

Needlestick and Sharps Injuries among Nurses: A Systematic Review of Occupational Safety and Health Practices

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ABSTRACT

Needlestick and sharps injuries (NSIs) remain one of the most significant occupational hazards among nurses, exposing them to blood-borne pathogens and psychological distress. This systematic review synthesised evidence from 15 empirical and review papers published between 2012 and 2025, focusing on the prevalence, associated factors, knowledge, attitudes, practices (KAP), and occupational safety and health (OSH) measures associated with NSIs among nurses and closely related healthcare groups. A PRISMA-informed process was applied to a comprehensive search across Google Scholar, PubMed, and MEDLINE, which initially identified 1,265 records; following screening and eligibility assessment, 15 studies met inclusion criteria. The included studies, conducted across Asia, the Middle East, and Europe, consistently showed that NSIs are highly prevalent, frequently under-reported, and closely linked to gaps in training, inconsistent adherence to standard precautions, and system-level challenges such as weak reporting systems and limited follow-up of exposed workers. Knowledge and awareness of NSI prevention were generally moderate, yet gaps persisted in actual practice, including safe injection behaviours, sharps disposal, incident reporting, and post-exposure management. Only a minority of studies examined structured OSH prevention strategies comprehensively. Overall, the findings highlight the urgent need for multifaceted OSH programs integrating safety-engineered devices, continuous education, strengthened reporting mechanisms, and institutional support to effectively protect nurses.

Keywords: Needlestick injuries, Sharps injuries, Nurses, Occupational safety, Safety practices

INTRODUCTION

Needlestick and sharps injuries (NSIs) represent one of the most serious occupational hazards faced by nurses due to their frequent involvement in invasive procedures and handling of sharp medical devices. NSIs can expose nurses to blood-borne pathogens such as hepatitis B, hepatitis C, and HIV, with profound physical, psychological, and occupational consequences. Numerous studies from varied healthcare settings consistently report NSIs as a continuing challenge for nursing personnel (Abdul Wahab et al., 2019; Ehsani et al., 2012; Ishak et al., 2019; Kim & Lee, 2015).

Beyond direct clinical risks, NSIs reflect deeper occupational safety and health (OSH) system issues, including inadequate training, inconsistent adherence to standard precautions, staffing shortages, high workload, insufficient access to safety devices, and weak post-exposure management protocols (Alabdli et al., 2024; Ghanei Gheshlagh et al., 2025). Under-reporting of NSIs remains a critical barrier to accurate surveillance and institutional improvement. For instance, Voide et al. (2012) demonstrated widespread under-reporting in a Swiss university hospital, reducing the effectiveness of OSH initiatives.

While knowledge, attitudes, and practices (KAP) are central to NSI prevention, evidence suggests that awareness does not always translate into safe behaviours. Studies involving nurses and nursing students indicate persistent gaps in sharps handling, disposal, and follow-up adherence (Azman et al., 2022; Xin, 2020; Yazid et al., 2023). Even when NSIs are reported, follow-up procedures and PEP completion are often inconsistent (Mohd Fadhli et al., 2018; Mohamud et al., 2023).

Recent work has emphasized the need for OSH-focused interventions, highlighting the value of integrating engineering controls, administrative policies, and sustained education into safety programmes (Alabdli et al., 2024). Other studies have contributed epidemiological data, identifying patterns and determinants of NSIs across various healthcare settings (Ehsani et al., 2012; Ishak et al., 2019; Kim & Lee, 2015; Mohamud et al., 2023; Mohammed & Mahmood, 2025; Ghanei Gheshlagh et al., 2025).

Given the continued burden of NSIs and increasing interest in OSH-prevention frameworks, a targeted synthesis of evidence is warranted to support improved safety protocols for nurses.

Objectives

1. To summarise the prevalence and epidemiological patterns of needlestick and sharps injuries among nurses.
2. To examine individual and organisational factors associated with NSIs, including knowledge, attitudes, practices (KAP), and workplace conditions.
3. To identify OSH-related practices and interventions for NSI prevention and post-exposure management.
4. To highlight gaps in current evidence and propose implications for policy, practice, and future research.

Design And Reporting

This study is a systematic literature review conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The review adhered to the four PRISMA stages: identification, screening, eligibility, and inclusion. A comprehensive search was performed in Google Scholar, PubMed, and MEDLINE, yielding 1,265 records.

