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INCIDENCE AND REPORTING PATTERNS OF NEEDLE STICK INJURIES AMONG HEALTHCARE WORKERS: A 1-YEAR SURVEILLANCE STUDY AT NISHTAR HOSPITAL, MULTAN

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ABSTRACT

Background: Needle stick injuries (NSIs) remain a major occupational hazard for healthcare workers (HCWs), leading to potential exposure to blood-borne pathogens such as HBV, HCV, and HIV. Despite global awareness, under-reporting persists in many healthcare settings in Pakistan.

Objective: To determine the incidence and reporting patterns of NSIs among healthcare workers at Nishtar Hospital, Multan, during a 1-year surveillance period and to identify associated risk factors and preventive gaps.

Methods: A descriptive, prospective surveillance study was conducted from January to December 2024 at Nishtar Hospital. Data were collected through direct observation, incident reports, and infection-control logs using WHO-validated forms. A total of 350 HCWsincluding nurses, doctors, technicians, and students were monitored. Variables included frequency, department, device type, reporting behavior, and post-exposure management. Data were analyzed using SPSS version 26; descriptive and inferential statistics (Chi-square, $p < 0.05$) were applied.

Results: A total of 47 NSIs were formally reported, corresponding to an incidence rate of 3.2 per 100 HCWs per year. However, survey data indicated that approximately 58% of incidents went unreported, suggesting a true incidence of around 350 NSIs annually. Nurses (48.3%) and junior doctors (34.7%) were the most frequently affected groups, particularly those with less than two years of experience (59.2%). The Emergency and Accident Center (30.6%) and medical

wards (21.8%) were the highest-risk areas. The most common causes of injury were suturing (27.9%), recapping needles (25.2%), and blood collection (22.4%), with hollow-bore needles (57.8%) as the predominant device involved. Only 62.6% of reported injuries were submitted within 24 hours. Key reasons for under-reporting included perceived low risk (55.2%), time constraints (31.9%), and lack of awareness of reporting procedures (28.4%). Statistically significant associations were found between under-reporting and limited work experience ($p = 0.004$), profession ($p = 0.042$), and incomplete HBV vaccination ($p = 0.002$). While 89.1% performed appropriate first aid, only 66.7% were fully vaccinated against HBV, and PEP was initiated in less than 20% of eligible cases.

Conclusion: The study revealed a moderate incidence of NSIs with significant under-reporting. Nurses were the most vulnerable group, and recapping needles was the leading cause. Continuous training, strict reporting mechanisms, and universal HBV vaccination are critical to minimize occupational risk and improve safety culture at Nishtar Hospital.

INTRODUCTION

Needle stick injuries (NSIs) constitute one of the most prevalent occupational hazards among healthcare workers (HCWs) globally(Jiang et al., 2024a). They pose a significant risk of transmission of blood-borne pathogens including Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV) (Wu et al., 2024). According to the World Health Organization (WHO, 2022), approximately 2 million healthcare workers sustain percutaneous injuries annually worldwide, resulting in over 90,000 potential viral transmissions(WHO, 2022).

The risk profile of an NSI depends on several factors, including the pathogen involved, the depth of the injury, the type of needle, the volume of blood involved, and the viral load of the source patient(Degavi et al., 2020). The hollow-bore needle, commonly used for venipuncture and injections, poses the highest risk as it can contain a larger volume of blood (Prados et al., 2025).

In developed countries, the implementation of universal precautions, safety-engineered devices (e.g., retractable syringes, needleless systems), robust post-exposure prophylaxis (PEP) protocols, and mandatory surveillance systems has led to a significant decline in NSI rates over the past two decades (Fadil et al., 2021). However, the scenario in low- and middle-income countries (LMICs), including Pakistan, remains alarming(Erturk Sengel et al., 2021). Factors such as understaffing, high patient turnover, inadequate supplies of safety devices, insufficient training, and a lack of institutional support contribute to a persistently high incidence of NSIs (Ji et al., 2022).

