

Implementing OSH-MS in North Sumatra's Hospitals and Public Health Centers: Challenges and Best Practices

Herlina J. EL-MatURY^{1*}, Nabila Syahlan², Mohd Rafee B. Baharuddin³,
Rizliana Anggita⁴

^{1,4} Faculty of Public Health, Institut Kesehatan Deli Husada Deli Tua, Deli Serdang, Sumatera Utara, 20355, Indonesia

² Master Program of Occupational Safety and Health, Department of Occupational Safety and Health, Faculty of Public Health, Universitas Indonesia, Depok, West Java, 16424, Indonesia

³ Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia

*Corresponding author: herlinajelmatury.hjem@gmail.com

ABSTRACT

Background: Occupational Safety and Health Management Systems (OSH-MS) are essential for protecting healthcare workers and ensuring safe service delivery in healthcare facilities.

Purpose: This study aimed to assess and compare the implementation of OSH-MS in hospitals and primary health centres using a principle-based framework.

Methods: A cross-sectional assessment was conducted in six hospitals and seven primary health centres, evaluating five OSH-MS principles: establishing OHS policies, OSH plans, OHS plan implementation, OHS performance monitoring and evaluation, and OHS performance review and improvement. Data were collected through document review and verification of implementation evidence, and achievement was analysed descriptively as percentages.

Results: The results reveal substantial variation in OSH-MS implementation, with overall achievement ranging from 14% to 88%. OSH planning and implementation showed relatively high achievement across most facilities, indicating that operational safety measures are generally in place. In contrast, establishing OHS policies, monitoring and evaluation, and performance review and improvement demonstrated consistently lower achievement, particularly in several primary health centres. Hospitals generally performed better than primary health centres, although variability was observed within both groups.

Conclusion: In conclusion, OSH-MS implementation in healthcare facilities remains uneven and predominantly focused on operational activities, with limited emphasis on governance, monitoring, and continuous improvement. Strengthening leadership commitment, formal OHS policies, and systematic monitoring and review mechanisms is necessary to achieve comprehensive and sustainable OSH-MS implementation, especially in primary health care settings.

Keywords: Health Care, Health Service, Management, Public

Received May 10, 2026; Revised June 12, 2026; Accepted July 3, 2026

DOI: <https://doi.org/10.30994/jnp.v9i4.1068>



The Journal of Nursing Practice, its website, and the articles published there in are licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

BACKGROUND

Occupational Safety and Health (OSH) is a critical component of healthcare system performance due to the inherently hazardous nature of healthcare work. Healthcare workers are routinely exposed to biological agents, hazardous chemicals, physical and ergonomic risks, and psychosocial stressors. Recent evidence shows that healthcare workers experience higher rates of occupational injuries and work-related illnesses compared to other sectors, including needlestick injuries, musculoskeletal disorders, and work-related stress, which negatively affect worker well-being and service quality (Kartika et al., 2024; Safitri et al., 2024). Although Occupational Safety and Health Management Systems (OSH-MS) are widely recognized as an effective approach to controlling workplace risks through structured planning, implementation, monitoring, and continuous improvement, studies published in the last five years indicate that their implementation in healthcare facilities remains inconsistent. Research in hospitals and primary health centres has shown that operational aspects of OSH, such as hazard control measures and use of personal protective equipment, are more frequently implemented than governance components, including leadership commitment, formal OHS policy establishment, and systematic monitoring (Lestari & Nasrifah, 2024; Safitri et al., 2024). Weak monitoring systems contribute to underreporting of incidents and limited corrective action, reducing the effectiveness of OSH-MS (Mandowa et al., 2025).

Comparative studies further demonstrate disparities between hospitals and primary health centres. Hospitals generally achieve higher OSH-MS performance due to better organizational structures and resource availability, while primary health centres often face constraints related to funding, managerial capacity, and staff competency development (Prasetyo et al., 2025; Siswanto & Opoku Agyemang, 2025). Recent evaluations of OSH-MS in primary healthcare settings report low achievement in performance monitoring, evaluation, and continuous improvement, despite the presence of basic OSH planning documents (Purba et al., 2025). In Indonesia, regulatory frameworks mandate the integration of OSH into healthcare management systems; however, empirical studies suggest that implementation is frequently compliance-oriented and focused on administrative fulfilment rather than a fully functioning management cycle (Purba et al., 2025; Safitri et al., 2024). Systematic reviews published within the last five years confirm that monitoring, evaluation, and review remain the weakest components of OSH-MS in healthcare settings (Pradana & Iqbal, 2023). Despite this growing body of evidence, comprehensive comparative assessments using a principle-based OSH-MS framework across hospitals and primary health centres are still limited.

