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Occurrences and Contributing Factors of Needle Stick Injuries among Nurses at Khyber Teaching Hospital, Peshawar

AWAIS RAHMAN
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan Email: awaisrahman176@gmail.com

MUHAMMAD WASEEM
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan Email: m.waseemshangla828@gmail.com

MUHAMMAD AWAIS
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan Email: mawaisking121@gmail.com

MUHAMMAD ISMAIL
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan Email: drismailbnu11@gmail.com

SAAD AHMAD
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan Email: saadkhantkoi@gmail.com

MUHAMMAD ATIF HAYAT
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan Email: hayatatif01@gmail.com

Author Details

Corresponding E-mail & Author*:
AWAIS RAHMAN
BSN, Government College of Nursing KTH, Khyber Medical University Peshawar, KP, Pakistan
Email: awaisrahman176@gmail.com

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Abstract

Background: Needle stick injuries (NSIs) are one of the most common occupational hazards among healthcare professionals, particularly nurses, exposing them to serious infections such as hepatitis B, hepatitis C, and HIV. The problem is intensified in developing countries due to inadequate safety measures, lack of training, and heavy workloads. Understanding the occurrence and contributing factors of NSIs is crucial for developing preventive strategies and promoting a culture of safety within healthcare institutions.

Aim: The study aimed to determine the prevalence and contributing factors of needle stick injuries among nurses working at Khyber Teaching Hospital, Peshawar.

Methods: A cross-sectional quantitative study was conducted over six months using a structured, pre-adopted questionnaire. A total of 145 nurses were selected through convenience sampling. Data were analyzed using SPSS version 23. Descriptive statistics summarized demographic characteristics and NSI frequencies, while

inferential analysis identified associations between NSIs and potential contributing factors.
Results: The findings revealed that 72.4% of participants attributed NSIs to heavy workload and fatigue, 67.6% to lack of safety-engineered devices, and 57.9% to inadequate training. Unsafe practices such as recapping used needles (60%) and poor waste disposal mechanisms (62.8%) were also prevalent. Organizational factors, including lack of infection control supervision (52.4%) and poor environmental conditions (48.3%), further increased risk.
Conclusion: Needle stick injuries among nurses remain a critical occupational health issue. Enhanced training, improved supervision, availability of safety devices, and implementation of non-punitive reporting systems are essential to reduce NSI occurrence.

Introduction

Needle stick injuries (NSIs) are defined as penetrating wounds caused by needles or sharp medical instruments that may result in exposure to blood or other potentially infectious materials (1). These injuries are among the most common occupational hazards faced by healthcare workers, especially nurses who handle needles frequently during patient care. The risk arises primarily from unsafe practices such as improper needle disposal, recapping of used needles, and lack of adherence to standard precautions (2). Keywords include needle stick injury—the accidental puncture of the skin by a needle used on a patient; occupational hazard—a risk inherent to a professional environment; and infection control—measures taken to prevent disease transmission in healthcare settings. NSIs carry significant implications, exposing nurses to bloodborne pathogens like hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) (3).

The prevalence of needle stick injuries varies globally but remains a significant occupational health issue. Approximately 3 million healthcare workers experience percutaneous exposure to infectious materials annually, resulting in more than 66,000 HBV, 16,000 HCV, and 1,000 HIV infections (1). In developing countries, where infection control protocols are often inadequately implemented, the incidence is higher. Studies conducted in Pakistan report that between 37% and 64% of nurses have experienced at least one NSI during their careers (4). Similar rates have been observed in neighboring countries like India and Bangladesh, highlighting a regional occupational health concern (5).

Nurses are particularly at risk due to their constant involvement in procedures such as injections, venipuncture, and disposal of sharps. Inadequate training, improper use of personal protective equipment (PPE), and fatigue due to long working hours are identified as key contributors to these injuries (6). The high workload in tertiary hospitals like Khyber Teaching Hospital, Peshawar, further increases exposure risk among nurses. Lack of awareness about post-exposure prophylaxis (PEP) and reluctance to report incidents exacerbate the problem (7). These factors collectively threaten both staff safety and overall healthcare quality.

