

Prevalence of Needle Stick Injury and Associated Determinants among Healthcare Employees of Tertiary Care Hospital, Bangladesh

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ABSTRACT

Objective: Needle stick injuries (NSIs) are a recurrent issue among healthcare employees. The study aims to evaluate the frequency of needle stick injuries and identify predisposing components at a tertiary care facility in Dhaka.

Methods: This descriptive cross-sectional study was organized at six medical and dental hospitals in Dhaka, Bangladesh, from January 2023 to August 2023. The study sample consisted of 240 doctors, dentists, and paramedical staff working at the hospital. The data was collected via a structured questionnaire with nine closed-ended questions for the study subjects. The analysis of data was done using SPSS 23.

Results: The overall prevalence of NSIs was 60%. The main reason for incurring the injury was drawing blood, which accounts for 54.2% of the total injuries, the second was while performing surgery (27%), and breaking vials (12%). The predominance of the injuries occurred during the morning shift (81.3%). A large majority, i.e., 60.4%, did not report their injury, and 74% of the study population reported that the vaccination for Hepatitis B was taken prophylactically. A large majority managed a needle stick injury by wound toilet (30.6%), and the same percentage of the study population ignored it.

Conclusion: This study observed that healthcare providers had a high prevalence of needle stick injuries. Hospital administration must devise a way to increase the availability of safety equipment, reduce workload, and provide better training to reduce the risk of injury. Moreover, reporting must be made mandatory for all those who incur this kind of injury in the future, and immunization must be made available.

Keywords: Needlestick Injuries; Healthcare Workers; Occupational Exposure; Blood-Borne Pathogens; Bangladesh

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Introduction

Needle stick injuries (NSIs) are a significant occupational hazard faced by healthcare professionals worldwide. According to the World Health Organization (WHO), sharps injuries contribute to 40% of Hepatitis C Virus (HCV) and Hepatitis B Virus (HBV) infections and 2–3% of

Human Immunodeficiency Virus (HIV) infections among healthcare workers. ¹ The National Institute for Occupational Safety and Health (NIOSH), USA, defines needle stick injuries as those caused by devices such as blood collection needles, hypodermic needles, needles used in intravenous (IV) systems, and IV stylets. ²

Healthcare workers (HCWs) are at an

elevated risk of NSIs, particularly in developing countries, where up to half of injections may be unsafe. According to the Centers for Disease Control and Prevention (CDC), approximately 385,000 needle stick injuries occur annually in US hospitals alone, while globally, over 3 million HCWs experience transcutaneous exposure to blood-borne pathogens each year.³ In developing nations, these injuries are responsible for an estimated 16,000 HCV infections, 66,000 HBV infections, and 1,000 HIV infections annually.

Globally, needle stick injuries remain a pressing concern in the healthcare sector. Among 39.5 million HCWs, approximately 3 million experience percutaneous exposure to infectious diseases annually.⁴ Such injuries account for 40% of hepatitis C and B cases and 2.5% of AIDS/HIV cases among healthcare professionals. Unsafe injection practices are implicated in 33% of new hepatitis B cases, 42% of hepatitis C cases, and 2% of new HIV cases. The probability of infection transmission through a needle stick injury is approximately 3–10% for hepatitis B, 3% for hepatitis C, and 0.3% for HIV. On average, healthcare workers face four NSIs each year, with contributing factors including inadequate supplies, excessive reliance on injections, poor access to sharps containers, staffing shortages, needle recapping, and insufficient adoption of safer needle technologies. The prevalence of NSIs in Bangladesh varies widely, with reported frequencies ranging from 30% to 73%.⁵

Bangladesh's healthcare system faces numerous challenges that increase the risk of needle stick injuries. Limited resources, overcrowded facilities, and a lack of comprehensive training on occupational hazards contribute to the prevalence of these injuries.⁶ Moreover, inadequate access to safety-engineered devices, weak enforcement of infection control policies, and poor awareness regarding post-exposure prophylaxis (PEP) further exacerbate the issue.⁷ Compounding this, the lack of robust reporting mechanisms and improper sharps waste disposal practices expose healthcare workers to additional risks.⁸ Addressing these systemic shortcomings is critical to ensuring the safety of healthcare workers and improving patient care outcomes.