A critical compounding issue, which obscures the true scale of the problem, is the widespread underreporting of NSIs. Studies from various LMIC settings indicate that only 30-60% of all NSIs are formally reported (Wang et al., 2025). This "silent epidemic" is driven by a complex interplay of factors, including a lack of awareness about reporting protocols, fear of stigma or blame, perceived low risk from the source patient, time constraints, and a distrust in the effectiveness of the post-exposure management system (Xu

et al., 2022). Underreporting not only deprives the HCW of timely and appropriate medical care, including PEP, but also prevents hospital administration from understanding the true magnitude and patterns of the problem, thereby hindering the development of effective preventive strategies(Alfarhan et al., 2023).

In Pakistan, the problem is aggravated by heavy patient loads, inadequate safety equipment, and limited compliance with infection control protocols (Ghanei Gheshlagh et al., 2025a). Surveillance studies report that the prevalence of NSIs among nurses' ranges from 30% to 80% depending on the clinical setting (Al-Mugheed et al., 2023). Under-reporting of these injuries remains a major challenge, hindering timely post-exposure management and institutional policy development (Abdelmalik et al., 2023).

Nishtar Hospital is a tertiary-care teaching hospital in South Punjab with over 1,000 beds and a diverse workforce of physicians, nurses, technicians, and support staff. Despite ongoing infection-control initiatives, needle stick injuries continue to occur, posing threats to staff safety and public health.This study provides one-year surveillance data on the incidence and reporting patterns of NSIs among HCWs at Nishtar Hospital, Multan, with a view to identifying gaps in reporting, post-exposure management, and training.

OBJECTIVES

- To determine the incidence of needle stick injuries among healthcare workers at Nishtar Hospital over one year.
- To analyze reporting patterns and factors contributing to under-reporting of NSIs.
- To identify high-risk departments and procedures associated with NSIs.
- To assess post-exposure management and HBV vaccination status of affected HCWs.

Methodology

Study Design and Setting: This was a prospective, hospital-based, observational surveillance study conducted over a 12-month period from January 1, 2024, to December 31, 2024. The study was set at Nishtar Hospital, Multan, a high-volume, 1,000-bed tertiary-care teaching hospital and a major referral center in Southern Punjab, Pakistan. The hospital encompasses all major clinical departments, including Medicine, Surgery, Obstetrics & Gynecology, Pediatrics, and a busy Emergency and Accident Center, providing a comprehensive environment for monitoring occupational hazards.

Study Population and Sampling: The study population included all healthcare workers (HCWs) at Nishtar Hospital with potential exposure to needles and other sharp instruments. This comprised doctors (consultants, residents, and house officers), nurses, nursing students, medical technicians. A purposive sampling technique was used. Based on previous year's staffing records, a target sample of 350 HCWs was aimed for to ensure representation across all major professional groups and high-risk departments.

Inclusion Criteria:

HCWs with a minimum of 6 months of service at the hospital.

Direct involvement in clinical, surgical, or diagnostic procedures (e.g., venipuncture, suturing, surgery, IV line insertion, laboratory testing).

Exclusion Criteria:

Administrative or clerical staff with no patient contact or handling of sharp instruments.

HCWs on long-term leave (e.g., sabbatical, maternity, sick leave) for the duration of the study period.

Data Collection Tools: Data were collected using two primary instruments:

Structured Reporting Form for NSIs: A standardized form was adapted from the CDC Sharps Injury Log and WHO guidelines for the surveillance of sharp object injuries. This form, finalized by the Hospital's Medication Safety & Device Surveillance (MSDS) and Infection Control Departments, captured:

Section A: Demographics: Profession, department, years of experience**.**

Section B: Injury Details: Date, time, and location of the incident; device involved (e.g., hollow-bore needle, suture needle); procedure being performed (e.g., suturing, blood draw); and the injured body part.

Section C: Circumstances & Cause: Detailed activity at the time of injury (e.g., during use, after use before disposal, during disposal); specific unsafe practice if any (e.g., recapping, transferring specimen).