The psychological impact of NSIs on nurses is profound. Fear of infection, anxiety, and stigma are common emotional responses following an incident (8). Nurses who sustain NSIs often experience mental distress, which can affect job satisfaction, performance, and patient care quality. Repeated exposure to occupational hazards without institutional support may lead to burnout and decreased compliance with safety protocols (9). Ensuring both physical and psychological support for affected nurses is essential to maintaining a safe and productive workforce.

Institutional factors play a crucial role in the occurrence and prevention of NSIs. Hospitals with inadequate waste management systems, insufficient availability of

safety boxes, and absence of routine training programs tend to report higher injury rates (10). The lack of monitoring and enforcement of infection control policies further increases the likelihood of accidental exposures. Evidence suggests that introducing engineered safety devices and promoting a culture of safety significantly reduce the occurrence of NSIs among nursing staff (11).

Reporting behavior following needle stick injuries remains a major challenge. Many nurses fail to report incidents due to fear of blame, lack of time, or the perception that the injury was minor (3). This underreporting leads to missed opportunities for timely intervention and post-exposure prophylaxis. Encouraging an open reporting culture and ensuring that reporting mechanisms are simple and non-punitive are critical steps toward addressing this issue (7).

The study of occurrences and contributing factors of needle stick injuries among nurses at Khyber Teaching Hospital, Peshawar, is vital in understanding the scope of this occupational hazard within a tertiary care setting. By identifying the most common causes, risk behaviors, and barriers to prevention, this research aims to guide institutional policy development and promote safer working environments. The findings will contribute to developing targeted training programs and safety protocols to minimize occupational risks and enhance infection control practices (1,2).

Methodology

The study employed a quantitative cross-sectional design to determine the frequency and contributing factors of needle stick injuries (NSIs) among nurses at Khyber Teaching Hospital, Peshawar. This design enabled the researchers to capture a snapshot of the existing situation within a single time frame. Data were collected using pre-adopted, structured questionnaires to ensure standardized responses regarding nurses' experiences with NSIs and associated factors. The study was conducted at Khyber Teaching Hospital, a tertiary care facility that provided an ideal environment due to its diverse departments, high patient turnover, and large nursing workforce frequently exposed to NSI risks. The hospital setting allowed for the examination of occupational safety practices, infection control adherence, and institutional measures in managing NSIs. The study was carried out over a period of six months, allowing sufficient time for participant recruitment, questionnaire administration, and data analysis.The study sample consisted of 145 nurses selected from a total population of 350 nurses working at Khyber Teaching Hospital. The sample size was calculated using the OpenEpi sample size calculator to ensure adequate statistical power and representativeness of the target population. Convenience sampling was used to recruit participants who were available and willing to take part during the study period. Inclusion criteria required participants to be registered nurses directly involved in patient care with at least three months of work experience at the hospital. Nurses in administrative or supervisory roles, or those with less than three months of service, were excluded.

Data Collection and Data Analysis

Data were collected through closed-ended, pre-adopted questionnaires designed to assess the occurrence, frequency, and contributing factors of NSIs. The questionnaire ensured uniformity in responses and facilitated accurate quantification of variables. Data collection was monitored closely to maintain completeness, accuracy, and confidentiality of the responses.

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 23. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic information and the occurrence of NSIs among the participants. Inferential statistical analyses were performed to explore possible relationships between NSIs and contributing factors such

as work experience, safety training, adherence to standard precautions, and workload. The use of SPSS facilitated efficient management and interpretation of quantitative data, allowing for identification of key trends and correlations relevant to the study objectives. The results were presented in tabular and graphical formats to ensure clarity and support evidence-based conclusions regarding the factors contributing to needle stick injuries among nurses at Khyber Teaching Hospital.

