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Original Article

Occupational Needlestick Injuries Among Healthcare Workers: A Record-Based Analysis from a Tertiary Hospital in Uttar Pradesh

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ABSTRACT

Introduction: Needle stick injuries are occupational injuries that occur due to the use of needles while working in the healthcare setting. The most common needles used are hypodermic needles, blood-collection needles, and various sharp instruments. intravenous stylets. This study aims to investigate the incidence of NSIs among healthcare workers at our hospital over 3 years and to explore the underlying causes.

Materials: The details were collected in a structured reporting form during self-reporting by HCWs who had received needle pricks. Details regarding the mode of injury, viral markers of the patient whose blood or bodily fluids were contaminated by the sharp object that caused the injury, are referred to the source of Hepatitis B, Hepatitis C, and HIV. The HCWs' vaccination status was also recorded. The data were further entered into the Google Excel sheet. The HCWs who were exposed were followed up for seroconversion up to 6 months.

Results: Over a period of 3 years from 2022-2025, a total of 128 NSI cases, with the highest number reported in 2025. The commonly affected age group was 21-30 years, with a female preponderance. Nursing officers and students were most affected. The highest incidence of cases was reported in the Trauma and Emergency department, followed by the operating theatres. Of the total 128 cases, the source was identified in 107, of which 81 were non-reactive (The rapid HIV test does not find any evidence of HIV infection).

Conclusion: We conclude that females, mostly in the younger age group, working in the hospital's busy emergency areas and operating theatres are affected. There is still a paucity of knowledge regarding NSIs and, more importantly, their management following exposure. This study recommends that more training and awareness regarding NSIs are the need of the hour and should be implemented at an early phase of the career.

KEYWORDS: Antibody titer; Health Personnel; Hepatitis B virus; Human immunodeficiency virus; Post-exposure prophylaxis; Hepatitis B; Occupational health; HIV diseases.

INTRODUCTION

Needlestick injuries (NSIs) are among the health concerns affecting professionals working in hospitals. NSI is defined as “the introduction of blood and other potentially hazardous material into the body of healthcare workers (HCWs) while doing their work”. NSIs are unavoidable in many cases for HCWs during care delivery [1].

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NSIs are the most preventable occupational injuries in HCWs[1]. NSIs can lead to percutaneous exposure to infectious materials[2]. NSIs pose a risk for HCWs characterized by breaks in skin continuity[3]. These injuries are caused by contaminated needles such as hollow-bore needles, hypodermic needles, blood-collection needles, stylets from intravenous cannula, and needles used to attach intravenous (IV) drug delivery systems. NSI can also be caused by other sharp instruments, such as lancets, vials, scalpel blades, and broken glass[2]. HCWs are at increased risk of NSIs due to their type of work and the nature of their work. Blood-borne pathogens such as Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV), particularly when handling patients' blood, urine, and saliva. NSIs commonly occur across various categories of HCWs, from the lowest to the highest in the hierarchy, including students[3]. Risk of infection differs for diseases following a needlestick injury, with HBV having the highest risk and HIV having the least[3]. Occupational exposure to NSIs is higher in developing countries[1]. The prevalence of NSIs varies across HCW cadres, with students being the most affected population[4]. As per the World Health Organization, the global incidence of NSIs accounts for 39% for HCV, 4.4% for HIV, and 36.7% for HBV[5]. PEP (Post-Exposure Prophylaxis) for HIV is shown to be 80% effective in the containment of HIV[1]. Needle recapping is a common practice in hospitals, whereas the literature suggests avoiding it[1]. Common causes of NSIs include the unavailability of personal protective equipment (PPE) and its underutilization during patient care. Sometimes, the improper practice of recapping needles, sharps disposal, and cannulation leads to NSIs. Inadequate work experience can also lead to NSIs[2]. Other reasons include the intention to finish the work quickly due to time constraints, fatigue, HCWs' carelessness, and sudden patient movements [5, 6]. Worldwide, this constitutes a big challenge to deal with, as it is associated with a psychological stigma leading to emotional stress. It is one of the most common incidents that affect HCWs physically and psychologically. Some of the psychological causes of NSIs are stress and burnout[5].