OBJECTIVE

This study aims to assess and compare the implementation of the Occupational Safety and Health Management System (OSH-MS) in hospitals and primary health centres based on five core principles: establishing OHS policies, OSH planning, OHS plan implementation, OHS performance monitoring and evaluation, and OHS performance review and improvement. In addition, this study seeks to identify priority areas for strengthening OSH-MS implementation across different types of healthcare facilities in order to support more comprehensive and sustainable occupational safety and health practices.

METHODS**Study Design and Setting**

This study employed a cross-sectional descriptive design to assess and compare the implementation of the Occupational Safety and Health Management System (OSH-MS) in healthcare facilities. The study was conducted between November 2024 and September 2025

in eight cities/regencies in North Sumatra Province, Indonesia: Pematang Siantar City, Gunung Sitoli City, Deli Serdang Regency, Serdang Bedagai Regency, North Nias Regency, Simalungun Regency, Asahan Regency, and Central Tapanuli Regency.

Study Sites and Participants

The study included six hospitals and seven primary health centres selected from the study area to represent different healthcare settings and organizational contexts. Because the study was designed as a descriptive comparative assessment rather than an inferential study, the number of facilities was determined by the availability of eligible healthcare facilities that met the inclusion criteria and agreed to participate, rather than by statistical power calculations.

Healthcare facilities and participants were selected using purposive sampling. This approach enabled the inclusion of facilities with established OSH organizational structures and available OSH documentation, as well as personnel directly involved in the planning, implementation, monitoring, and evaluation of the OSH-MS. Five key informants were recruited from each facility, comprising the Occupational Safety and Health (OSH) Manager, OSH Coordinator, Safety Officer, OSH administrator, and one additional staff member responsible for OSH implementation. These participants were selected because of their direct involvement in OSH-MS activities and their familiarity with institutional policies and practices.

Data Collection

Data were collected using the Occupational Safety and Health Management System (OSH-MS) checklist stipulated in Government Regulation of the Republic of Indonesia No. 50 of 2012. The assessment employed the initial-level audit instrument consisting of 64 assessment criteria, which are organized into nine assessment elements: Element 1 (Commitment Development and Maintenance), Element 2 (Making and Documenting of OSH Plans), Element 3 (Contract Control, Design, and Review), Element 4 (Document Control), Element 5 (Product Purchasing and Control), Element 6 (Work Safety Based on OSH-MS), Element 7 (Monitoring Standards), Element 8 (Reporting and Correction of Nonconformities), Element 9 (Material Management and Handling), and Element 12 (Skill and Ability Development). For analysis, these elements were grouped into the five core OSH-MS principles: (1) establishment of OHS policies (Element 1), (2) OSH planning (Elements 2–3), (3) implementation of OSH plans (Elements 4,6 and 9), (4) OHS performance monitoring and evaluation (Element 7), and (5) OHS performance review and continual improvement (Elements 8 and 12).

Data collection was conducted through three complementary methods: in-depth interviews, direct observation, and document review. Interviews were undertaken with the designated key informants to obtain information regarding OSH-MS implementation. Direct observations were conducted to verify workplace practices and implementation of OSH measures, while institutional documents including OSH policies, standard operating procedures, inspection records, and monitoring reports were reviewed to confirm compliance with regulatory requirements. The use of multiple data sources enabled triangulation of findings and strengthened the credibility of the assessment.

Data Quality Assurance

Before data collection, all assessors received standardized training on the objectives of the study, interpretation of each checklist criterion based on Government Regulation No. 50 of 2012, interview techniques, document verification procedures, and observation methods. Training included case discussions and pilot scoring exercises to standardize interpretation of assessment criteria.

To ensure consistency across study sites, identical assessment procedures and operational definitions were applied in all healthcare facilities. When discrepancies occurred

between interview responses, documentary evidence, and field observations, the final assessment was determined through verification using documentary evidence and direct observation, followed by consensus among the research team. Observer bias was minimized through the use of a standardized government-issued checklist, standardized assessor training, triangulation of interviews, observations, and document review, and consensus-based resolution of scoring disagreements.