Section D: Source and Outcome: Known serological status of the source patient (if available); immediate first aid taken; and whether the injury was formally reported.

Confidential Survey on Reporting Practices: An anonymous, self-administered questionnaire was distributed to a cross-section of HCWs to assess perceptions and reasons for underreporting. It included questions on knowledge of reporting protocols, past history of unreported NSIs, and barriers to reporting (e.g., lack of time, perceived low risk, fear).

Data Collection Procedure

A dual-method approach was employed for comprehensive data capture:

Active Surveillance for Reported NSIs: The Infection Control Department (ICD) served as the central reporting hub. All HCWs experiencing an NSI were mandated and encouraged to immediately report to the ICD. Upon reporting, the HCW was counseled, managed according to the post-exposure prophylaxis (PEP) protocol, and asked to complete the structured NSI reporting form under the guidance of an infection control nurse.

Cross-Sectional Survey for Unreported NSIs: To estimate the true incidence and understand underreporting, the anonymous survey was administered at the 6-month mark (July 2024) to 200 randomly selected HCWs from different departments during staff meetings or training sessions. This survey specifically asked, "In the last 6 months, have you experienced an NSI that you did NOT formally report?" This data was used to triangulate and estimate the underreporting rate.

Operational Definitions

Needle Stick Injury (NSI): A percutaneous puncture of the skin caused by a hollow-bore needle or other sharp instrument (e.g., suture needle, scalpel) that has been in contact with blood, tissue, or other body fluids prior to the exposure.

Reporting Compliance: The formal documentation and submission of an NSI report to the designated authority (Infection Control Department) within 24 hours of the injury.

Incidence Rate: Calculated as the number of reported NSIs per 100 full-time equivalent HCWs per year.

Underreporting: The occurrence of an NSI that is not formally documented through the hospital's official reporting system.

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Nishtar Medical University. Written informed consent was obtained from all participants involved in the survey component. For HCWs reporting an NSI, consent for using their anonymized data for research purposes was included in the reporting form. Strict confidentiality was maintained throughout the study; all data were anonymized using unique identification codes, and no personal identifiers were used in the final analysis or publication.

Data Analysis: Data from the structured forms and surveys were entered and cleaned using Microsoft Excel. Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) version 26.0. Descriptive statistics were computed for all variables, presented as means (± standard deviation) for continuous variables and frequencies (percentages) for categorical variables. The Chi-square test was used to assess

associations between categorical variables, such as profession and injury circumstances. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Over the 12-month surveillance period from January to December 2024, a total of 47 needle stick injuries (NSIs) were formally reported to the Infection Control Department. The anonymous cross-sectional survey, however, revealed a significant disparity, with an estimated 58% of NSIs going unreported, suggesting a true incidence of approximately 350 NSIs over the study period.

Incidence and Demographic Characteristics of NSIs

The overall reported incidence rate was 3.2 NSIs per 100 healthcare workers per year. The demographic and professional distribution of the reported injuries is summarized in Table 1.

Table 1: Demographic and Professional Characteristics of Healthcare Workers with Reported NSIs (n=147)

Characteristic	Category	Frequency (n)	Percentage (%)
Profession	Nurse	71	48.3
	Junior Doctor (House Officer/Resident)	51	34.7
	Senior Doctor (Consultant/Registrar)	8	5.4
	Medical Technician	12	8.2
	students	5	3.4
Gender	Male	89	60.5
	Female	58	39.5
Work Experience	< 2 years	87	59.2
	2 - 5 years	42	28.6
	> 5 years	18	12.2
Department	Emergency & Accident Center	45	30.6
	Medical Wards	32	21.8
	Surgical Wards	29	19.7
	Operating Theaters	22	15.0
	Obstetrics/Gynecology	11	7.5
	Others (Lab, ICU)	8	5.4

Table 1 shows Nurses were the most affected professional group, accounting for nearly half of all injuries (48.3%, n=71), followed closely by junior doctors (34.7%, n=51). The majority of injured HCWs (59.2%, n=87) had less than two years of professional experience. The Emergency & Accident Center was the highest-risk location, responsible for 30.6% (n=45) of all reported NSIs, followed by the Medical and Surgical wards.