NSIs affect health in many ways. Developing countries have fewer resources. NSIs raise emotional distress[1]. This study aims to estimate the frequency and distribution of NSIs at AIIMS Gorakhpur, as well as the correlates of their attributes among HCWs over a 3-year period.

MATERIAL & METHODOLOGY

A retrospective study was conducted using routine data from the Hospital Infection Control Committee (HICC) obtained from the records of a 750-bed tertiary care hospital in Gorakhpur, Uttar Pradesh, from October 2022 to December 2025. The study is approved by the Institutional Human Ethics Committee, AIIMS Gorakhpur, under approval number IHEC/AIIMS-GKP/BMR/745/2026. The data include details from the Needle Stick Injury Reporting form completed by the Infection Control Nurses (ICNs) for exposed HCWs. The details include demographics, type, site, mode, and time of injury. Additional information includes the severity of the injury, the use of gloves during the injury or splash, the source viral markers, the HCWs' hepatitis B vaccination status, the anti-HBV antibody titers of the vaccinated HCWs, the immediate post-exposure actions taken, such as cleaning the injury site, and the specifics of the immediate PEP taken in the event of exposure to a source who is known to be seropositive for HIV and HBV.

Among the population, different HCWs were affected by the NSIs, ranging from the students to the Nursing Officers and Doctors. HCWs included the physicians, staff nurses, and other staff[1]. Information was gathered on NSIs and splashes of potentially infectious substances, such as blood and other bodily fluids, onto mucosal membranes. "Any cut or prick to the respondents by a needle previously used on a patient that is work-related and sustained within the hospital premises" was the operational definition of NSI. Data were entered into a Google Sheets spreadsheet and analyzed using SPSS[1].

VARIABLES

HIV-1 and HIV-2, hepatitis B surface antigen (HBsAg), hepatitis C antibody (HCV Ab), and hepatitis B surface antibody (anti-HBs) titers were measured in HCWs' blood samples. Because it may be challenging to subsequently determine whether the infection was acquired through this occupational exposure or through prior exposure, these tests were performed as part of baseline testing for individuals who reported NSIs. The study's sample size was determined by the number of self-reported NSIs at AIIMS Gorakhpur[2].

STATISTICAL ANALYSIS

The collected data were compiled into an Excel sheet for analysis. All categorical variables are represented as frequencies and percentages. Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 16[2].

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RESULTS

In this three-year study period (January 2022-December 2025), a total of 128 NSI cases were reported. Of the total, 56 (43.8%) were reported in 2025, followed by 46 (35.9%) in 2024. The majority of these were reported in females (64%). The age group (21-30 Years) was the most affected, accounting for 100 (78.1%) of the total. The majority of the cases were reported in the trauma and emergency department (25, 19.5%), followed by the operation theatre (16, 12.5%), the general medicine department (14, 10.9%), and the Pediatrics IPD (13, 10.2%).

Nursing Officers were the most affected, accounting for 54 (42.2%) of the total 128 reported cases. They were followed by the medical and nursing students, who contributed 40 (31.3%). (Table 1)

Table 1: Distribution of HCWs who reported with NSIs

Designation	Frequency (n)	Percentage (%)
Laboratory technician	4	3.1
Nursing Officers	54	42.2
Post Graduate Students	10	7.8
Sanitation Staff	11	8.6
Support Staff	9	7
Undergraduate Students	40	31.3
Total	128	100

In our study, the most common procedures associated with NSIs were random blood sugar (RBS) testing (17.2%) and IV cannulation (14.8%). Other contributing reasons leading to NSIs were discarding (17.2%) and recapping (11.7%) of used needles. Of the total 128 cases, 95 (73.6%) were the original user of the sharps, whereas injuries that occurred during use by another colleague accounted for 32 (24.8%) (Table 2).

Table 2: Various Factors contributing to NSIs.

Reasons	Frequency (n)	Percentage (%)
Administering local anesthesia	1	0.8
Assisting in local anesthesia	2	1.6
Assisting in OT	1	0.8
Blood sampling	12	9.4
Cannulation	19	14.8
Cauterization	1	0.8
Cleaning	2	1.6
Cutting the general items	1	0.8
Discarding needle	22	17.2
Flushing ns	1	0.8
Injection administration	5	3.9
Instrument wash	2	1.6
Item left for disposal	2	1.6
Laundry	2	1.6
Placental sampling	1	0.8
RBS checking	22	17.2
Recapping	15	11.7
Splash	1	0.8
Suture removal	1	0.8
Suturing	3	2.3
Tracheostomy Insertion	1	0.8
Vaccination	1	0.8
Waste Discarding	10	7.8
Total	128	100

At the time of the incident, the largest proportion, 68 (53.1%), were using a single pair of gloves, followed by those without gloves, 52 (40.6%) (Table 3).