Scoring and Data Analysis

Each checklist criterion was assessed dichotomously. A score of **1** (fulfilled) was assigned when documentary evidence, direct observation, and interview findings confirmed that the requirement had been fully implemented in accordance with Government Regulation No. 50 of 2012. A score of **0** (not fulfilled) was assigned when the requirement was absent, incomplete, or inconsistent with the regulatory requirements. Non-fulfilled criteria could be classified during the audit process as critical, major, or minor findings according to the provisions of Government Regulation No. 50 of 2012.

Implementation achievement was calculated using the following formula:

$$\text{Achievement Level (\%)} = \frac{\sum \text{Fulfilled Criteria}}{\text{Total Assessment Criteria}} \times 100$$

Achievement scores were converted into implementation categories according to the national OSH-MS assessment guideline:

- **0–59%:** Poor implementation
- **60–84%:** Good implementation
- **85–100%:** Satisfactory implementation

Descriptive statistics were used to calculate the percentage of fulfilled criteria for each OSH-MS principle and overall implementation. The findings were summarized and compared descriptively between hospitals and primary health centres.

Instrument Validity and Reliability

The study employed the standardized OSH-MS checklist established by Government Regulation of the Republic of Indonesia No. 50 of 2012. As this checklist is a nationally mandated regulatory audit instrument rather than a newly developed psychometric questionnaire, additional construct validation was not performed. The instrument possesses content validity because each assessment criterion directly reflects mandatory OSH-MS requirements specified in the national regulation.

Internal consistency reliability (e.g., Cronbach's alpha) was not assessed because the checklist comprises independent regulatory compliance criteria rather than questionnaire items designed to measure a single latent construct. Instead, measurement reliability was strengthened through standardized assessor training, uniform assessment procedures across all facilities, operational definitions for each criterion, and triangulation of interview, observation, and documentary evidence.

RESULTS

The results present a comprehensive overview of Occupational Safety and Health Management System (OSH-MS) implementation across the studied hospitals and primary health centres, based on performance against five core principles: establishing OHS policies, OSH planning, OHS plan implementation, OHS performance monitoring and evaluation, and OHS performance review and improvement. Overall levels of compliance varied markedly between facilities and across principles, revealing distinct patterns of strength and weakness in policy commitment, operational implementation, and performance oversight. The following

section details these findings by principle and facility type to highlight comparative performance and identify priority areas for improvement.

Table 1. Location of 6 Hospital and 7 PHCs

City/Regency	Hospital/PHC	Type of Hospital/PHC
Pematang Siantar	RS A	Regency Government's hospital
	PHC G	Government's Public Health Centre
	PHC H	Government's Public Health Centre
Asahan	PHC J	Government's Public Health Centre
	PHC M	Government's Public Health Centre
Tapanuli Tengah	RS B	Regency Government's hospital
Deli Serdang	RS C	Private hospital
Gunung Sitoli	RS D	Regency Government's hospital
Nias Utara	PHC K	Government's Public Health Centre
Simalungun	RS E	Private hospital
	PHC I	Government's Public Health Centre
Mandailing Natal	PHC L	Government's Public Health Centre
Serdang Bedagai	RS F	Regency Government's hospital

Table 1 summarises the geographic distribution and institutional characteristics of the study sites, comprising six hospitals and seven primary health centres (PHCs) across multiple cities and regencies. The hospitals include four regency government hospitals (RS A, RS B, RS D, and RS F) and two private hospitals (RS C and RS E), while all PHCs are government-owned public health centres. Several locations host more than one facility, notably Pematang Siantar, which includes one hospital and two PHCs, and Simalungun, which includes one private hospital and one PHC. Overall, the table indicates that the study settings represent a diverse mix of public and private hospitals and government PHCs distributed across urban and regional administrative areas.

