

ORIGINAL ARTICLE

Needle Stick Injury among Health Care Workers in Tertiary Care Setting in Peshawar

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ABSTRACT

Background: Needle-stick injuries (NSIs) represent a significant occupational risk for healthcare workers and increase the likelihood of exposure to blood-borne pathogens. Understanding their prevalence, underlying causes and associated determinants is essential for implementing effective preventive measures in tertiary care institutions. Our objective is to assess the distribution, causes, and associated factors of NSIs among healthcare workers in tertiary care private setting in Peshawar.

Methods: This retrospective descriptive cohort study involved 17 reported NSI incidents recorded in the Hospital Management Information System (HMIS) online complaint portal from September 2022 to September 2025. Data related to gender, profession, the cause of the injury, the condition of the patient and the hospital where the patient was hospitalized were coded and subjected to a descriptive analysis.

Results: Most NSIs occurred among male healthcare workers (n=12, 70.6%), with nurses (n=8, 47.1%) and doctors (n=5, 29.4%) being the most affected professions. Catheter/line and syringe/line procedures were the leading causes of injury (35.3% each). The majority of exposures involved patients without documented blood-borne infections (76.5%), while hepatitis C and B were reported in 17.6% and 5.9% of cases, respectively. The Emergency Room (n=4, 23.5%) and pediatric ward (n=3, 17.6%) were the most common locations for NSIs. A significant association was observed between profession and injury cause (p = 0.027), with nurses predominantly affected by catheter- and syringe-related injuries. No significant associations were found between gender or hospital location and injury cause.

Conclusion: Needle-stick injuries (NSIs) are a major occupational hazard, especially for nurses and during catheter/line or syringe procedures. These findings highlight the need for targeted training, strict safety protocol adherence, and robust reporting systems to protect healthcare workers. Results are preliminary, based on a single institution.

Keywords: Needle Stick Injury; Healthcare Workers; Occupational Exposure; Tertiary Care Hospital

This article may be cited as: Ahmad S, Khan MSA, Ali T, Ahmad W, Shehzad K, Ilyas M. Needle stick injury among health care workers in tertiary care setting in Peshawar. Int J Pathol;24(2). DOI; <https://doi.org/10.59736/IJP.24.02.1049>

Introduction

Needle-stick injuries (NSIs) are a significant occupational risk hazard faced by healthcare workers (HCWs) on a global scale.

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These accidents occur when the needles or other sharp instruments accidentally pierce the skin during clinical procedures, exposing HCWs to blood-borne pathogens. The recent international experience proves that, despite improvements in infection control methods and educational programs, NSIs remain a serious occupational health concern to this day. (1,2)

The main concern related to NSIs is the possibility of transmitting serious infections, and in particular, hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Recent empirical research (since 2020) highlights the fact that NSIs continue to be a major source of occupational exposure of HCWs to these pathogens, especially in hospital facilities where invasive procedures are commonly performed on patients.(3,4) NSIs often cause psychological stress, fear of spreading the disease, and post-exposure testing and follow-up, even without infection, which follows afterward, which often happens even in cases when the infection does not take place.(5)

Tertiary care hospitals represent high-risk environments for NSIs due to heavy workloads, emergency care demands, and frequent handling of sharp instruments. Recent studies from low- and middle-income countries have reported higher NSI rates in emergency rooms and inpatient wards, where rapid clinical decision-making and urgent procedures increase the likelihood of accidental injuries. (6,7) Accident-rate-based evaluation of NSIs is therefore essential to identify high-risk hospital locations and procedures.

Profession-wise analyses consistently demonstrate that nurses experience the highest number of NSIs, followed by doctors and support staff such as housekeeping personnel. Syringe handling and intravenous line procedures remain the most frequently reported causes of injury, highlighting gaps in safe sharps

handling and disposal practices. (8,9) Furthermore, exposure to patients with known or unknown HBV or HCV status highlights the importance of proper documentation and prompt post-exposure management. (10)

In Pakistan, limited retrospective cohort evidence is available that systematically documents NSIs events using hospital records, particularly in tertiary care hospitals in Peshawar. Therefore, this study aims to assess the location-wise distribution, gender and profession-based patterns, causes of injury, and associated patient disease status of needle-stick injuries among HCWs in tertiary care private settings in Peshawar, with the objective of identifying high-risk practices and informing targeted occupational safety interventions.