Eligibility Criteria

Studies were included if they met the following criteria:

- i. Population: Nurses; studies involving other healthcare workers or students were eligible if NSI-related outcomes were applicable to nursing practice.
- ii. Exposure/Outcome: Needlestick or sharps injuries; prevalence, incidence, risk factors, KAP, reporting, follow-up, or OSH practices linked to NSIs.
- iii. Study Design: Quantitative observational studies (cross-sectional, retrospective, meta-analysis) or narrative reviews.
- iv. Setting: Hospital, clinical, or educational healthcare environments
- v. Language: English; peer-reviewed articles only.

Information Sources

A comprehensive search of Google Scholar, PubMed, and MEDLINE identified 1,265 records. Database searches were supplemented by citation tracking. After removing 312 duplicates, 953 records proceeded to title/abstract screening. No additional searches were conducted outside these databases.

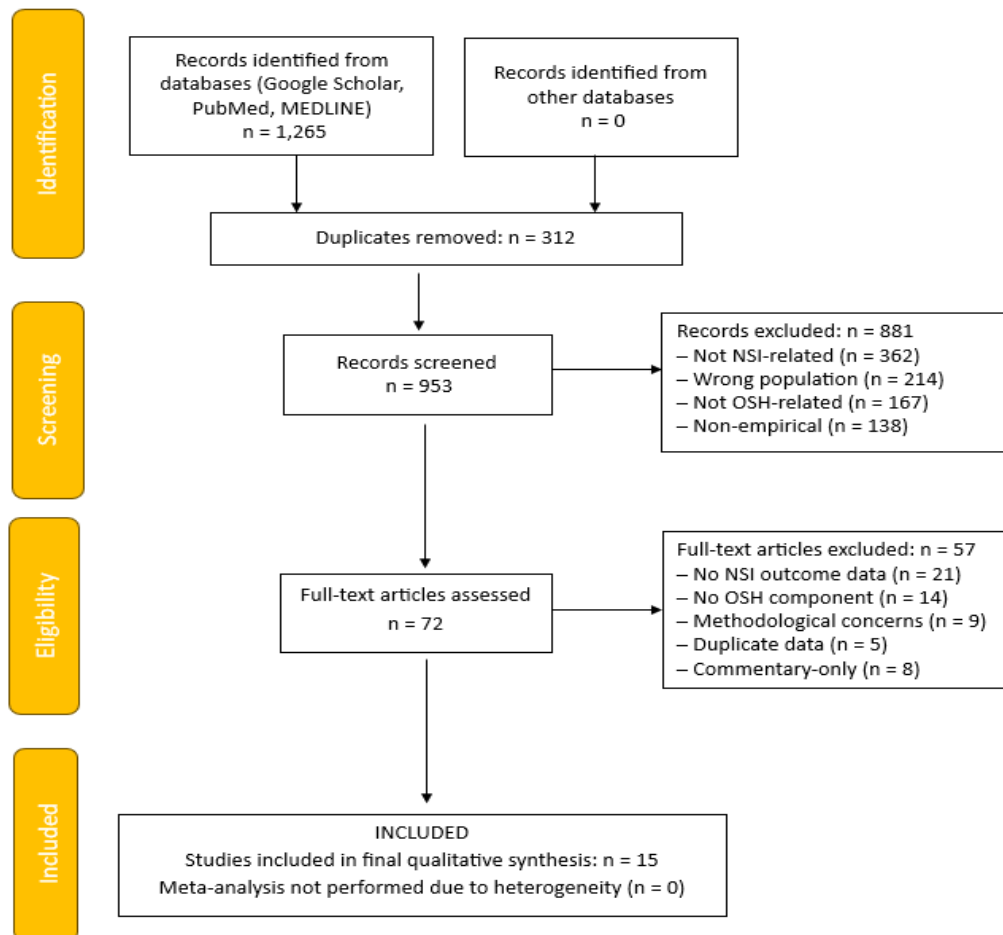


Figure 1: Prisma Guideline 2020

Data Extraction and Items

Data extraction for this review was conducted systematically, guided by the PRISMA 2020 recommendations to ensure accuracy, uniformity, and transparency. A structured data extraction matrix was developed to capture all relevant information from each included study. For every article, the reviewers recorded the author and year of publication to establish the temporal distribution of research and identify any shifts in NSI trends over time. The country and healthcare setting were documented to contextualise findings geographically and organisationally, recognising that NSI prevalence and prevention practices vary widely across regions and health systems.