Despite the importance of accurate data, needle stick injuries in Bangladesh are underreported due to weak reporting systems and insufficient attention from authorities. A study conducted in Bangladesh found that 60 (31.1%) of

healthcare workers reported experiencing such injuries. Ensuring the health and safety of healthcare professionals is essential to improving patient care. By implementing stringent precautionary measures and promoting the responsible use of needles, the risk of occupational exposure to blood-borne pathogens can be significantly reduced. Given the limited research in this area, this study aims to document the frequency of NSIs and identify associated risk factors at a tertiary care facility in Bangladesh.

Materials and Methods

This study employed a descriptive cross-sectional design to assess the attitudes and knowledge of doctors and paramedical staff in Bangladesh. A period of eight months was spent conducting this study, from January 2023 to August 2023. The study was conducted across six tertiary care hospitals in Dhaka, Bangladesh. Participants were recruited from the medical, surgical, ENT, and ophthalmology wards of these facilities. The study population consisted of 240 doctors and paramedical staff who were registered employees of Dhaka, Bangladesh, and actively involved in providing healthcare services. Eligible participants included house officers, medical officers, postgraduate trainees, specialists, dentists, and nursing staff involved in direct clinical patient care. HCWs were excluded from the study if they were absent during data collection or were unwilling to participate. All healthcare workers meeting the inclusion criteria and present during the data collection period were invited to participate, yielding a total of 240 respondents from across the six facilities.

A convenient non-probability sampling method was utilized to select the study candidates. To ensure data collection accuracy, a preformed and pretested questionnaire was designed to gather relevant information on the knowledge and attitudes of the study subjects.

The structured, self-administered questionnaire comprised nine closed-ended items organized in three sections. The first section collected sociodemographic information, including gender, marital status, years of clinical experience, and professional role. The second section assessed NSI experience within the preceding six months, including occurrence, timing (daytime or night), cause (blood drawing, surgery, breaking vials, or molding needles), post-injury management (wound

toilet, wound dressing, immunization, or no action), and whether the injury was formally reported. The third section assessed general preventive practices, including the use of personal protective equipment during needle handling and hepatitis B vaccination status. The questionnaire was pretested on 15 healthcare workers to assess clarity and comprehension; minor revisions to item phrasing were made based on pilot feedback. Questions about NSI timing, cause, management, and reporting applied only to participants who reported experiencing an NSI (n=144); percentages for these items were calculated using n=144 as the denominator. Questions on preventive practices and vaccination were applied to all participants (N=240).

The selected participants were approached during their working hours and explained the purpose and significance of the study. Written informed consent was procured from every participant. Participation in the study was voluntary.

After the completion of data collection, a rigorous data cleaning process was undertaken. This step involved scrutinizing the collected

responses to identify and rectify any errors or inconsistencies. The data was anonymized and coded for confidentiality. Upon data cleaning, it was entered in the Statistical Package for Social Sciences version 23 (SPSS Inc., Chicago, IL, USA) for further analysis. Descriptive statistics were employed to summarize the data, presenting results in frequencies and percentages. As this was a descriptive survey, inferential statistical comparisons across subgroups were not performed. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies.

Results

The sociodemographic characteristics of health professionals are shown in Table 1. When it came to the role of participants in the hospital, this study showed that 110 (45.8%) were House Officers, 38 (15.8%) were Specialists, 54 (22.5%) were Nursing Staff, and 36 (15.0%) were MO/PG.