Methods

Data for this study were obtained from the Hospital Management Information System (HMIS) online complaint reporting system of Northwest General Hospital & Research Centre, an integrated digital platform used for institutional incident documentation and administrative reporting. This entry in HMIS is voluntary. The study included all reported needle-stick injury (NSI) incidents recorded in the HMIS between September 2022 and September 2025.

Within the institutional framework, occupational exposure was defined as any percutaneous injury (including needle-stick or sharps injury) or contact of mucous membranes or non-intact skin with potentially infectious blood or body fluids. The hospital has a standardized protocol for the prevention and management of occupational exposure that focuses on safe handling and disposal of sharps, avoiding recapping of needles, using safety devices primarily in operating and high-risk settings, and following strict biomedical standard precautions.

After the occurrence of an exposure incident, immediate first aid care is compulsory, such as washing the affected area and dressing. All exposure incidents are reported to the supervising authority. Then follow-ups occur via HMIS, and finally, assessment is done for a patient and source, whether exposed or source, for hepatitis B and C, and HIV. In accordance with institutional conditions, follow-ups and care after exposure are done with respect to source patient status and timelines. Continuous care and counseling are undertaken and ensured by the institution. Institutional protocol for management of occupational exposure to blood and body fluids is given in **Fig. 1**

For the purpose of this study, the following information was extracted from each HMIS report: the date of occurrence, hospital location, department or unit involved healthcare worker profession and gender, patient disease status, and a narrative description of circumstances and contributing factors involving an injury. Descriptive statistical analyses were used to examine the distribution and patterns of NSIs across hospital units and procedural contexts. Approval from the Institutional Review Board as well as the ethical committee was sought [Ref No: IRB&EC/2024-GH/0146; Dated: 13/08/2024]. All the information obtained was anonymous, stored, and only retrievable by certified personnel from the research field.

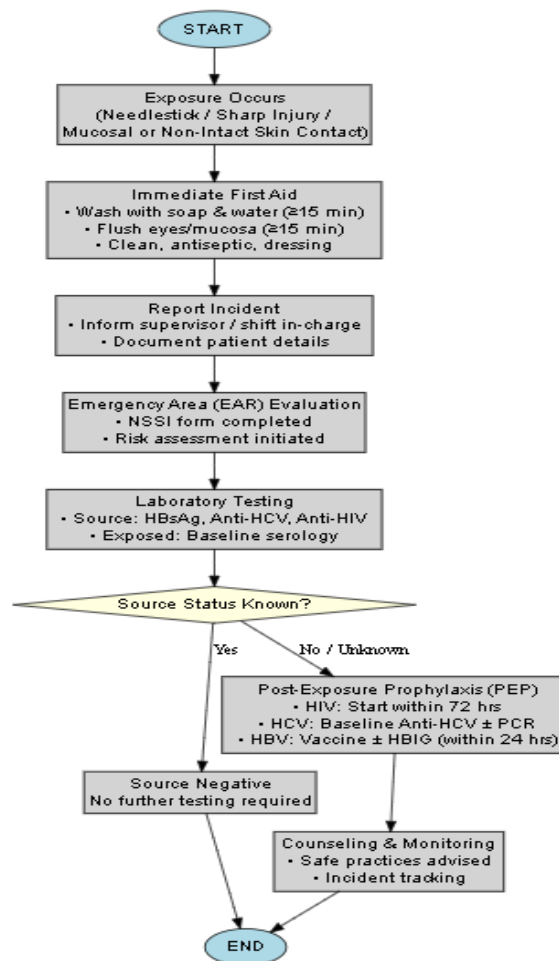


Figure 1: Flowchart of the institutional protocol for management of occupational exposure to blood and body fluids

Results

The distribution of reported needle stick injury (NSI) cases by gender, profession, injury cause, patient disease status, and hospital location. As shown in the table, most NSIs occurred among male healthcare workers (n=12, 70.6%), with nurses constituting the largest professional group affected (n=8, 47.1%), followed by doctors (n=5, 29.4%). Catheter/line-related and syringe/line procedures were the predominant causes of injury, each

accounting for 35.3% of cases. The majority of exposures involved patients with no documented blood-borne infection (n=13, 76.5%), while hepatitis C and hepatitis B were reported in 17.6% and 5.9% of cases, respectively. Location wise **Table 1** shows that the emergency room had the highest proportion of NSIs (n=4, 23.5%) followed by the pediatric ward (n=17.6%), with other departments contributing smaller proportions.