The study design was extracted to classify whether the article used cross-sectional, retrospective, review, or meta-analytic methods, as differences in design influence the strength and interpretability of findings. Information regarding the sample size and population characteristics was also recorded, including whether the participants were nurses, other healthcare workers, students, or dental personnel. This helped determine the representativeness and relevance of each study to nursing practice.

Key NSI-related outcomes such as prevalence, incidence, recurrence, and patterns of exposure were systematically documented. The reviewers also extracted reported risk and associated factors, ranging from individual-level determinants such as experience, fatigue, and adherence to standard precautions, to system-level conditions including workload, staffing adequacy, and availability of safety devices. In studies examining behavioural aspects, the reviewers summarised the knowledge, attitudes, and practices (KAP) of participants regarding NSI prevention, sharps handling, disposal, and post-exposure responses.

Given the importance of institutional responses to NSIs, particular attention was paid to reporting behaviours and follow-up adherence, including whether affected nurses completed serological testing, post-exposure prophylaxis (PEP), or subsequent clinical monitoring. Finally, any occupational safety and health (OSH) interventions or recommendations such as training programs, safety-engineered devices, policy improvements,

or administrative controls were extracted to support the synthesis of prevention strategies.

Synthesis of Results

Due to substantial methodological heterogeneity across the included studies particularly differences in study design, population characteristics, measurement tools, and types of outcomes assessed, a quantitative meta-analysis was not appropriate. Instead, the review employed a narrative thematic synthesis, which allowed for the integration of diverse forms of evidence while maintaining conceptual coherence.

The synthesis process involved repeated reading, coding, and categorisation of extracted data, followed by clustering of similar findings into broader conceptual themes. Four major themes were developed through this iterative process. The first theme, Epidemiology, encompassed trends in prevalence, types of injuries, and patterns of exposure across clinical departments and countries. The second theme, Risk Factors, captured both individual-level determinants such as experience, behaviour, or fatigue and organisational influences such as workload, availability of sharps containers, and OSH system strength. The third theme, Knowledge, Attitudes, Practices, and Reporting, examined behavioural competence, perceived barriers, reporting culture, and adherence to follow-up procedures. The fourth theme, OSH Prevention Practices, synthesised recommendations and interventions at institutional and system levels, including engineering controls, training initiatives, and policy frameworks.

Quality Assessment and Risk of Bias

Although a formal risk-of-bias tool such as the Joanna Briggs Institute (JBI) checklist or the Newcastle-Ottawa Scale was not systematically applied, the review incorporated a descriptive assessment of methodological quality to support critical interpretation of findings. The evaluation focused on several key indicators, including the appropriateness of sampling methods, representativeness of the sample, and the clarity of outcome definitions for NSIs. Studies that clearly described inclusion criteria, operational definitions, and data collection processes were considered more methodologically robust.

Response rates and completeness of reporting were also noted, as studies with low response rates or incomplete data may be more susceptible to bias. In addition, reviewers assessed whether the studies acknowledged and addressed limitations, which enhances transparency and helps contextualise findings.

Common risks of bias identified across the included studies included recall bias, particularly in self-reported surveys where participants were asked to remember past NSI events. Under-reporting was another major concern, as several studies relied on voluntary reporting systems known to underestimate true NSI incidence. Furthermore, heavy reliance on self-report measures posed risks of social desirability bias and misclassification.

These methodological considerations were incorporated into the interpretation of results, ensuring that conclusions were grounded in a balanced appraisal of the strengths and limitations of the underlying evidence.

RESULTS

Characteristics of Included Studies

A total of 15 studies were included in this review, representing diverse geographical regions including Malaysia, Iran, Pakistan, South Korea, Somalia, Iraq, Switzerland, and Saudi Arabia. Most of the studies adopted a cross-sectional design, while two were reviews and one was a meta-analysis. Sample sizes varied considerably across studies, ranging from fewer than 100 participants to more than 1,000 healthcare workers, although nurses consistently formed the primary population of interest. Several studies also involved mixed groups such as medical students, dental personnel, or other allied health workers, but were included when the outcomes were directly relevant to nursing practice or sharps-handling safety. Across the body of evidence, the studies measured key outcomes including the prevalence of needlestick and sharps injuries, associated individual and organisational risk factors, knowledge and awareness levels, attitudes and practices, reporting behaviour, and adherence to post-exposure follow-up procedures. Although methodological quality varied, most studies clearly

described their data collection processes and provided statistically analysable findings suitable for synthesis. However, reliance on self-reported survey data was common, suggesting an inherent risk of recall and social desirability bias.