Table 2. Descriptive Statistics for Overall Occupational Safety and Health Management System (OSH-MS) Implementation by Facility Type

Facility Type	Average (%)	Median (%)	Minimum (%)	Maximum (%)
Hospitals (n=6)	61%	54%	47%	84%
Public Health Centres (n=7)	58%	59%	14%	88%

Table 2 presents the descriptive statistics of overall Occupational Safety and Health Management System (OSH-MS) implementation scores by healthcare facility type. Hospitals achieved a slightly higher mean implementation score than primary health centres (61% vs. 58%), indicating generally better overall OSH-MS implementation. However, the median implementation score was higher among primary health centres (59%) than hospitals (54%), suggesting that the typical level of implementation was comparable between the two facility types. The range of implementation scores differed substantially. Hospital scores varied from 47% to 84%, whereas primary health centres showed a much wider range, from 14% to 88%. This wider distribution indicates greater variability in OSH-MS implementation among primary health centres, with some facilities demonstrating excellent implementation while others exhibited very low levels of compliance.

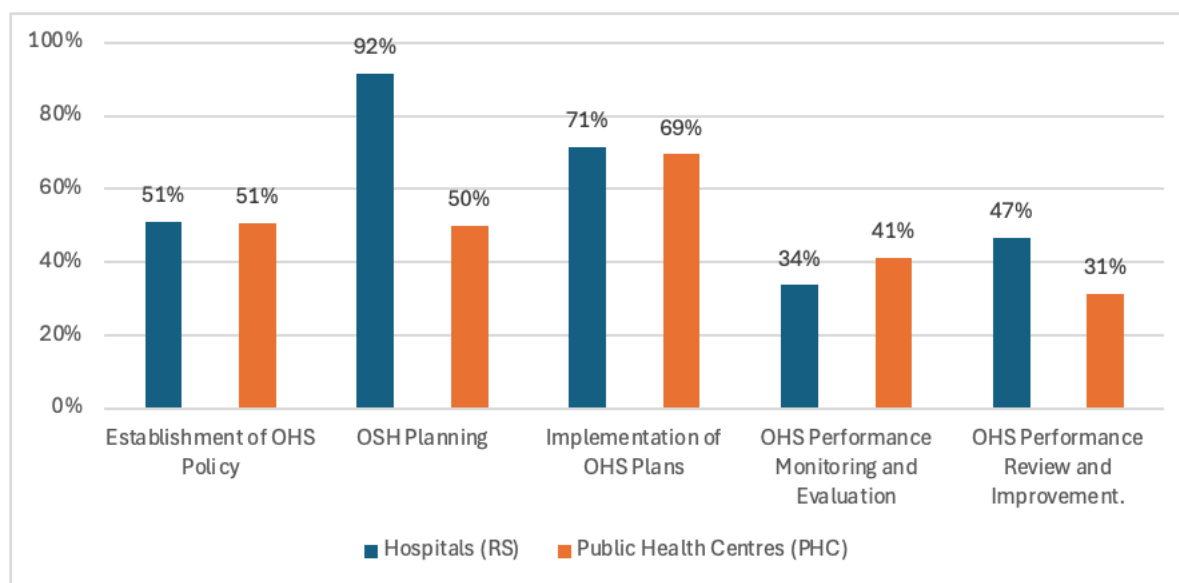


Figure 1. Average OSH-MS Implementation by Five Principle in Hospitals and Primary Health Centres

Figure 1 compares the mean implementation scores for the five core OSH-MS principles between hospitals and primary health centres. Overall, hospitals demonstrated higher implementation across the five OSH-MS principles than primary health centres, although differences varied by principle. The largest gap was observed in OSH planning (P2), whereas implementation of OHS performance monitoring and evaluation (P4) remained relatively low in both facility types. The highest implementation in hospitals was observed for OSH planning (P2) (91%), whereas primary health centres achieved their highest scores in OSH plan implementation (P3) (69%) and OSH planning (P2) (50%). Comparable performance was observed for establishment of OHS policy (P1) in both facility types (approximately 50%). Hospitals outperformed primary health centres in OSH planning (P2) and OHS performance review and improvement (P5), while primary health centres achieved slightly higher scores in OHS performance monitoring and evaluation (P4). However, implementation of P4 remained relatively low in both facility types.