Table 1: Sociodemographic properties suited for the study population (N=240)

Variable	Percentage (%)
Gender	
Male	95 (39.6%)
Female	145 (60.4%)
Marital Status	
Married	106 (44.2%)
Unmarried	134 (55.8%)
Years of Experience	
1-5	147 (61.3%)
6-10	59 (24.6%)
11-15	19 (7.9%)
16-20	9 (3.8%)
>20	6 (2.5%)

Perceptions and Practices regarding needle stick injuries in the study population are shown in Table 2. Out of the 144, those who had an injury, only 56 (38.9%) reported the injury, while 87 (60.4%) did not. Regarding post-injury management, 45 (31.3%) ignored their injury, 44 (30.6%) performed wound toilet, 39 (27.1%)

applied wound dressing, and 15 (10.4%) sought immunization. When asked overall from all 240 participants, 141 (58.8%) said that they used protection while handling needles, and 99 (41.3%) said "No". 179 (74.6%) said that they were vaccinated against Hepatitis B, while 61 (25.4%) said "No".

Table 2: Perceptions and Practices regarding needle stick injuries in the study population

Variable	Percentage
Injury Report	
Yes	56 (38.9%)
No	87(60.4%)
Not Specified	1 (0.7%)
Management	
Ignored it.	45 (31.3%)
Wound toilet	44 (30.6%)
Wound dressing	39 (27.1%)
Immunization	15 (10.4%)
Not Specified	1 (0.7%)
Used any Prevention	
Yes	141 (58.8%)
No	99 (41.3%)
Are you vaccinated against hepatitis?	
Yes	179 (74.6%)
No	61 (25.4 %)

† Injury Report and Management: percentages calculated among participants who experienced NSI (n=144). Prevention and Vaccination: percentages calculated among all participants (N=240)

As shown in Table 3, this study showed that 144 (60%) participants experienced an NSI in the past 6 months of the questionnaire being administered, while 96 (40%) did not have such an experience. Forty-six (19.2%) participants understood NSI as an injury caused by a needle, 16 (6.7%) as an injury caused by sharps, and 178 (74.2 %) as injuries caused by sharp instruments and

needles. Of those who experienced an NSI, the majority reported the injury occurred during daytime (n=117, 81.3%) rather than at night (n=26, 18.1%). The most common reason for NSI was drawing blood (n=78, 54.2%), followed by surgery (n=39, 27.1%), breaking vials (n=17, 11.8%), and molding needles (n=10, 6.9%).

Table 3: Familiarity and understanding and frequency of Needle Stick of NSI in the study population (N=240)

Variables	Percentage
Injury in 6 months	
Yes	144 (60%)
No	96 (40%)
Timing of NSI	
Daytime	117 (81.3%)
Night	26 (18.1%)
Not Specified	1 (0.7%)
Reason for NSI	
Drawing Blood	78 (54.2%)
Surgery	39 (27.1%)
Breaking Vials	17 (11.8%)
Molding Needles	10 (6.9%)
Understanding	
Caused by Needle	46 (19.2%)
Caused by Sharps	16 (6.7%)
Caused by Needles and Sharp Instruments	178 (74.2%)

Discussion

Needle stick injuries pose a serious hazard to both healthcare professionals and patients. Injuries can result in the spread of HIV/AIDS, Hepatitis B and C, the treatment for which is quite expensive.⁹ Healthcare professionals put themselves at unnecessary risk every day when they are catering to the needs of the patients while rendering services to them.¹⁰ The study aimed to find out the frequency of needle stick injuries in healthcare providers in a tertiary care facility in Dhaka, Bangladesh. A sample of 240 was taken from medicine, surgery, ENT, and eye wards of different hospitals. This included healthcare providers with clinical experience of as little as 1 year and as great as that of more than 20 years.