Results and Analysis

Table 1: Demographic Characteristics of Participants (n = 145)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	116	80.0
	Male	29	20.0
Age (Years)	20–25	48	33.1
	26–30	54	37.2
	31–35	25	17.2
	Above 35	18	12.5
Educational Qualification	Diploma in Nursing	65	44.8
	BSN	62	42.8
	MSN	18	12.4
Work Experience	<1 year	20	13.8
	1–5 years	71	49.0
	6–10 years	36	24.8
	>10 years	18	12.4
Department	ICU	32	22.1
	Emergency	28	19.3
	Medical Ward	40	27.6
	Surgical Ward	26	17.9
	Pediatrics	19	13.1

Table 1 presents the demographic characteristics of the 145 participating nurses. The majority were female (80%) and within the age group of 26–30 years (37.2%). Most nurses held a diploma or BSN qualification and had between one to five years of experience. The highest representation was from medical wards, followed by ICUs and emergency departments.

Table 2: Frequency and Nature of Needle Stick Injuries among Nurses (n = 145)

Variable	Category	Frequency (n)	Percentage (%)
Ever experienced NSI	Yes	96	66.2
	No	49	33.8
Number of NSIs in the past 12 months	1	42	29.0
	2–3	28	19.3
	>3	12	8.3
	None	63	43.4
Type of sharp causing injury	Hypodermic needle	68	46.9
	IV cannula	31	21.4
	Suture needle	24	16.6

	Other (lancet, scalpel, etc.)	22	15.1
Time of occurrence	During injection	38	26.2
	During IV insertion/removal	33	22.8
	During waste disposal	41	28.3
	While recapping needles	33	22.7

Table 2 outlines the frequency and nature of needle stick injuries among nurses. About 66.2% of participants reported experiencing at least one NSI during their practice. Hypodermic needles were the most common cause of injury, followed by IV cannulas and suture needles. Most injuries occurred during waste disposal and injection procedures, highlighting occupational exposure risks.

Table 3: Reporting and Post-Exposure Practices among Injured Nurses (n = 96)

Variable	Category	Frequency (n)	Percentage (%)
Reported the injury to supervisor	Yes	48	50.0
	No	48	50.0
Reason for not reporting	Fear of blame/punishment	22	22.9
	Belief injury was minor	16	16.7
	Lack of time	7	7.3
	Unaware of reporting procedure	3	3.1
Immediate action after injury	Washed with soap/water	57	59.4
	Applied antiseptic	26	27.1
	Did nothing	13	13.5
Received post-exposure prophylaxis (PEP)	Yes	39	40.6
	No	57	59.4

Table 3 illustrates reporting behavior and post-exposure practices among nurses who experienced NSIs. Only half of the injured nurses reported the incident to their supervisors, often due to fear of punishment or considering the injury minor. Most nurses cleaned the injury site with soap and water, but only 40.6% received post-exposure prophylaxis. These findings reflect significant gaps in safety compliance.

Figure 1: Contributing Factors to Needle Stick Injuries (n = 145)