Author	Country	Study Design	Population	Sample Size	Key Outcomes
Abdul Wahab et al. (2019)	Malaysia	Cross-sectional	Healthcare workers (including nurses)	170	NSI prevalence, follow-up adherence
Akyol & Kargin (2016)	Turkey	Cross-sectional	Nurses	109	NSI patterns, risk behaviours
Alabdli et al. (2024)	Multi-country	Review	Nurses	–	NSI prevention and OSH strategies
Almoliky et al. (2024)	Saudi Arabia	Cross-sectional	Nurses	538	NSI prevalence and associated factors
Azman et al. (2022)	Malaysia	Cross-sectional	Medical, nursing & paramedic students	350	Knowledge and awareness of NSIs
Ehsani et al. (2012)	Iran	Cross-sectional	Nurses	200	Epidemiology of NSIs
Ghanei Gheshlagh et al. (2025)	Pakistan	Meta-analysis	Nurses & nursing students	1,000+	Pooled prevalence of NSIs
Ishak et al. (2019)	Malaysia	Cross-sectional	Healthcare workers	1,002	Prevalence & reporting
Kim & Lee (2015)	South Korea	Cross-sectional	Nurses	287	Risk factors & injury patterns
Mohamud et al. (2023)	Somalia	Retrospective review	Healthcare workers	457	NSI trends & reporting
Mohd Fadhli et al. (2018)	Malaysia	Cross-sectional	Healthcare workers	203	Follow-up protocol adherence
Mohammed & Mahmood (2025)	Iraq	Cross-sectional	Nurses	370	NSI prevalence & determinants
Voide et al. (2012)	Switzerland	Observational	Healthcare workers	210	Under-reporting of NSIs
Xin (2020)	China	Cross-sectional	Dental personnel	661	Knowledge & safety practices
Yazid et al. (2023)	Malaysia	Cross-sectional	Nurses	250	KAP related to NSIs

Prevalence and Epidemiology of NSIs

The prevalence of needlestick and sharps injuries across the included studies was consistently high, with reported rates ranging widely from approximately 19% to more than 70% among nurses and related healthcare personnel.

Several studies documented multiple NSI events among individual healthcare workers, indicating recurrent exposure risks in busy clinical environments. The majority of injuries were caused by hollow-bore needles, followed by suture needles and lancets, particularly in departments with high patient turnover such as emergency units, medical wards, intensive care units, and phlebotomy services. Under-reporting of NSIs was a recurrent issue across the studies, especially in settings with less structured occupational safety systems; this phenomenon was strongly highlighted in the Swiss study by Voide et al. (2012), which reported significantly lower documented cases than estimated actual occurrences. Meta-analytic findings from Pakistan further reinforced the high burden of NSIs, suggesting that younger nurses and those with fewer years of experience face disproportionately higher risks. Collectively, the evidence demonstrates that NSIs remain a persistent and significant occupational hazard across diverse healthcare systems.

Risk Factors Associated with NSIs

Both individual and organisational factors contributed to NSI occurrence. Individual-level risks included limited clinical experience, inadequate training on safe sharps-handling practices, fatigue, extended working hours, shift rotation, and non-adherence to standard precautions. Unsafe behaviours such as needle recapping, improper disposal of sharps, hurried clinical procedures, and failure to use personal protective equipment (PPE) were widely reported. Organisational factors were equally prominent, with multiple studies citing heavy workloads, staff shortages, overcrowded clinical areas, lack of functional sharps containers, and inadequate availability of safety-engineered devices. Weak occupational safety and health infrastructures, absence of regular training updates, and inconsistent supervision further exacerbated NSI risks. Notably, several studies highlighted that even when nurses possessed adequate knowledge, systemic pressures such as time constraints or workload demand hindered their ability to practise safely.

Knowledge, Attitudes, Practices (KAP) and Reporting Behaviour

Findings on knowledge, attitudes, and practices were mixed. Knowledge of NSI risks and prevention measures was generally moderate to high among nurses and students; however, this knowledge did not consistently translate into safe clinical behaviours. Attitudinal barriers such as fear of blame, reluctance to report incidents, and perceptions that an injury was "minor" contributed to the widespread under-reporting of NSIs. Many nurses reported that incident reporting procedures were time-consuming or not well supported by supervisors, which discouraged appropriate follow-up. Studies also showed that post-exposure management practices were often incomplete; although some nurses-initiated reporting, many did not complete the recommended serology testing or post-exposure prophylaxis (PEP), largely due to workflow constraints or lack of institutional support. Overall, KAP findings suggest a disconnect between theoretical understanding and actual behaviour, underscoring the need for stronger safety culture development.