About two-thirds of the participants got vaccinated against hepatitis, similar to a study done in Sindh, Pakistan.¹¹ Understanding and familiarity with needle stick injury was high in our study population; a large preponderance knew that these are injuries caused by needles and sharp instruments. This is quite reasonable, as the study was conducted among practicing doctors, as they are expected to understand exactly what needle stick injuries are. This is in accordance with results from a similar study, where the majority of people, i.e., 73.3% (n=220), were aware of the definition of needle stick.¹² However, in other similar studies, not much literature has been found about the understanding of the term "needle stick injuries."

In this analysis, the frequency of needle stick injuries was determined to be notably high at 60%. This figure closely resembles another study conducted in Lahore, which reported a prevalence of 69% among nursing staff. However, in contrast, a study conducted in Ethiopia revealed a lower prevalence of 29.5%.¹³ The disparities in these results indicate a potential lack of standardized operating protocols in our country with regard to needle stick injury prevention and management.

In the present study, needle stick injuries mainly occurred during blood drawing (54.2%), surgery (27.1%), and breaking vials (11.8%) or molding needles (6.9%). Similarly, a study in Lahore, Pakistan, found the highest injuries during surgery (55%), followed by maintaining IV lines (29%) and drawing blood samples (27%).¹⁴

In this study, 27% (39 out of 144) of the injured healthcare workers managed their needle stick injuries by dressing the wounds, while

approximately 30% opted for wound toilet, finding it less time-consuming and convenient. A concerning observation was that the majority, 31%, ignored their injuries, potentially increasing the likelihood of blood-borne diseases among healthcare professionals. A small percentage of subjects in the study chose to get immunized after the injury, possibly because of the high cost of hepatitis B vaccines in Bangladesh.

This study differs from others in a few respects, 60.9% cleaned the location of injury with soap and water, and 14.8% did not do anything following their latest needle stick injury. Only 20 (7.8%) of the health care providers took prophylaxis after exposure to HIV/AIDS. In another study conducted in Yemen, 7.9% of the candidates had contacted a medical emergency room, 7.9% had notified the infection control principal, 10.1% had spoken to their professional collaborators, and 74% of the participants reported taking no action for the injury.¹⁵

Underreporting is a major concern when it comes to needle stick injuries, as it is a barrier to fully understanding the scope of this occupational hazard. In the present study, only 38.9% reported the injury, which is somewhat better, yet still a matter of concern, than other research, where in India, only 27.5% of the total needle stick injuries get reported to the healthcare system. And a German study where 28.7% of injured respondents reported a needle stick injury, 20.9% reported only sporadically, and 50.4% of the needle stick injuries went unreported.¹⁶

An observational study in Pakistan which took place for 6 years showed junior doctors (interns and residents), who are usually subjected to long working hours and more patient load experienced the greatest amount of injuries (n 394; 28.5%) succeeded by enrolled nurses (n 283; 20.4%), which showed that increase in the number of work hours lead to more injuries, these results, too, are in correspondence with our results.¹⁷

In this study, long working hours (> 44 hours/week) were predisposed to needle stick injuries. Doctors who had worked 25-32 hours per week showed the least number of needle stick injuries, which suggests that there is a connection between the occurrence of needle stick injuries and working hours. This is supported by another study conducted in Iran, which concluded that workload is an important risk factor.¹⁸

In this study, only 58.3% of people used

protective equipment while handling needles, which is not a satisfactory outcome, as over 40% of professionals are already at increased risk of incurring an injury. This situation deserves instantaneous attention by health-related policymakers and administrators of hospitals, who can certainly decrease the chance of spreading blood-borne pathogens from patients to health care professionals or vice versa. Knowledge is not enough; it must be complemented by practice. These healthcare workers expose themselves to the superfluous danger of not reporting, thus stripping themselves of the virtue of intervention.¹⁹

A study conducted in Saudi Arabia indicates that 75.7% of healthcare professionals had put on gloves at the time of a prick. Our findings also vary from another study in Saudi Arabia, where 84.1% used single gloves, 86.2% had training in NSIs, 98.6% knew about hospital policies regarding NSIs, and 99.1% had knowledge of disease transmission by NSIs.²⁰