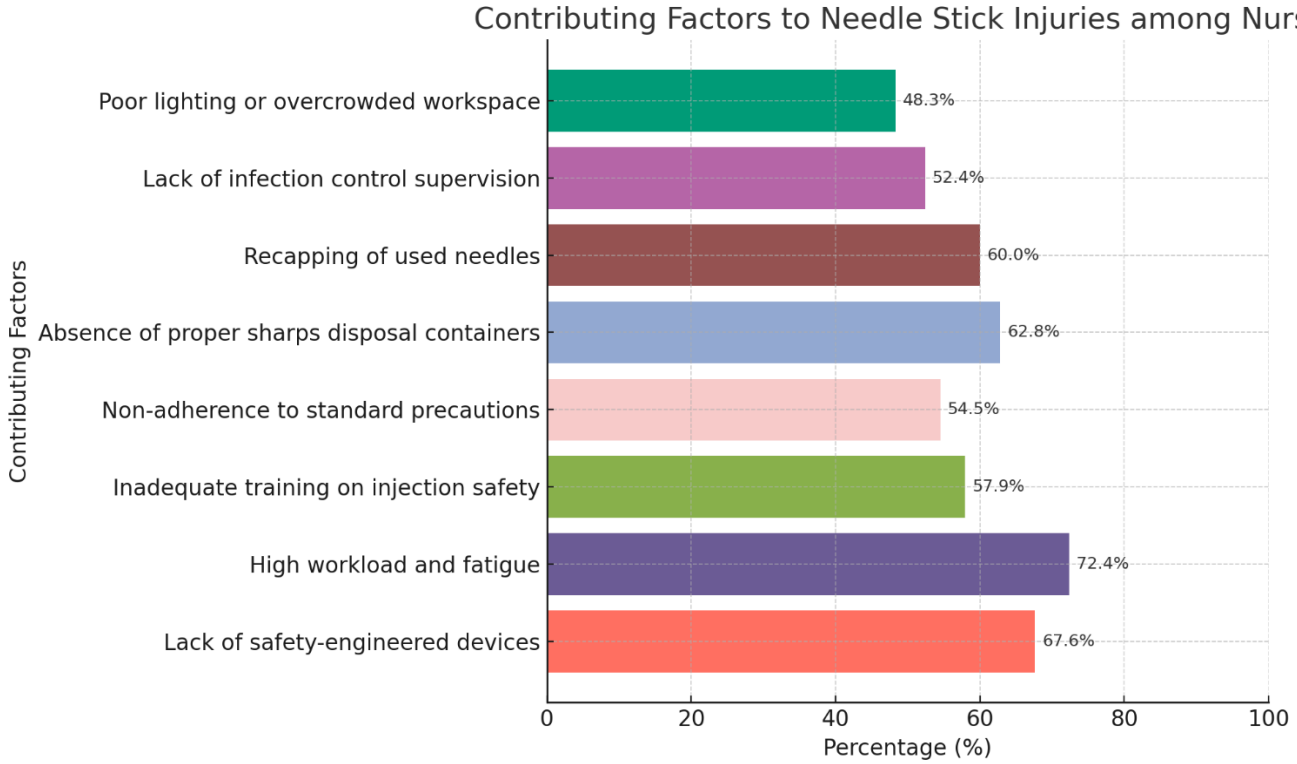


Figure 1 identifies contributing factors associated with needle stick injuries among the participants. High workload, lack of safety-engineered devices, and inadequate training were the most frequently cited causes. Poor adherence to standard precautions and improper disposal practices also contributed to increased risk. These findings indicate the need for enhanced safety protocols and staff education.

Discussion

The findings of this study revealed a significant occurrence of needle stick injuries (NSIs) among nurses at Khyber Teaching Hospital, with multiple contributing factors identified, including high workload, lack of safety-engineered devices, and inadequate training. This aligns with the findings of De Vries et al. (13), who emphasized that occupational exposure to bloodborne pathogens remains a persistent risk in hospital settings, particularly in low- and middle-income countries where safety compliance is suboptimal. The present study found that 72.4% of participants attributed NSIs to heavy workload and fatigue, which mirrors the conclusions of Brady et al. (14), who reported that overburdened nurses are more likely to commit handling errors due to exhaustion and divided attention.

A significant proportion of nurses in the current study (67.6%) identified the lack of safety-engineered devices as a major contributing factor. This finding is consistent with the results of Bates et al. (15) and Kale et al. (16), who demonstrated that the absence of modern safety syringes and retractable needles increases the risk of accidental injuries. In contrast, studies conducted in high-income settings, such as those by Flynn et al. (17) and Meyer-Massetti et al. (18), showed lower NSI rates due to the mandatory use of engineered safety controls. The difference highlights disparities in resource availability and policy implementation between developing and developed healthcare systems.

The study also revealed that 57.9% of nurses had inadequate training on injection safety, indicating a gap in professional development. This is in agreement with Abdulmutalib and Safwat (12), who noted that insufficient safety education contributes directly to unsafe practices during injection and disposal. Similarly, Carlton and Blegen (19) found

that ongoing training programs significantly reduced NSI incidents by reinforcing correct techniques and emphasizing awareness. Conversely, in hospitals where education is sporadic or optional, as in this study's setting, unsafe practices such as recapping needles remain prevalent.