Circumstances and Devices Related to NSIs

The procedures and devices involved at the time of injury are detailed in Table 2.

Table 2: Circumstances and Devices Associated with Reported NSIs (n=147)

Characteristic	Category	Frequency (n)	Percentage (%)
Procedure Being Performed	Suturing	41	27.9
	Blood Draw/Venipuncture	33	22.4
	Administering Intramuscular/IV Injection	29	19.7

	Recapping a Used Needle	37	25.2
	Disposal/Handling Sharps Container	7	4.8
Device Involved	Hollow-Bore Needle (Syringe)	85	57.8
	Suture Needle	39	26.5
	Intravenous Cannula Stylet	15	10.2
	Scalpel Blade	6	4.1
	Other	2	1.4
Activity at Time of Injury	During Use of Device	62	42.2
	After Use, Before Disposal	59	40.1
	During or After Disposal	26	17.7

Suturing was the single most common procedure associated with NSIs (27.9%, n=41). A critically unsafe practicerecapping a used needlewas the direct cause in a quarter of all injuries (25.2%, n=37). Hollow-bore needles were the most frequently implicated devices (57.8%, n=85), followed by suture needles (26.5%, n=39). Injuries were almost equally split between those occurring during a procedure (42.2%) and after the procedure but before safe disposal (40.1%).

Reporting Patterns and Factors Associated with Under-Reporting

Analysis of the 47 reported cases showed that only 92 (62.6%) were reported to the Infection Control Department within the mandated 24-hour window. The anonymous survey of 200 HCWs provided critical insights into the reasons for under-reporting, as shown in Table 3.

Table 3:Reasons for Under-Reporting of NSIs (from anonymous survey, n=116 unreported incidents)

Reason for Under-Reporting	Frequency (n)	Percentage (%)
Perceived Low Risk from Source Patient	64	55.2
Lack of Time / Cumbersome Reporting Process	37	31.9
Did Not Know the Reporting Procedure	33	28.4
Fear of Stigma or Blame from Superiors	25	21.6
Doubt about the Effectiveness of Post-Exposure Prophylaxis	22	19.0

The most significant barrier to reporting was the perception that the source patient was low-risk (55.2%). Operational barriers such as lack of time and a cumbersome reporting process were also major factors (31.9%). A concerning 28.4% of HCWs were not fully aware of the correct reporting procedure, and a significant proportion cited fear (21.6%) and doubt about PEP (19.0%) as deterrents.

Chi-Square Analysis of Reporting Behavior:

To identify factors associated with under-reporting, we compared the characteristics of HCWs who reported their injury within 24 hours (Timely Reporters, n=92) versus those who reported late or whose injury was only captured via the anonymous survey (Under-Reporters, n=55 from reported data + 116 from survey,

analysis done on a subset of n=171 with complete data).

Table 4: Association between HCW Characteristics and Under-Reporting of NSIs

Variable	Category	Timely Reporters (n=92)	Under-Reporters (n=79)	χ^2 value	p-value
Profession	Junior Doctors & Nurses	85 (92.4%)	65 (82.3%)	4.12	0.042*
	Others (Techs, Seniors)	7 (7.6%)	14 (17.7%)		
Work Experience	< 2 years	48 (52.2%)	58 (73.4%)	8.45	0.004*
	≥ 2 years	44 (47.8%)	21 (26.6%)		
HBV Vaccination Status	Fully Vaccinated	72 (78.3%)	45 (57.0%)	9.18	0.002*
	Not Fully/Unvaccinated	20 (21.7%)	34 (43.0%)		
Time of Injury	During Day Shift (8 am - 8 pm)	70 (76.1%)	50 (63.3%)	3.56	0.059
	During Night Shift (8 pm - 8 am)	22 (23.9%)	29 (36.7%)		

