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Knowledge, Attitudes, and Practices Regarding Needlestick Injuries and Post-Exposure Prophylaxis Among Healthcare Personnel: A Cross-Sectional Study

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Abstract

Background

To assess the knowledge, attitude, and practices related to needlestick injuries (NSIs) and post-exposure prophylaxis (PEP) among healthcare personnel and to identify behavioral and systemic factors influencing reporting and compliance.

Materials and Methods:

A descriptive cross-sectional study was conducted among 300 healthcare personnel from surgical disciplines at a tertiary care center between September and December 2025. Data were collected using a validated, structured questionnaire assessing knowledge, attitude, practice, and post-exposure responses.

Statistical Analysis:

Data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize variables, and associations were assessed using the chi-square test. A p-value < 0.05 was considered statistically significant.

Results:

Although 86% of participants demonstrated good knowledge regarding NSIs, only 62% consistently followed safe injection practices. Awareness of PEP guidelines was reported by 78%; however, only 54% initiated prophylaxis and 38% completed the full regimen. Positive attitudes were significantly associated with better preventive practices ($p = 0.03$). Non-reporting was mainly due to perceived minor injury (40%), fear of stigma (34%), and workload constraints (30.7%).

Conclusion:

Despite adequate awareness, gaps persist in safe practices, reporting, and post-exposure follow-up. By highlighting behavioral and institutional barriers alongside KAP findings, this study provides practical direction for strengthening occupational safety systems in tertiary-care settings.

Keywords: compliance; healthcare workers; needlestick injury; occupational exposure; post-exposure prophylaxis

Introduction

Needlestick injuries (NSIs) remain a major occupational hazard among healthcare personnel because they can transmit blood-borne pathogens such as hepatitis B virus, hepatitis C virus, and HIV. Although largely preventable through safe sharps handling, adherence to standard precautions, hepatitis B vaccination, and timely post-exposure prophylaxis (PEP), they continue to occur frequently in clinical practice[1,2]. In India, national guidelines issued by the National AIDS Control Organization and the National Center for Disease Control recommend prompt reporting, immediate first aid, risk assessment, and timely initiation of PEP after occupational exposure[3,4].

Indian studies continue to show a substantial burden of NSIs and important gaps in prevention and response. A recent study from Kerala reported that nearly one-third of healthcare professionals had sustained at least one NSI in the previous year; among those affected, only 69% formally reported the incident and 78% initiated PEP[5]. In Nagpur, although nurses demonstrated reasonable awareness regarding NSI risks and immediate management, unsafe practices persisted, including needle recapping[6]. Hepatitis B vaccination coverage among healthcare workers also remains inadequate, with fewer than half completing the full vaccination schedule in some tertiary-care settings[7]. Underreporting of sharps injuries remains common and continues to undermine timely post-exposure management [8].

Although previous studies have described the prevalence of NSIs and general awareness regarding PEP, fewer have examined knowledge, attitudes, and practices together with post-exposure response and reporting-related barriers in a single institutional setting. Therefore, the present study was undertaken to assess knowledge, attitudes, and practices regarding NSIs and PEP among healthcare personnel in a tertiary-care setting and to identify behavioral and system-level gaps relevant to infection control training and occupational safety improvement.

Materials and Methods

Study design and setting

A descriptive cross-sectional study was conducted in the Department of Surgical Disciplines of a tertiary care teaching hospital in India. The study was carried out over a 4-month period from September to December 2025. The study was approved by the Institutional Ethics Committee of AIIMS, New Delhi, with Reference No. AIIMSA3719. Written informed consent was obtained from each participant, and confidentiality was maintained. Healthcare personnel working across surgical wards, intensive care units, and outpatient units in the Department of Surgical Disciplines were invited to participate to ensure broad representation of clinical settings involving routine handling of sharps and potential occupational exposure.

Study population and sample size

The study targeted nursing officers and technologists as participants. Using an expected prevalence of 50% for adequate knowledge regarding needlestick injuries, along with a 95% confidence level and a 5% margin of error, the calculated minimum required sample size was 278. To account for a projected nonresponse rate of approximately 10%, the sample size was increased to 300 individuals[9].

Sampling technique

All eligible healthcare personnel listed in the departmental rosters were approached using a total enumerative sampling strategy. Individuals with at least 6 months of professional experience who agreed to participate were included in the study. Those who did not routinely handle sharps or were unavailable because of leave during the data collection period were excluded.