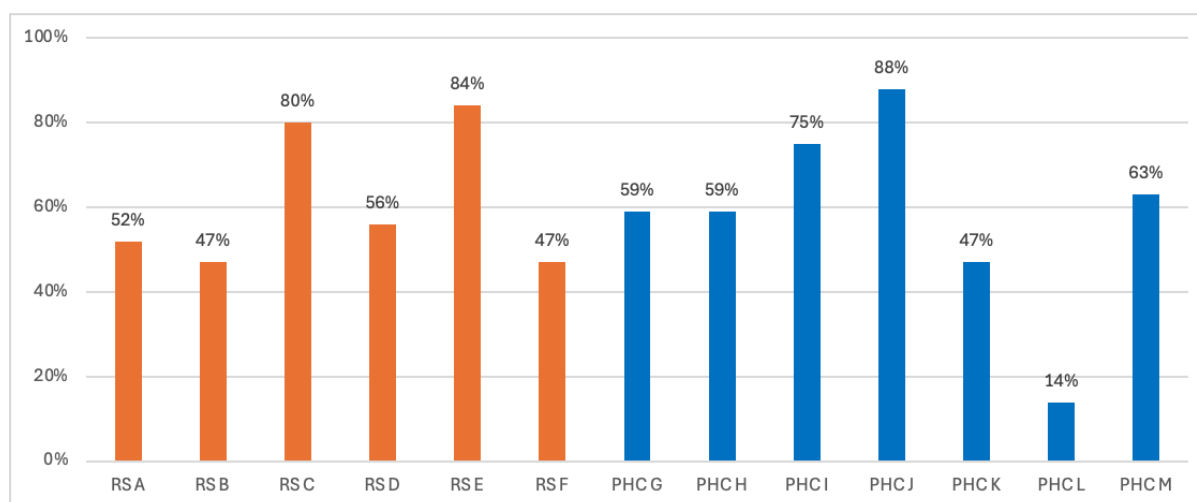


Figure 2. OSH-MS Performance

Figure 2 presents the overall OSH-MS implementation scores across the 13 participating healthcare facilities. Implementation levels varied considerably, ranging from 14% to 88%. Among hospitals, scores ranged from 47% to 84%, with Hospital E achieving the highest implementation (84%) and Hospitals B and F the lowest (47%). Among primary health centres, implementation ranged from 14% to 88%, with PHC J recording the highest overall score (88%) and PHC L the lowest (14%). Although hospitals generally demonstrated more consistent implementation, primary health centres exhibited greater variability, with both the highest and lowest implementation scores observed in this group. These findings indicate substantial differences in OSH-MS implementation across healthcare facilities, regardless of facility type.

Overall, the findings indicate that hospitals generally demonstrated slightly higher OSH-MS implementation than primary health centres. However, implementation varied considerably across facilities and assessment domains, with the greatest weaknesses observed in monitoring, evaluation, and continual improvement.

DISCUSSION

The findings of this study indicate substantial variability in Occupational Safety and Health Management System (OSH-MS) implementation across hospitals and primary health centres (PHCs), both overall and across the five core principles. Hospitals consistently demonstrated higher implementation than PHCs, particularly in OHS policy establishment, OSH plan implementation, and material management. These findings are consistent with previous studies showing that hospitals generally benefit from stronger organizational structures, greater regulatory oversight, dedicated OSH personnel, and better financial resources than PHCs (Pradana & Iqbal, 2023; Purba et al., 2025; Safitri et al., 2024; Siswanto & Opoku Agyemang, 2025). Implementation of OSH plan implementation was the strongest-performing principle, suggesting that operational activities such as hazard control, workplace safety procedures, equipment management, and material handling are more readily institutionalized than management functions requiring continuous evaluation. Similar findings have been reported in healthcare facilities where compliance with operational standards is often driven by accreditation requirements and regulatory inspections, whereas management review and performance evaluation receive less organizational attention (Muthmainnah et al., 2024; Rahayu & Mulyadi, 2024; Susilawati et al., 2023). This may be explained by the strong linkage between operational safety measures and accreditation requirements, which emphasize visible compliance indicators.

In contrast, OHS performance monitoring, evaluation, and continual improvement represented the weakest components of OSH-MS implementation, particularly in PHCs. This finding likely reflects several interrelated factors. First, monitoring activities are often viewed as administrative reporting requirements rather than management tools for identifying hazards and evaluating preventive actions. Second, PHCs frequently have limited numbers of trained OSH personnel, resulting in multiple responsibilities being assigned to the same staff, reducing the time available for systematic audits and incident investigations. Third, inadequate reporting systems and limited use of performance indicators restrict organizational learning and corrective action, weakening the continual improvement cycle required by OSH-MS. Consequently, implementation tends to focus on regulatory compliance rather than proactive risk management, a challenge also highlighted in recent healthcare OSH studies (Bte Muhammad et al., 2024; Kartika et al., 2024; Simarmata et al., 2025).