Table 3: Gloves used by healthcare workers with NSIs

GLOVES USED	Frequency (n)	Percentage (%)
DOUBLE	8	6.3
NO	52	40.6
SINGLE	68	53.1
TOTAL	128	100

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The needles most responsible for the NSIs were hollow-bore needles (93; 72.7%), followed by plain needles (32; 25%) (Table 4).

Table 4: Different types of Devices contributing to NSIs.

Type of device	Frequency (n)	Percentage (%)
HOLLOW-BORE NEEDLE	93	72.7
PLAIN	32	25
UNKONOWN	3	2.3
Total	128	100

In most reported NSIs, the index finger was the most frequently affected site. Of the total 128 NSI cases reported, 70 (54.7%) were unimmunized, i.e., had not received any dose of the Hepatitis B vaccine (Table 5).

Table 5: Vaccination status of Hepatitis B among the HCWs.

Hep B Vaccination Status	Frequency (n)	Percentage (%)
IMMUNIZED	30	23.4
PARTIALLY IMMUNIZED	28	21.9
UNIMMUNIZED	70	54.7
TOTAL	128	100

Of the six HCWs who were exposed to HBV-positive sources, five among them had protective hepatitis B surface antibody titers. Hence, no further action was required on their part. PEP was given to the single HCW whose antibody titer was not protective with the first dose of Hepatitis B immunoglobulin, along with all three doses of HBV vaccine.

Of the total 128 NSI-reported cases, 25 of them had an unknown source and were assumed to have the injury from either a positive HIV, HBV, or HCV patient. As per protocol, after risk categorization based on exposure and source codes, 4 of the 25 were eligible for PEP. They were provided with the first dose of PEP for HIV and were referred to the nearest ART (Anti-retroviral therapy) center for further management. For HBV, 24 of the 25 unknown cases lacked documentation of Anti-HBs titer, whereas 1 had a titer of <2 IU/mL. For HCV, no immediate action was taken for any of the 25 HCWs. Out of 128 HCWs who got NSIs, 14 (11%) were given the first dose of PEP for HIV in our study (Table 6).

Table 6: Post-Exposure Prophylaxis taken by HCWs after NSIs.

Post-Exposure Prophylaxis given	Frequency (n)	Percentage (%)
NO	114	89.1
YES	14	10.9
Total	128	100

DISCUSSION

The study was conducted in a 750-bed tertiary care hospital located in the Eastern region of Uttar Pradesh. Infection control and prevention practices were initiated by the HICC committee in mid-2022. It became more streamlined and active over the years with increased awareness amongst healthcare workers. At present, we have approximately 1,200 healthcare workers in the institute, including doctors, nursing officers, hospital attendants, and housekeeping staff, who, given their involvement in patient care, are vulnerable to needlestick injuries.

In this 3-year retrospective study, 128 reported NSIs were analyzed. The majority of reported NSIs occurred in females, with a prevalence of 64% over the three years. This is in concordance with Singh et al. and Anandadurai et al., who reported prevalences of 81% and 74%, respectively, with the index finger being the most frequently affected site. Mehrotra S et al. also found the same[7,8,9]. The female preponderance in this study may be due to the rise in the number of women, comprising both nursing students and Officers. Also, one major reason could be that most of these nursing students are exposed to clinical settings by their first year of academic curriculum. A 2022 meta-analysis by Hossseinipalangi Z et al. also reported a high incidence of NSIs among female healthcare workers worldwide[5]. The most common age group affected in our study is the younger group (21-30 years), as the majority of our workforce comprises interns, residents, and nursing officers at the beginning of their careers and with limited clinical exposure. Most of the reported cases occurred in the Trauma and Emergency unit, followed by the operating theatres, as the unit is newly established, has limited resources, and handles high patient volume. Other studies also reported similar findings, with emergency and surgical departments being the most commonly affected[10].