Study tool and data collection

Information was obtained through a self-administered, structured questionnaire that had been pretested for clarity and reliability. The tool was designed after reviewing relevant international and national recommendations, including those from the World Health Organization (WHO, 2024), the National AIDS Control Organization (NACO, 2024), and the National Center for Disease Control (NCDC, 2024)[2,3,4]. The questionnaire comprised four sections covering:

1. Demographic information
2. Knowledge about causes, risks, and preventive measures related to NSIs and post-exposure prophylaxis (PEP)
3. Attitudes toward reporting, vaccination, and adherence to safe practices

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4. Practices related to universal precautions, reporting behavior, and response to exposure

Specialists in occupational health and infection control reviewed the questionnaire to confirm its content validity. A pilot administration involving 20 respondents was carried out to refine the tool, yielding good internal consistency (Cronbach's $\alpha = 0.81$). Responses were scored as "good," "moderate," or "poor" based on predefined cutoff values: >80% (good), 60%–80% (moderate), and <60% (poor).

Statistical analysis

The collected data were first compiled in Microsoft Excel and then analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Frequencies, percentages, means, and standard deviations were used to summarize the study variables. The association between demographic variables and KAP scores was evaluated using either the chi-square test or Fisher's exact test, depending on the data distribution and applicability. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 300 healthcare personnel (HCPs) participated in the study. Most participants were women (83.3%), and nearly three-quarters (72.6%) were between 20 and 30 years of age. Most respondents were nursing officers (51.3%), followed by nursing students (27.3%) and technologists (4.7%). About 60.6% had less than 5 years of experience, whereas 56.7% had not received any formal training on the prevention of needlestick injuries (NSIs). Only 20% of participants had completed the full course of hepatitis B vaccination, and 60.7% had undergone anti-HBs antibody testing [Table 1].

Assessment of Knowledge, Attitude, and Practice Concerning NSI and PEP

Participants demonstrated high levels of knowledge regarding the causes, risk factors, and immediate management of NSIs. Nearly all (99.3%) correctly identified washing the wound with soap and water as the immediate first-aid measure, and 97.3% correctly identified HBV, HCV, and HIV as blood-borne pathogens transmitted through needles. Knowledge gaps were noted regarding the purpose and ideal timing of PEP, with only 80.7% answering correctly [Table 2].

Safe practices were followed variably. Most participants used gloves (98.7%), avoided recapping needles (90%), and adhered to the one-hand recapping method (88%). However, only 45.3% attended NSI training regularly, 16.7% had experienced an NSI in the preceding year, and among them, only one-fourth underwent viral marker testing at 6 weeks.

Attitudes were generally favorable: 94% believed NSIs were preventable, 92% expressed willingness to report an NSI immediately, and 79.3% were concerned about NSI risks. However, only 10% felt confident in safely handling sharps, indicating a gap between intent and self-efficacy [Table 2].

Association Between Attitude and Practice

A meaningful statistical relationship was observed between participants' attitudes and their practice behaviors ($p = 0.03$). Participants with good attitude scores (>80%) demonstrated higher adherence to safe practices than those with moderate or poor attitudes, highlighting the influence of behavioral factors on compliance [Table 3].

Post-Exposure Prophylaxis (PEP) Practices

Immediate post-exposure responses were appropriate, with 98.7% rinsing the affected area with soap and water. However, follow-up compliance was inconsistent. Only 79.3% received hepatitis B vaccination, 63.3% underwent anti-HBs titer testing, and 72% had viral marker screening following exposure. Tetanus vaccination was received by 73.3% [Table 4].

Reasons for Non-Reporting of NSI

Despite high awareness, nonreporting remained substantial. The most common reasons were the perception that the injury was too minor (40%), fear of stigma (34%), lack of time (30.7%), and unawareness of the reporting procedure (26.7%). Other barriers included embarrassment (22.7%) and lack of concern (21.3%) [Table 5]. These findings indicate multilevel psychosocial and system-level obstacles to timely reporting.

These findings highlight that nonreporting is driven by a combination of organizational and psychosocial factors rather than ignorance alone. Fear of punitive responses, unclear reporting channels, and low prioritization of occupational safety contribute to substantial under documentation of NSI incidents.

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Strengthening institutional support, simplifying reporting systems, and fostering a nonpunitive safety culture are therefore essential to improve compliance and ensure timely post-exposure management.