Although PHCs generally demonstrated lower implementation, several achieved performance comparable to or exceeding that of hospitals, indicating that organizational commitment and leadership may be as important as resource availability. This finding suggests

that effective OSH-MS implementation depends not only on facility type but also on management commitment, staff engagement, and the integration of OSH into routine organizational practices. From a policy perspective, the findings indicate that strengthening OSH-MS should extend beyond regulatory compliance toward continuous performance improvement. Policymakers should support PHCs through dedicated OSH funding, standardized monitoring indicators, periodic internal audits, and competency-based training programmes for OSH personnel. Healthcare managers should establish routine incident reporting systems, regularly review OSH performance indicators, and implement corrective actions based on audit findings to strengthen organizational learning and continuous improvement. These recommendations are consistent with the continuous improvement principles promoted by ISO 45001 and international guidance from the ILO and WHO (Afonso-Fernandes et al., 2026; Fadhel & Alqurs, 2025; ISO, 2018).

This study has several limitations. Healthcare facilities were selected using purposive sampling; therefore, the findings may not be representative of all hospitals and primary health centres in Indonesia. The descriptive cross-sectional design provides a snapshot of OSH-MS implementation but cannot identify causal relationships or determinants of implementation quality. Furthermore, comparisons between hospitals and PHCs were based on descriptive statistics without inferential analyses; therefore, observed differences should be interpreted as implementation patterns rather than statistically significant differences. Future studies should employ larger, randomly selected samples and multivariable statistical analyses to identify organizational and contextual factors associated with successful OSH-MS implementation.

Overall, this study contributes new evidence by applying a principle-based OSH-MS evaluation framework to compare hospitals and primary health centres across multiple healthcare settings. The findings demonstrate that although implementation has progressed, particularly in hospitals, substantial weaknesses remain in monitoring, evaluation, and continual improvement. Strengthening these management functions will be essential for improving worker safety and achieving resilient and sustainable healthcare systems.

CONCLUSION

This study demonstrated that Occupational Safety and Health Management System (OSH-MS) implementation varies across healthcare facility types and remains inconsistent across its core management principles. Although hospitals generally showed better implementation than primary health centres, important gaps persist, particularly in performance monitoring, evaluation, and continual improvement. The application of a principle-based evaluation framework provides a comprehensive understanding of OSH-MS implementation and helps identify priority areas for strengthening occupational safety and health management in healthcare settings. These findings highlight the need for policymakers and healthcare managers to strengthen monitoring systems, leadership commitment, workforce capacity, and continuous improvement mechanisms to support sustainable OSH-MS implementation across healthcare facilities. Future research should include larger and more representative samples and apply inferential analytical approaches to identify organizational factors influencing successful OSH-MS implementation.

ACKNOWLEDGMENT

The authors gratefully acknowledge the institutional support provided by the participating hospitals and primary health centres for facilitating data collection and access to relevant documents. Appreciation is also extended to the local health authorities and administrative offices at the city and regency levels for their cooperation and assistance during

the implementation of this study. This research was supported by institutional resources and logistical support that enabled the successful completion of the fieldwork and analysis.

