicating that exposure alone does not necessarily guarantee accident prevention. The results of the Chi-Square tests showed varying associations between OSH management components and workplace accidents.

The relationship between OSH promotion and workplace accidents was not statistically significant ($\rho = 0.141$). Similarly, OSH supervision ($\rho = 0.153$), incident investigation ($\rho = 0.575$), and OSH reporting ($\rho = 0.078$) showed no significant association with workplace accidents. In contrast, OSH training demonstrated a statistically significant relationship with workplace accidents ($\rho = 0.041$), indicating that training plays a key role in influencing occupational safety outcomes among laboratory personnel.

DISCUSSION

This study aimed to analyze the relationship between OSH management implementation including promotion, training, supervision, investigation, and reporting and workplace accidents among laboratory personnel at Dr. Wahidin Sudirohusodo General Hospital, Makassar. The cross-sectional design enabled the identification of associations between OSH management components and accident occurrence within a high-risk laboratory environment.

Relationship between OSH Promotion and Workplace Accidents

The findings indicate no significant relationship between OSH promotion and workplace accidents ($\rho = 0.141$). Although the majority of respondents reported receiving OSH promotion, accidents continued to occur. This suggests that OSH promotion alone, particularly when delivered in a general or passive manner, may be insufficient to directly influence safe work behavior.

This result is consistent with (Hartati, 2006), who noted that OSH promotion primarily serves an informative and persuasive function and may not lead to behavioral change unless supported by consistent supervision, training, and a strong safety culture. In laboratory settings, where risks are highly specific and technical, general safety messages may not adequately address practical hazards encountered during daily activities.

Relationship between OSH Training and Workplace Accidents

Unlike other OSH components, OSH training showed a statistically significant relationship with workplace accidents ($\rho = 0.041$). This finding indicates that training has a meaningful impact on accident prevention among laboratory personnel. Workers who receive structured OSH training are more likely to understand potential hazards, comply with standard operating procedures (SOPs), and correctly use personal protective equipment (PPE).

This result supports previous studies by (Hanifah, 2024), which found that regular and job-specific OSH training significantly reduces workplace accidents by improving workers' knowledge, skills, and safety awareness. In laboratory environments, training that focuses on biological, chemical, and mechanical hazards is particularly critical.

However, the occurrence of accidents among trained workers suggests that training effectiveness should be evaluated periodically. Hospitals should not only provide training but also assess its relevance, delivery methods, and frequency. Regular refresher training and competency-based evaluations are recommended to ensure that training outcomes translate into sustained safe work practices, in line with Minister of Health Regulation No. 66 of 2016 on Hospital Occupational Safety and Health.

Relationship between OSH Supervision and Workplace Accidents

The absence of a significant relationship between OSH supervision and workplace accidents ($\rho = 0.153$) may indicate that supervision is not conducted consistently or directly during high-risk laboratory activities. Supervision that is primarily administrative or documentation-based may fail to detect unsafe behaviors or hazardous conditions in real time.

According to (Suma`mur, 1996), effective OSH supervision must be continuous, active, and carried out directly in the workplace. Therefore, this finding highlights the need

to strengthen on-site supervision, particularly during procedures involving hazardous materials or equipment.

Relationship between OSH Investigation and Workplace Accidents

The analysis showed no significant relationship between OSH investigation and workplace accidents ($\rho = 0.575$). This result may be explained by the reactive nature of investigations, which are typically conducted after accidents occur. As stated by PMK (Perdhaki, 2000), accident investigations function primarily as learning tools to prevent recurrence rather than as direct preventive measures.

The effectiveness of investigations depends on the extent to which corrective actions are implemented and monitored. Without systematic follow-up, investigation findings may have limited impact on reducing future accidents.

Relationship between OSH Reporting and Workplace Accidents

The findings also revealed no significant relationship between OSH reporting and workplace accidents ($\rho = 0.078$). The very low number of reported incidents suggests the presence of underreporting among laboratory personnel. Minor incidents, such as needlestick injuries, are often perceived as insignificant and therefore not reported.

This finding aligns with (Pulungsih D.; Soeroso, S., 2005), who reported that underreporting is commonly influenced by fear of blame, lack of feedback, and limited awareness of reporting procedures. To address this issue, hospitals should promote a non-punitive reporting culture and emphasize that all incidents, including near misses, must be reported as part of an effective OSH management system.

Practical Implications

Based on these findings, hospitals are encouraged to:

a. Conduct regular evaluations of OSH training programs, focusing on content relevance, delivery methods, and training frequency.
b. Strengthen direct, on-site OSH supervision, particularly during high-risk laboratory procedures.
c. Ensure follow-up and monitoring of investigation recommendations to prevent accident recurrence.

d. Promote a transparent and non-punitive reporting culture to improve incident reporting and organizational learning.

CONCLUSION

Based on the results of statistical analysis and discussion, this study concludes that occupational safety and health (OSH) training has a significant relationship with the occurrence of workplace accidents among laboratory personnel at Dr. Wahidin Sudirohusodo General Hospital, Makassar. This finding highlights the critical role of structured and effective OSH training in improving safety awareness and reducing occupational risks in laboratory settings.

To strengthen accident prevention efforts, hospitals are recommended to implement regular and scheduled OSH training programs, particularly training that is technically oriented and tailored to laboratory activities involving biological, chemical, and mechanical hazards. Refresher training should be conducted periodically to ensure that laboratory personnel maintain up-to-date knowledge and competencies in safe work practices.

In addition, direct and routine on-site supervision should be enhanced, especially during high-risk laboratory procedures. Active supervision enables early identification of unsafe behaviors and hazardous conditions, thereby reducing the likelihood of workplace accidents.

The hospital is also encouraged to strengthen the occupational accident reporting system by promoting a transparent and non-punitive reporting culture. All workplace incidents, including minor accidents and near-miss events, should be reported and documented in detail to support accurate incident records and continuous improvement of the OSH management system. The K3RS team should proactively socialize reporting procedures and ensure that all laboratory personnel understand that occupational accidents are not limited to needlestick injuries but include all incidents occurring during work activities.

Overall, consistent training, strengthened supervision, and comprehensive reporting are essential to improving OSH performance and minimizing workplace accidents in hospital laboratory environments.

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