Discussion

Despite widespread recognition of the risks involved, needlestick injuries (NSIs) continue to be a prominent occupational threat for healthcare professionals. Similar to findings from regional and global studies, the present study showed good knowledge regarding NSI causes, transmission risks, and immediate wound-care measures, reflecting strong theoretical understanding among nurses and students[9, 10, 11]. The predominance of female participants and younger age groups in the present study reflects the underlying workforce composition in nursing services, where a large proportion of staff are female and in the early stages of their careers. As the study primarily included nursing personnel and students from surgical departments, this distribution was expected and is consistent with similar healthcare settings. However, this demographic profile may influence the generalizability of the findings to other groups such as senior healthcare workers or male personnel. Similar demographic and exposure patterns were reported by Babu et al. (2025) from AIIMS Patna, where the mean age of participants was 27 years, 52% were female, 22% reported at least one occupational exposure to blood and body fluids, and needlestick injuries accounted for 47.3% of exposures[12]. However, as observed in previous Indian and African cohorts, high knowledge did not consistently translate into safe practices or full adherence to post-exposure guidelines[13, 14]. A similar gap was noted by Anandadurai et al. (2024) in South India, where 89% of healthcare workers had good awareness about proper disposal practices and 89.5% were aware of post-NSI procedures, yet 44% incorrectly believed that recapping was recommended and 30.5% still practiced recapping[15].

Despite most participants recognizing NSI risks, gaps persisted in routine training participation, consistent use of engineered safety measures, and long-term PEP follow-up. Such knowledge-practice gaps have been documented across healthcare settings and are influenced by behavioral barriers such as low perceived susceptibility, limited confidence in handling sharps, and reliance on habitual work routines[16, 17]. Studies from South Asia similarly note that inadequate supervision and risk normalization contribute to poor compliance, even when staff understand recommended protocols[18]. A similar pattern was reported by Kakati et al. (2025), where awareness was generally good, but only 59% knew that used needles should not be recapped, 39% had experienced NSI, and only 32% reported the injury and initiated post-exposure prophylaxis[19].

System-level constraints further contributed to underreporting and incomplete PEP adherence. Fear of blame, workload pressure, unclear reporting pathways, and perceptions of minor injury were frequently cited patterns consistent with evidence showing that organizational climate strongly shapes reporting behavior[20,21]. Hospitals with punitive or unsupportive cultures repeatedly demonstrate low reporting rates despite adequate knowledge[22]. Similar institutional patterns were reported by Singh et al. (2024), who found that younger and female healthcare workers were more commonly affected, with most NSIs occurring in inpatient areas and during daytime shifts, highlighting the role of work setting and system-level factors[23]. Likewise, Jaggi et al. (2020) showed that structured process improvement and better adherence to hospital policies reduced sharps injuries by 21.3% in a tertiary hospital in Northern India. This suggests that improving reporting requires administrative simplification, supervisor reassurance, and a psychologically safe work environment[24].

The significant association between positive attitudes and safer practices in this study reinforces the influence of behavioral determinants. Previous studies have shown that favorable attitudes, particularly confidence, perceived organizational support, and willingness to report, predict better compliance with NSI and PEP protocols[25,26] Behavior-centered interventions, including scenario-based training and regular reinforcement, may help strengthen these attitudes and improve adherence over time.

Post-exposure management also revealed gaps, with inconsistent completion of PEP regimens and follow-up viral-marker testing. Similar deficiencies were reported in multicenter Indian studies, where healthcare workers often initiated PEP promptly but did not complete the full follow-up schedule[13,25,26]. However, the present study did not specifically assess the reasons for noncompletion of PEP; therefore, no

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definitive conclusions can be drawn regarding the underlying barriers. This finding highlights the need for future studies to explore factors influencing adherence, including individual, behavioral, and system-level determinants.

Underreporting in the present study mirrors international findings, where embarrassment, fear of repercussions, and perceived low severity discouraged disclosure. Bhattacharya et al. (2025) also highlighted that nurses often avoid reporting because of perceived administrative burden and lack of feedback[27]. These behavioral and structural impediments emphasize that NSI prevention must extend beyond knowledge-based training to strengthening institutional culture and reporting systems.

Overall, this study demonstrates that while knowledge regarding NSI prevention remains relatively high, important behavioral and system-level barriers continue to limit safe practices, timely reporting, and post-exposure follow-up. By examining knowledge, attitudes, practices, post-exposure actions, and reporting barriers together in a tertiary-care surgical setting, the study adds practical institutional evidence that may help Hospital Infection Control committees design more targeted and context-specific interventions.

Limitations

This study has some limitations. It was based on self-reported data and is therefore subject to recall and social desirability bias. As a single-center study from a tertiary-care setting, its findings may not be generalizable to other health care settings. Key behaviors, including safe sharps handling, NSI reporting, and completion of post-exposure prophylaxis, were not directly observed. In addition, the reasons for noncompletion of post-exposure prophylaxis were not specifically assessed. The predominance of young female nursing personnel, although reflective of the study setting, may also limit the applicability of the findings to other health care worker groups. Despite these limitations, the study provides useful insights into behavioral and system-level gaps in NSI prevention and post-exposure management.