Table 1: Characteristics of Reported Needle Stick Injury Cases (N = 17)

Basic Demographic		N (%)
Gender	Male	12 (70.6)
	Female	5 (29.4)
Profession	Doctor	5 (29.4)
	Nurse	8 (47.1)
	Housekeeper	2 (11.8)
	Assistant	2 (11.8)
injury cause	Catheter/Line procedure	6 (35.3)
	Surgical Procedure	3 (17.6)
	Syringe/Line procedure	6 (35.3)
	Other Invasive procedure	2 (11.8)
	Non-clinical	0 (0.0)
Patient Disease status	Hepatitis-C	3 (17.6)
	Hepatitis-B	1 (5.9)
	None	13 (76.5)
Location	CCU	1 (5.9)
	CSSD	1 (5.9)
	Emergency Room	4 (23.5)
	ENT	2 (11.8)
	Gynecology	1 (5.9)
	Medicine	2 (11.8)
	OT	2 (11.8)
	Pediatric wards ward	3 (17.6)
	Stroke Unit	1 (5.9)

The **table 2** presents the distribution of injury causes across gender, profession, and hospital location among reported needle stick injury cases. Catheter- and syringe-related injuries

were more frequently reported among male HCWs, while surgical injuries were proportionally higher among females; however, the association between gender and

injury cause was not statistically significant ($p = 0.340$). A statistically significant association was observed between profession and injury cause ($p = 0.027$), with nurses predominantly affected by catheter- and syringe-related injuries and all surgical injuries occurring among doctors. Location-wise, catheter-

related injuries were mainly reported from the Emergency Room, whereas syringe-related injuries occurred across multiple departments, with no statistically significant association identified between injury cause and hospital location ($p = 0.331$).

Table 2 Association of injury causes with gender, profession, and hospital location among Needle Stick Injury Cases

Characteristics		Injury Causes				P-value
		Catheter	Surgical	Syringe	Other Procedure	
Gender n (%)	Male	4 (66.7)	1 (33.3)	5 (83.3)	2 (100.0)	0.340
	Female	2 (33.3)	2 (66.7)	1 (16.7)	0 (0.0)	
Profession, n (%)	Doctor	1 (16.7)	3 (100.0)	0 (0.0)	1 (50.0)	0.027
	Nurse	5 (83.3)	0 (0.0)	3 (50.0)	0 (0.0)	
	Housekeeper	0 (0.0)	0 (0.0)	2 (33.3)	0 (0.0)	
	Assistants	0 (0.0)	0 (0.0)	1 (16.7)	1 (50.0)	
Location n (%)	CCU	0 (0.0)	0 (0.0)	1 (16.7)	0 (0.0)	0.331
	CSSD	0 (0.0)	0 (0.0)	0 (0.0)	1 (50.0)	
	ER	3 (50.0)	0 (0.0)	1 (16.7)	0 (0.0)	
	ENT	1 (16.7)	0 (0.0)	1 (16.7)	0 (0.0)	
	Gynecology	0 (0.0)	1 (33.3)	0 (0.0)	0 (0.0)	
	Medicine	1 (16.7)	0 (0.0)	0 (0.0)	1 (50.0)	
	OT	0 (0.0)	1 (33.3)	1 (16.7)	0 (0.0)	
	Paediatric ward	1 (16.7)	1 (33.3)	1 (16.7)	0 (0.0)	
	Stroke Unit	0 (0.0)	0 (0.0)	1 (16.7)	0 (0.0)	

Note: Due to small sample size, P-values should be interpreted with caution.