CONFLICTS OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

REFERENCES

- Afonso-Fernandes, J., Barbosa, J., Arezes, P., Pardo-Ferreira, C., Rubio-Romero, J. C., & Rodrigues, M. A. (2026). Assessing resilience potentials in management of occupational safety and health in hospitals: Development and validation of a tool. *Journal of Safety Science and Resilience*, 7(1), 100247. <https://doi.org/10.1016/j.jnlssr.2025.100247>.
- Bte Muhammad, K., Sistem Manajemen Keselamatan Dan Kesehatan Kerja Di RSUD Kota Makassar Karlyna Bte Muhammad Prodi, P. S., Keselamatan, T., Teknologi dan Kesehatan Tri Tunas Nasional Address, I., Antang Raya No, J., Manggala, K., Makassar, K., & Selatan, S. (2024). Penerapan Sistem Manajemen Keselamatan Dan Kesehatan Kerja Di RSUD Kota Makassar. *The Journal General Health and Pharmaceutical Sciences Research*, 2(1), 37–43. <https://doi.org/10.57213/tjghpsr.v1i4.216>.
- Fadhel, R., & Alqurs, A. (2025). Enhancing Occupational Health and Safety Through Strategic Leadership: The Mediating Role of Total Quality Management in Hodeida Hospitals, Yemen. *Risk Management and Healthcare Policy*, 18, 823. <https://doi.org/10.2147/rmhp.s506296>.
- ISO. (2018). *ISO 45001:2018 Occupational Health & Safety Management Systems*.
- Kartika, F., Lestari, S., & Nasution, R. (2024). Assessing the implementation of occupational safety and health management system in the hospital. *Kartika & Nasution 244 Jurnal Prima Medika Sains*, 6(2), 244–250. <https://doi.org/10.34012/jpms.v6i2.6364>.
- Lestari, H., & Nasrifah, L. (2024). Assessment of Occupational Health and Safety Management System Implementation in General Hospital. *Safety and Health for Medical Workers*, 1(2), 65–77. <https://doi.org/10.69725/shmw.v1i2.117>.
- Muthmainnah, M., Fachrin, S. A., & Ikhtiar, M. (2024). Pelaksanaan Standar Kesehatan dan Keselamatan Kerja di Rumah Sakit Ibnu Sina YW-UMI Kota Makassar Tahun 2023. *Journal of Aafiyah Health Research (JAHR)*, 5(1), 428–441. <https://doi.org/10.52103/jahr.v5i1.1840>.
- Pradana, F. K. P., & Iqbal, M. (2023). Systematic Literature Review: Penerapan Manajemen Keselamatan dan Kesehatan Kerja di Puskesmas. *Journal Occupational Health Hygiene And Safety*, 1(2). <https://publikasi.dinus.ac.id/johhs/article/view/9921>.
- Prasetyo, E., Ulya, aTul, Laksamana Caesar, D., Rachma Dewi, E., Teknologi Kesehatan Cendekia Utama Kudus, I., & Tinggi Ilmu Kesehatan Kendal, S. (2025). Implementation of Occupational Safety and Health (OSH) Office Program in Community Health Center. *Journal Of Nursing Practice*, 8(3), 675–687. <https://doi.org/10.30994/jnp.v8i3.812>.
- Purba, L., Rambey, H., & Nur Saputri, I. (2025). Evaluation of the Implementation of Occupational Health and Safety Management System at Lima Puluh Public Health Center, Batu Bara Regency, in 2025. *Jurnal Kesmas dan Gizi (JKG)*, 8(1), 200–206. <https://doi.org/10.35451/c1ftq750>.

- Rahayu, P. D., & Mulyadi, D. (2024). Implementasi Sistem Manajemen Keselamatan Dan Kesehatan Kerja Rumah Sakit Di RSUD Jatisari. *Jurnal Akuntansi Keuangan Dan Bisnis*, 2(2), 184–190. <https://jurnal.ittc.web.id/index.php/jakbs/article/view/1238>.
- Safitri, J., Trisnawati, E., & Rizky, A. (2024). Occupational Safety and Health Management System (OSHMS) in Health Care Facilities of Puskesmas Sekadau. *Sekadau Hilir Subdistrict. Indonesian Journal of Administration and Health Research (IJAHR)*, 01(01), 15–29. <https://doi.org/10.20473/ijahr.v1i1.2024.1>.
- Simarmata, V. P. A., Marantuan, R. S., & Hutagalung, P. (2025). The Relationship Between Work Environment, Occupational Safety and Health Implementation, and Employee Performance: A Cross-Sectional Study. *Journal of Applied Nursing and Health*, 7(3), 762–774. <https://doi.org/10.55018/janh.v7i3.462>.
- Siswanto, & Opoku Agyemang, C. (2025). Assessing Occupational Health and Safety Management: A Multi-Center Study of 30 in Primary Health Centers in Indonesia. *Journal of Applied Nursing and Health*, 7(1), 48–58. <https://doi.org/10.55018/janh.v7i1.288>.
- Susilawati, S., Budiani, R. L., Paramita, I., & Puspitasiwi, P. (2023). Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) di Puskesmas Umbulharjo II Kota Yogyakarta. *Jurnal Kesehatan Vokasional*, 8(2), 112. <https://doi.org/10.22146/jkesvo.72671>.