Conclusion

The study demonstrates that although nursing personnel possess high knowledge regarding needlestick injury (NSI) prevention and post-exposure prophylaxis (PEP), significant behavioral and systemic gaps continue to hinder safe practices, timely reporting, and complete post-exposure follow-up. Strengthening institutional accountability through regular hands-on training in safe needle handling and immediate post-exposure management, simplifying reporting systems with quick and confidential digital mechanisms, and ensuring consistent availability and monitoring of PEP across clinical departments are essential to bridge the knowledge-practice gap. Promoting a supportive, nonpunitive safety culture with active managerial reinforcement can further enhance compliance and reduce underreporting. These findings provide actionable direction for Hospital Infection Control (HIC) committees and policymakers to strengthen occupational safety frameworks and reduce preventable exposures in health care settings.

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Results

Table 1. Demographic profile of study participants (N = 300)

Variable	n (%)
Sex	
Male	50 (16.7)
Female	250 (83.3)
Age group, years	
20–30	218 (72.6)
30–40	30 (10.0)
40–50	52 (17.3)
Qualification	
GNM	46 (15.3)
BSc	122 (40.7)
MSc	20 (6.7)
Post Basic BSc	106 (35.3)
PhD	6 (2.0)
Job category	
Senior Nursing Officer	50 (16.7)
Nursing Officer	154 (51.3)
Technologist	14 (4.7)

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Nursing Student	82 (27.3)
Experience, years	
<5	182 (60.6)
6–10	26 (8.6)
11–15	10 (3.3)
16–20	32 (10.6)
>20	50 (16.6)
Hepatitis B vaccination status	
Complete	60 (20.0)
Incomplete	58 (19.3)
Not done	182 (60.7)
Anti-HBs antibody test	
Done	182 (60.7)
Not done	118 (39.3)
Received NSI prevention training	
Yes	130 (43.3)
No	170 (56.7)

***Values are expressed as frequency and percentage. Most participants were young females with less than 5 years of experience; vaccination and NSI training coverage were limited.**

Table 2. Knowledge of participants regarding NSI and PEP (N = 300)

Domain	Item	n (%)
Knowledge	Definition of NSI	282 (94.0)
	Common cause of NSI	262 (87.3)

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	High-risk activity for NSI	274 (91.3)
	Immediate action after NSI	298 (99.3)
	Blood-borne pathogens transmitted	292 (97.3)
	Purpose of PEP	242 (80.7)
	Ideal time to start PEP	242 (80.7)
	Factors increasing HIV transmission risk	270 (90.0)
Practices	Use gloves while handling sharps	296 (98.7)
	Recap needle before discarding*	30 (10.0)
	Use one-hand recapping method	264 (88.0)
	Avoid PPE during emergency*	24 (8.0)
	Experienced NSI in past 1 year	50 (16.7)
	Had multiple NSIs	28 (9.3)
	Follow hospital NSI protocol	244 (81.3)

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	Attend NSI training regularly	136 (45.3)
	Repeat viral marker testing at 6 weeks	74 (24.7)
	Viral marker testing at 12–24 weeks	64 (21.3)
Attitudes	Concerned about NSI risk	238 (79.3)
	Believe NSIs can be prevented with precautions	282 (94.0)
	Confident in handling sharps safely	30 (10.0)
	Institution provides adequate NSI training	236 (78.7)
	Willing to report NSI immediately	276 (92.0)

*Negative item

Table 3. Association between attitude and practice levels

Attitude score	Low practice n	Moderate practice n	High practice n	p-value
Poor (<60%)	6	4	8	0.03*
Moderate (60–80%)	6	20	6	
Good (>80%)	46	152	52	

*A statistically significant association was found between positive attitude and better NSI prevention practices (p = 0.03).

Table 4. Post-exposure prophylaxis (PEP) practices among participants (N = 50)

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Practice item	Yes n (%)	No n (%)
Rinsed with soap and water after NSI	35 (70.0)	15 (30)
Received hepatitis B vaccination	38 (76)	12 (24)
Checked anti-HBsAg titre	24 (48)	26 (52)
Screened for viral markers (self/source)	42 (84)	8 (16)
Received tetanus vaccine post exposure	46 (92)	4(8)

*Immediate wound care practices were well followed, though vaccination coverage and follow-up testing were inconsistent.

Table 5. Reasons for non-reporting of NSI (N = 300)

Reason	Yes n (%)	No n (%)
Injury considered minor	120 (40.0)	180 (60.0)
Fear of stigma/discrimination	102 (34.0)	198 (66.0)
Lack of time to report	92 (30.7)	208 (69.3)
Unaware of reporting procedure	80 (26.7)	220 (73.3)
Too embarrassed to report	68 (22.7)	232 (77.3)
Not bothered to report	64 (21.3)	236 (78.7)

*The most common barriers to reporting were perception of minor injury, fear of stigma, and lack of time.

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