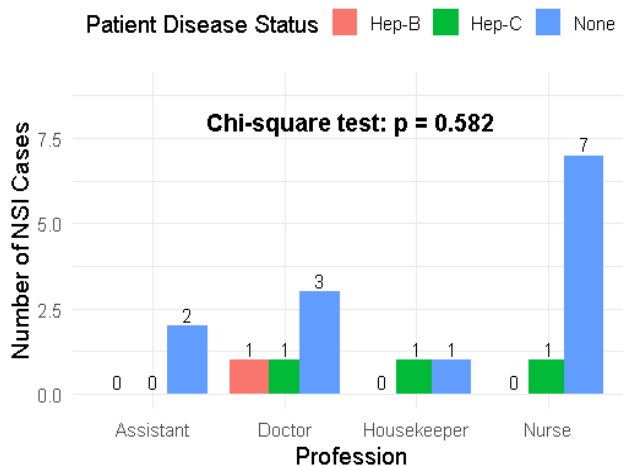


Figure 2: Distribution of Hepatitis B and C Cases among Healthcare workers by Profession

Figure 2 presents the distribution of patients with hepatitis B (Hep-B), hepatitis C (Hep-C), and no hepatitis infection across professions/designations. No hepatitis cases were observed among assistants. Among doctors, one patient each was positive for Hep-B and Hep-C, while three patients had no hepatitis infection. Housekeepers and nurses each had one Hepatitis-C-positive patient, with no Hepatitis-B cases recorded in these groups. The chi-square test indicated no statistically significant association between

healthcare profession and patient disease status ($p = 0.582$).

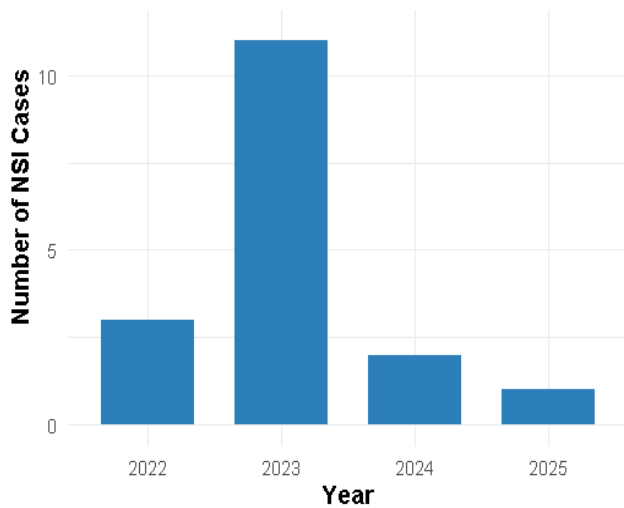


Figure 3: Year-wise distribution of NSI cases

Figure 3 shows the annual distribution of needle stick injury (NSI) cases over the study period. The highest number of NSI cases was reported in 2023 ($n = 11$), followed by 2022 ($n = 3$). A marked decline was observed in subsequent years, with two cases reported in 2024 and one case in 2025.

Discussion

This study assessed patterns of needle stick injuries (NSIs) among healthcare workers at Northwest General Hospital & research Centre. Consistent with the study objectives, most NSIs occurred in male staff (70.6%) and were most frequent among nurses (47.1%), followed by doctors (29.4%). Catheter/line and syringe/line procedures were the predominant mechanisms of injury, each contributing 35.3% of cases. A large majority of exposures involved patients without documented blood-borne infections (76.5%), while smaller proportions were linked with hepatitis C (17.6%) and hepatitis B (5.9%). The Emergency Room and pediatric ward accounted for the highest proportions of NSIs.

A significant association was observed between profession and injury cause ($p = 0.027$), whereas gender and location did not show statistically significant differences. Patient disease status was similarly independent of profession ($p = 0.582$). Lastly, NSI incidence peaked in 2023 and declined thereafter.