Occupational Safety and Health (OSH) Prevention Practices

The review found that relatively few studies evaluated OSH interventions in depth. Among those that did, commonly reported measures included structured training programmes, continuous professional development sessions, safety audits, and implementation of safety-engineered devices such as retractable needles. Where safety-engineered devices were available and properly used, injury rates were significantly reduced. Administrative controls such as clear reporting protocols, supportive supervisory structures, and mandatory follow-up pathways were also shown to improve safety outcomes. However, implementation of OSH measures varied widely between countries and healthcare institutions, with resource-limited settings demonstrating lower uptake of engineering controls and weaker reporting systems. These disparities highlight the need for harmonised OSH strategies and stronger policy enforcement across healthcare facilities.

DISCUSSION

This review synthesised current evidence on needlestick and sharps injuries among nurses and related healthcare groups, revealing that NSIs continue to pose a major occupational hazard despite long-standing global efforts to reduce such injuries. High prevalence rates across diverse settings demonstrate that NSIs remain a systemic challenge rather than an isolated clinical issue. Individual behavioural factors contribute significantly to NSI

risk; however, many of these behaviours are reflections of deeper structural and organisational shortcomings such as heavy workloads, insufficient staffing, limited resources, and lack of access to safety-engineered devices.

Knowledge gaps alone do not appear to fully explain unsafe practices, as several studies reported that nurses with moderate to high levels of knowledge continued to engage in high-risk behaviours. This reinforces the argument that institutional culture, behavioural reinforcement, and supportive supervision are critical factors in ensuring adherence to safety practices. Furthermore, widespread under-reporting of NSIs remains a significant obstacle to effective surveillance, prevention, and policymaking. Under-reporting delays initiation of PEP and obstructs accurate identification of high-risk areas, thereby weakening organisational safety systems. Collectively, the findings emphasise the importance of integrating engineering controls, administrative policies, educational interventions, and safety culture development into a comprehensive OSH framework.

Limitations of the Review

This review is subject to several limitations. First, only English-language articles were included, which may have resulted in the omission of relevant evidence published in other languages. Second, the search was limited to Google Scholar, PubMed, and MEDLINE; inclusion of additional databases may have yielded a broader sample of studies. Third, many of the included studies relied on self-reported data, making them susceptible to recall and social desirability bias. Fourth, although methodological limitations of each study were acknowledged, a formal risk-of-bias appraisal tool was not applied, which may affect the depth of critical assessment. Lastly, heterogeneity in study designs, populations, and outcome measures precluded meta-analysis, limiting the review to narrative synthesis.

RECOMMENDATIONS

The findings of this review suggest several important implications for practice, policy, and research. For nursing practice, continuous training programmes and competency-based assessments should be implemented to strengthen safe sharps-handling behaviours. Institutions must ensure adequate supply of safety-engineered devices, enforce strict adherence to standard precautions, and support timely disposal of sharps.

From a policy perspective, healthcare facilities should implement mandatory NSI reporting systems, establish structured post-exposure prophylaxis pathways, and conduct regular workplace safety audits. National OSH frameworks should emphasise engineering controls, supportive supervision, and a non-punitive reporting culture.

Future research should adopt standardised definitions and measurement tools for NSIs to enable comparability across studies. Prospective, multi-centre studies are needed to reduce reliance on self-reporting and strengthen the evidence base. Additionally, more research should be conducted on behavioural and organisational interventions designed to improve reporting behaviour and follow-up compliance.

CONCLUSIONS

This systematic review demonstrates that needlestick and sharps injuries remain a substantial occupational hazard among nurses, with persistent high prevalence rates, recurrent injuries, and significant gaps in reporting and follow-up behaviours. Despite moderate knowledge levels, unsafe practices continue to occur due to a combination of individual behaviour and systemic institutional factors. Strengthening OSH systems through continuous education, safety-engineered devices, structured reporting pathways, and supportive workplace cultures is essential to reducing NSI incidence and protecting nurses' health and well-being.

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