This study has several limitations. First, it was conducted at a single tertiary care facility, limiting the generalizability of the findings to other healthcare settings in Bangladesh. Second, the reliance on self-reported data may have introduced recall bias and underreporting, as NSIs are often inadequately reported in similar settings. Furthermore, the present study employed a descriptive analytical approach, and inferential statistical tests to examine associations between demographic variables (e.g., professional role, years of experience, working hours), and NSI prevalence was not examined. Future studies should employ chi-square or logistic regression analyses to identify independent predictors of NSI among healthcare workers in Bangladesh. Finally, the study did not evaluate the effectiveness of existing infection control policies or the availability of protective equipment, which are crucial in preventing NSIs.

To address these challenges, future studies should include multiple healthcare facilities across diverse regions to provide a more comprehensive understanding of NSIs in Bangladesh. It is also imperative to develop and enforce strict hospital policies for injury prevention, including the provision of safer needle devices, adequate sharps disposal systems, and accessible PEP services. Regular training programs for healthcare workers on infection control practices, NSI management, and the importance of reporting injuries should be instituted. Additionally, promoting vaccination

coverage for hepatitis B among all healthcare workers and subsidizing the cost of vaccines could significantly mitigate the risk of blood-borne infections.

By addressing these limitations and implementing evidence-based interventions, the healthcare system in Bangladesh can create a safer working environment for healthcare professionals and reduce the burden of NSIs.

Conclusion

In this hospital, 60% of healthcare professionals experienced needle stick injuries, indicating a significant problem in their understanding of such injuries and the proper utilization of precautionary equipment. Shockingly, only 38.9% of those who suffered needle stick injuries reported the incidents. It is crucial to address this issue and make sure that these insults are promptly reported to the relevant authorities. This reporting is essential to facilitate appropriate counseling, prophylaxis, or early treatment. Furthermore, strict adherence to safety-engineered devices is necessary to effectively reduce needle stick injuries and the associated danger of blood-borne infections.

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Author Contribution

FK and MMR conceived the idea, collected data, and wrote the initial manuscript. FK and MMR collected data, analyzed the data, validated the results, and proofread the finalized manuscript.

Data Availability Statement

All relevant data are within the manuscript. Additional data supporting this study are available from the corresponding author upon reasonable request.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki and was approved by the institutional ethical board (Ref: ERB/MARKS/2023:0587)