Gheshlagh et al. demonstrate that needle stick injuries are disproportionately high among nursing personnel in tertiary care settings in Pakistan, particularly due to the frequent performance of invasive procedures and direct patient contact, which increases occupational exposure risk.(8) Similarly, Kiddeer et al. report that hollow-bore needles and line-related procedures are among the most common mechanisms of NSIs, aligning with our findings of predominant catheter/line and syringe/line-related injuries.(7) The trend is also in line with findings in other larger contexts that indicate higher NSI rates in the emergency and high-intensity clinical settings.(11) Compared to the comparatively low level of NSIs with infected patients in our study, Shaikh et al. found that more NSIs are associated with exposure to the hepatitis B virus, which demonstrates that the exposure to serology varies across the contexts. (12) The excessive rate of NSIs in nurses has been supported by other researchers at two tertiary care hospitals of Karachi representing public and private sectors where unsafe working behaviors like needle recapping were found to be the primary cause of occupational injuries.(13) Moreover, a meta-examination conducted by Ghanei Gheshlagh et al. has verified an overall NSI morbidity of close to 48 percent among nurses in Pakistan, which reflects the high job risk to the specified population .(8) Khan et al. also highlight the significance of post exposure prophylaxis knowledge and

practices in nurses with the identified gaps that might influence NSI outcomes and reporting.(14) It is also indicated by the regional studies that the reporting practice is not optimal and this can lead to the underestimation of the actual NSI incidence.(7) Moreover, there is also evidence in the international literature suggesting that the workload, lack of safety equipment, and incomplete training correlate with an increase in NSI rates among nurses and other health specialists .(15) Conclusively, the wider scope of occupational health studies indicates that because NSIs are frequently caused by a multifaceted interplay between systemic safety practices and the demands of the procedure, there has to be holistic prevention mechanisms .(8,16)

The high correlation between profession and cause of injury is probably due to the allocation of tasks in the clinical working process, where nurses practice more invasions and doctors are involved in surgical procedures. They are not correlated with gender and place, which indicates procedural risk can go beyond these demographic and situational factors after clinical exposures take place.

The true incidence of NSIs is likely underestimated due to underreporting driven by stigma, limited awareness of reporting procedures, perceived low risk, and time constraints in busy clinical settings. (17,18) Additionally, as this study reflects data from a single tertiary care institution, findings may be influenced by local practices, staffing patterns, and institutional safety protocols, limiting generalizability. Nevertheless, these preliminary observations offer valuable insights into occupational risks and can guide targeted preventive strategies and training within similar healthcare environments.

The strengths of this study include the use of an institutional incident reporting system, which enabled a detailed classification of the causes and settings of NSIs. The findings highlight the importance of targeted training in safe sharps handling, improved HBV vaccination coverage, and simplified reporting procedures.

However, several limitations should be considered. The small sample size (N = 17) limits the generalizability of the findings to other healthcare settings or the broader population of healthcare workers as well as the statistical significance statement should be interpreted cautiously. Additionally, reliance on self-reported data from the HMIS may have led to underreporting or misclassification of NSI cases, particularly minor incidents perceived as low risk. The cross-sectional and retrospective nature of the study also prevents establishing causal or temporal relationships between exposures and injury outcomes. Furthermore, several important variables that may influence NSI risk were not available in the dataset, including HBV vaccination status, training in sharps safety, use of protective or safety-engineered devices, and years of professional experience. The absence of these factors limits the ability to assess their potential contribution to injury risk and reporting behavior. Finally, as the study was conducted in a single tertiary care hospital in Peshawar, variations in institutional policies, workload, and departmental practices may limit the external validity of the results. Future research should consider multicenter, prospective designs incorporating these variables to better identify risk factors and evaluate preventive interventions.

Conclusion

Needle-stick injuries (NSIs) remain a significant occupational hazard among healthcare workers, particularly among nurses and during procedures such as catheter/line and syringe insertion. These findings highlight the importance of targeted training, strict adherence to safety protocols, and strengthening institutional reporting systems to reduce the incidence of NSIs and protect healthcare professionals from exposure to blood-borne infections. However, these results should be interpreted as preliminary observations from a single institution, emphasizing the need for larger, multicenter studies to better understand risk factors and inform broader preventive strategies.

Conflict of Interest: Nothing

Funding: Nothing to disclose

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HISTORY	
Date received:	31-01-2026
Date sent for review:	25-02-2026
Date received reviewers comments:	31-03-2026
Date received revised manuscript:	27-04-2026
Date accepted:	03-07-2026

CONTRIBUTION OF AUTHORS	
AUTHOR	CONTRIBUTION
Conception/Design	SA,WA,MI
Data acquisition, analysis and interpretation	TA
Manuscript writing and approval	MSAK,KS
All the authors agree to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed.	