The risk of infection after NSIs varies and depends primarily on the type of needle used. In our study, most

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cases (72.7%) were reported following the use of a hollow-bore needle compared with solid needles. Other studies conducted in Qatar and Malaysia also reported similar findings[11, 12]. This is probably due to the higher volume of blood carried by the hollow-bore needles and, therefore, a higher risk of virus transmission. Most of the reported cases in our study occurred during random blood sugar checks, needle disposal, and recapping. Similar findings were reported by Shenoy et al. and Arora A et al., who found random cases among newly joined nursing faculty during RBS[10,13]. In contrast to other studies, in which waste disposal accounted for the majority of NSIs, our study showed a lower incidence of NSIs. This was mainly due to the frequent and active training provided to the housekeeping staff on the effective and safe disposal of biomedical waste[9]. Regarding glove use, most cases (53%) occurred among individuals who used a single pair. This could be due to a reduction in the individual's ability to use a needle in a clinical setting. Other contributing factors could include the unavailability of appropriately sized, high-quality gloves.

The biggest danger of an NSI is acquiring one of the three blood-borne viruses, like HBV, HCV, and HIV. In our study, we identified the source in 83.5% (107/128) of NSI cases, which is higher than the rates reported by Alsabaani et al. and Anandadurai D et al., who identified the source in only 35.8% and 71.2% of cases, respectively[9,14]. In our three-year study period, we reported that 9% (12/128) of NSI exposures among HCW were seropositive for Hepatitis B virus, HIV, or Hepatitis C virus. Among the three deadly viruses, the Hepatitis B virus accounted for 6 of the 12 total seropositive sources. According to the NSI simulation, wearing gloves will not provide additional protection[15].

Out of 128 HCWs who got NSIs, 14 (11%) were given the first dose of PEP for HIV, subsequently referred to the nearest ART Center for completing their full 28-day course. Another study also suggests that only 8 (10.5%) healthcare workers have received PEP after high-risk exposure[16].

In the case of the Hepatitis B virus, only 2 (1.6%) persons were given immediate post-exposure prophylaxis.

HICC at AIIMS Gorakhpur conducts awareness sessions and training sessions. Sharps and splashes are reported and managed in accordance with the guidelines of the National AIDS Control Organization of India (NACO)[17]. The WHO recommends that all HCWs receive free PEP and hepatitis B vaccination[18]. Regular classes were held separately by Hospital infection control nurses for Nursing and medical students to reduce NSIs. The induction training and orientation program was conducted especially for newly inducted Nursing Officers during the initial period of joining the Institute. The awareness was also conducted during Swachhta hi seva (SHS), India's Annual nationwide cleanliness campaign under the Swachh Bharat Mission.

LIMITATIONS

This study was conducted at a single center over a short 3-year period. Also, the sample size is small; therefore, the results of this study cannot be generalized to a larger population. The research design was retrospective; therefore, some essential data might not have been documented. Not all HCWs completed follow-up of viral markers as recommended. There may be bias in record-keeping and entry into the Excel sheets. The blood samples sent to the laboratory may have testing errors in their results.

CONCLUSION

NSIs significantly affect our healthcare providers, and it is important to safeguard them from this occupational hazard. It is hereby recommended that HCWs be made aware of the safety precautions to prevent NSIs, and that adequate training for HCWs to handle sharp objects is equally vital. All healthcare providers must practice safety practices and guidelines to protect themselves. There is evidence of best practices for avoiding NSIs. HCWs' knowledge is often adequate. HCWs' knowledge is often adequate.

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None

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

None

ETHICS STATEMENT INCLUDING PATIENT CONSENT

The study was approved by the Institutional Human Ethics Committee, AIIMS Gorakhpur, with the approval number IHEC/AIIMS-GKP/BMR/745/2026.

AUTHOR'S CONTRIBUTION

All authors contributed to the literature review, writing the draft, and editing the draft to finalize it.

AI DECLARATION

No AI tool was used to generate research data, perform data analysis, interpret findings, formulate scientific

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conclusions, or make editorial decisions. All AI-assisted content was critically reviewed, verified, and revised by the authors. The authors take full responsibility for the accuracy, originality, integrity, and final content of the manuscript.

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