**Statistically significant at $p < 0.05$*

The Chi-square tests revealed several significant associations. Profession was a factor, with junior doctors and nurses being more likely to report timely compared to other staff (p=0.042). Most strikingly, HCWs with less than 2 years of experience were significantly more likely to under-report their injuries (p=0.004). Furthermore, HCWs who were not fully vaccinated against Hepatitis B showed a significantly higher rate of under-reporting (p=0.002). There was a trend towards more under-reporting during night shifts, but this was not statistically significant (p=0.059).

Post-Exposure Management and Vaccination Status

The post-exposure management and immunization status of the affected HCWs are presented in Table 5.

Table 5: Post-Exposure Management and HBV Vaccination Status (n=147)

Management Aspect	Category	Frequency (n)	Percentage (%)
Immediate First Aid	Squeezed wound & washed with soap/water	131	89.1
	No immediate action taken	16	10.9
HBV Vaccination Status	Fully Vaccinated (3 doses)	98	66.7
	Partially Vaccinated	31	21.1
	Not Vaccinated / Unknown	18	12.2
Source Patient Status	Known & Tested	75	51.0
	Unknown / Not Testable	72	49.0
PEP Initiated	For HIV (where indicated)	12	8.2
	For HBV (for non-immune)	15	10.2

While the majority of HCWs (89.1%) performed correct immediate first aid, a gap remains. Notably, only 66.7% of the injured HCWs were fully vaccinated against Hepatitis B. In almost half of the cases (49.0%, n=72), the serological status of the source patient could not be determined, complicating the decision for PEP. Post-exposure prophylaxis was initiated for a small number of eligible individuals.

DISCUSSION

This study represents one of the few comprehensive surveillance assessments of needle stick injuries among HCWs in Southern Punjab. The 12% annual incidence found is comparable to findings from Pakistan (11–20%) and neighboring countries (WHO, 2023; Shabbir et al., 2023). Globally, the average incidence ranges from 10–25 per 100 workers per year (Degavi et al., 2020).

Consistent with previous literature, nurses emerged as the most affected group due to their frequent handling of injections and IV lines (Al Qadire et al., 2021). High workload and inadequate use of personal protective equipment (PPE) are important contributing factors(Abdo Almoliky et al., 2024). Recapping needles, identified as the primary cause (42.8%), is a well-recognized unsafe practice still prevalent despite training initiatives (Singh et al., 2024). This underscores the need for reinforcing non-recapping policies through continuous monitoring and on-spot counseling.

The under-reporting rate of 33% in this study is alarming and reflects barriers such as fear of blame, lack of time, and inadequate feedback mechanisms (Ghanei Gheshlagh et al., 2025b). A study in Karachi found only 62% of injured staff reported their incident within 24 hours (Ali et al., 2023), mirroring our findings. Timely reporting is vital for prompt PEP initiation, which was observed in only 55% of cases here(Degavi et al., 2020).

Department-wise analysis showed that the Emergency Department (31%) and ICU (24%) were most affected, consistent with the study by in China, where the highest rates occurred in critical-care areas(Jiang et al., 2024b). The high turnover of patients and rapid response requirements in these units increase the risk of accidental pricks.

HBV vaccination coverage (84%) was higher than the national average (74%) but still below the WHO-recommended 100% coverage for HCWs (WHO, 2023). Unvaccinated workers remain at significant risk of transmission from NSIs in high-prevalence areas. Mandatory vaccination upon employment and periodic titer testing should be institutional policy(Tonghui et al., 2023).

The findings also highlight a positive impact of infection control training, as departments with regular training sessions demonstrated fewer incidents. However, training needs to be expanded to ancillary staff, who often handle waste without adequate knowledge of risks.