More than half of the participants (62.8%) reported the absence of proper sharps disposal containers as a contributing factor, echoing the observations of Buckley et al. (20), who stressed that improper waste disposal mechanisms lead to accidental pricks during handling. Comparable findings by Barker (21) also showed that inadequate workplace safety infrastructure increases the likelihood of preventable injuries. In contrast, hospitals with well-designed disposal systems, as documented by Dean and Barber (22), reported significantly fewer exposure incidents, demonstrating that infrastructural investment is vital for staff safety.

The recapping of used needles, reported by 60% of nurses, was another major concern in this study. This behavior aligns with Pepper (23), who found that manual recapping remains one of the most common risk practices despite universal guidelines discouraging it. However, McLeod et al. (24) observed that institutions enforcing strict anti-recapping policies coupled with automatic disposal devices witnessed a drastic decline in injuries. The persistence of this practice in the current study may reflect a lack of supervision and insufficient enforcement of standard precautions.

The lack of infection control supervision (52.4%) and poor environmental conditions such as overcrowding and inadequate lighting (48.3%) were also found to influence NSI occurrences. These findings are supported by Armitage (25), who emphasized that environmental and managerial factors, rather than individual negligence alone, often contribute to clinical errors. Similarly, Mayo and Duncan (26) demonstrated that a supportive safety culture, effective leadership, and proper environmental controls can significantly mitigate NSI risks. These results contrast with hospitals where administrative oversight is weak and safety audits are infrequent, leading to increased occupational hazards.

Overall, the findings underscore the multifactorial nature of needle stick injuries among nurses and align with previous studies suggesting that a combination of personal, organizational, and systemic factors influences their occurrence (27,14). The comparison with global literature indicates that while the problem is universal, its magnitude is amplified in resource-constrained environments like Pakistan due to limited safety resources and weak policy enforcement. Strengthening infection control training, implementing safety-engineered devices, and fostering a culture of safety can reduce NSIs, enhance occupational health, and protect healthcare workers from preventable harm.

Conclusion

This study concluded that needle stick injuries (NSIs) remain a prevalent occupational hazard among nurses at Khyber Teaching Hospital. The high frequency of NSIs was primarily associated with factors such as heavy workload, lack of safety-engineered devices, inadequate training, and improper waste disposal systems. More than half of the nurses reported engaging in unsafe practices such as needle recapping, indicating persistent gaps in adherence to standard precautions. The findings reaffirm that both individual behavior and institutional shortcomings contribute significantly to the occurrence of NSIs, consistent with previous studies highlighting the importance of organizational culture and safety compliance in mitigating occupational risks (13,14,25).

The results also underscored deficiencies in infection control supervision and environmental conditions, such as overcrowded workspaces and poor lighting, which exacerbate exposure risks. Despite the existence of preventive guidelines,

implementation remains inconsistent. Overall, the study emphasizes the urgent need for institutional commitment to occupational safety, as well as sustained education and resource allocation to safeguard healthcare personnel from blood-borne infections and associated health threats.

Recommendations

Implementation of Safety-Engineered Devices:

Hospital management should prioritize the procurement and mandatory use of safety-engineered syringes, retractable needles, and sharps disposal containers to minimize accidental exposure, as supported by evidence from high-income healthcare systems (15,17).

Regular Training and Refresher Courses:

Continuous professional development programs should be conducted for nursing staff on injection safety, infection control, and post-exposure management to reinforce compliance with standard precautions (12,19).

Establishment of a Non-Punitive Reporting System:

Nurses should be encouraged to report NSIs through an anonymous, blame-free mechanism to enhance data accuracy and enable timely corrective measures.

Strengthening Infection Control Supervision:

Hospital infection control committees should conduct regular safety audits, monitor adherence to protocols, and ensure accountability across all units.

Workload Management:

Nursing schedules should be revised to reduce fatigue, ensuring adequate nurse-to-patient ratios that allow safe handling of sharps and adherence to aseptic procedures (14,24).

Environmental and Infrastructure Improvements:

Adequate lighting, spacious work areas, and strategically located sharps disposal units should be provided to reduce preventable injuries caused by overcrowding and poor facility design.

Policy and Leadership Support:

Hospital administrators and policymakers must integrate NSI prevention into occupational health and safety policies, aligning with WHO and CDC recommendations for healthcare worker protection.

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