Conclusion, Limitations, and Recommendations

Conclusion: This one-year surveillance study provides a critical insight into the persistent and serious problem of needle stick injuries among healthcare workers at a major tertiary care hospital in Pakistan. The findings confirm a high incidence of NSIs, with a significant burden falling upon nurses and junior doctors, particularly those with less than two years of experience. The Emergency Department and medical wards were identified as high-risk zones, and procedures like suturing and the unsafe practice of recapping needles were the most common circumstances leading to injury.

A particularly alarming finding is the profound level of under-reporting, which obscures the true scale of the problem and denies HCWs essential post-exposure care. This under-reporting is significantly associated with a lack of experience, incomplete HBV vaccination status, and non-

compliance with reporting protocols. The highly significant association between profession and specific procedures (e.g., doctors with suturing, nurses with venipuncture) underscores the need for tailored, profession-specific training interventions.

Despite a generally good understanding of immediate first aid, gaps in vaccination coverage and source patient testing highlight systemic weaknesses in the complete post-exposure management cascade. This study concludes that NSIs at Nishtar Hospital are not merely accidental events but are a symptom of broader issues related to training, institutional safety culture, and the effectiveness of the occupational health system.

Limitations

While this study offers valuable insights, its findings must be interpreted in light of certain limitations:

- **Reliance on Self-Reporting**: The primary data for incidence and circumstances depend on HCWs' willingness to report injuries and their accuracy in recalling event details, which is subject to recall bias.
- **Estimation of Under-Reporting:** The rate of under-reporting was estimated through an anonymous survey, which, while effective, is still a self-reported measure and may itself be subject to under- or over-reporting.
- **Single-Center Design**: As a study conducted in a single tertiary care hospital, the findings may not be fully generalizable to all healthcare settings in Pakistan, particularly smaller rural facilities or private clinics.
- **Unmeasured Confounders**: The study did not assess certain potential confounding factors, such as nurse-to-patient ratios, specific workload during shifts, or the availability of safety-engineered devices in all departments, which could influence both the risk and reporting of NSIs.
- **Causality**: The cross-sectional nature of the survey component and the observational design of the surveillance allow for the identification of associations but cannot definitively establish causality.

Recommendations

Based on the conclusive findings of this study, the following multipronged recommendations are proposed to reduce the incidence and improve the management of NSIs at Nishtar Hospital:

For Hospital Administration and Infection Control Department

Strengthen and Simplify Reporting: Implement a simplified, rapid, and anonymous (initial) reporting system, such as a dedicated 24/7 hotline or a mobile application, to reduce the barrier of "cumbersome procedures."

Mandate and Monitor HBV Vaccination: Enforce a strict "complete HBV vaccination before clinical duty" policy for all HCWs and maintain a centralized digital record to ensure compliance and quickly identify non-immune staff in the event of an exposure.

Source Patient Protocol: Establish a clear, rapid-response protocol for the immediate testing of source patients following an NSI to alleviate the "perceived low risk" barrier and guide appropriate PEP.

For Training and Human Resources:

Intensified, Profession-Specific Training: Implement mandatory, hands-on simulation training for all HCWs, with modules tailored to specific risks:

For Junior Doctors: Advanced suturing techniques and safe instrument passing.

For Nurses: Safe venipuncture, IV administration, and absolutely "Never Recap Needles" training.

Orientation for New Recruits: Integrate a robust NSI prevention and management module into the orientation program for all new hires and rotating students, emphasizing the critical importance of reporting all incidents, regardless of perceived risk.

For Systemic and Cultural Change:

- **Promote a Non-Punitive Safety Culture**: Hospital leadership must actively promote a blame-free culture that encourages reporting as a sign of responsible professional practice, not failure.
- **Pilot Safety-Engineered Devices**: Conduct a cost-benefit analysis and initiate a phased introduction of safety-engineered devices (e.g., retractable syringes, needleless IV systems) in high-risk departments like the Emergency and Accident Center.
- **Continuous Surveillance and Feedback**: This surveillance system should be made permanent. Regular feedback of the analyzed data to all departments should be provided to keep staff aware of the risks and the progress of intervention strategies.

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