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Conflict of Interest

None

References

- Alfulayw KH, Al-Otaibi ST, Alqahtani HA. Factors associated with needlestick injuries among healthcare workers: implications for prevention. *BMC Health Serv Res.* 2021;21(1):1074. doi:10.1186/s12913-021-07110-y.
- Hosseinipalangi Z, Golmohammadi Z, Ghashghae A, Ahmadi N, Hosseinifard H, Mejareh ZN, et al. Global, regional and national incidence and causes of needlestick injuries: a systematic review and meta-analysis. *East Mediterr Health J.* 2022;28(3):233-41. doi:10.26719/emhj.22.031.
- Abdelmalik MA, Alhowaymel FM, Fadlalmola H, Mohammed MO, Abbakr I, Alenezi A, et al. Global prevalence of needle stick injuries among nurses: a comprehensive systematic review and meta-analysis. *J Clin Nurs.* 2023;32(17-18):5619-31. doi:10.1111/jocn.16661.
- Scott GY, Ezie KN, Dauda Z, Andigema AS, Amekpor F. Occupational exposure to infectious diseases among health workers: effects, managements and recommendations. *J Infect Dis Epidemiol.* 2023;9(3):295. doi:10.23937/2474-3658/1510295.
- Zaman MNU, Afroze N. Occupational hazards faced by nurses in Rajshahi Medical College Hospital, Bangladesh. *Int J Nurs Crit Care.* 2021;7(1):32-7.
- Karatas M, Eriskin L, Deveci M, Pamucar D, Garg H. Big data for healthcare industry 4.0: applications, challenges and future perspectives. *Expert Syst Appl.* 2022;200:116912. doi:10.1016/j.eswa.2022.116912.
- Chowdhury T, Chowdhury H, Rahman MS, Hossain N, Ahmed A, Sait SM. Estimation of the healthcare waste generation during COVID-19 pandemic in Bangladesh. *Sci Total Environ.* 2022;811:152295. doi:10.1016/j.scitotenv.2021.152295.
- Begum T, Khan SM, Adamou B, Ferdous J, Parvez MM, Islam MS, et al. Perceptions and experiences with district health information system software to collect and utilize health data in Bangladesh: a qualitative exploratory study. *BMC Health Serv Res.* 2020;20(1):465. doi:10.1186/s12913-020-05322-2.
- Rai R, El-Zaemey S, Dorji N, Rai BD, Fritschi L. Exposure to occupational hazards among health care workers in low- and middle-income countries: a scoping review. *Int J Environ Res Public Health.* 2021;18(5):2603. doi:10.3390/ijerph18052603.
- Holmér S, Nedlund AC, Thomas K, Krevers B. How health care professionals handle limited resources in primary care – an interview study. *BMC Health Serv Res.* 2023;23(1):6. doi:10.1186/s12913-022-08996-y.
- Soomar SM, Siddiqui AR, Azam SI, Shah M. Determinants of hepatitis B vaccination status in health care workers of two secondary care hospitals of Sindh, Pakistan: a cross-sectional study. *Hum Vaccin Immunother.* 2021;17(12):5579-84. doi:10.1080/21645515.2021.1986332.
- Alzaaqui A, Alruwaili T, Almesned M. Incidence, knowledge, attitude and practice of healthcare workers regarding needle stick injuries at a tertiary care hospital in Riyadh, Saudi Arabia. *Saudi J Med Pharm Sci.* 2024;10(6):357-68. doi:10.36348/sjmpps.2024.v10i06.004.
- Berhan Z, Malede A, Gizeyatu A, Sisay T, Lingerew M, Kloos H, et al. Prevalence and associated factors of needle stick and sharps injuries among healthcare workers in northwestern Ethiopia. *PLoS One.* 2021;16(9):e0252039. doi:10.1371/journal.pone.0252039.
- Iqbal N, Quraishi F, Bhatti MA, Mughal F, Mumtaz T, Khan MS. Prevalence of needle stick injury among surgeons. *J Pharm Res Int.* 2021;33(32B):89-94. doi:10.9734/jpri/2021/v33i32B31745.
- Al-Abhar N, Moghram GS, Al-Gunaid EA, Al Serouri A, Khader Y. Occupational exposure to needle stick injuries and hepatitis B vaccination coverage among clinical laboratory staff in Sana'a, Yemen: cross-sectional study. *JMIR Public Health Surveill.* 2020;6(1):e15812. doi:10.2196/15812.
- Keicher F, Zirkel J, Leutritz T, König S. Combatting the occurrence of needle-stick injuries in a medical school: why is it still an issue? *BMC Med Educ.* 2024;24(1):312. doi:10.1186/s12909-024-05279-4.
- Zafar A, Habib F, Hadwani R, Ejaz M, Khowaja K, Khowaja R, et al. Impact of infection control activities on the rate of needle stick injuries at a tertiary care hospital of Pakistan over a period of six years: an observational study. *BMC Infect Dis.* 2009;9(1):78. doi:10.1186/1471-2334-9-78.
- Masoumi-Asl H, Rahbar M, Soltani A, Pezeshki Z, Khanaliha K, Kolifarhood G. Epidemiology of needlestick injuries among healthcare workers in Tehran, Iran: a cross-sectional study. *Arch Clin Infect Dis.* 2016;12(2):e37605. doi:10.5812/archcid.37605.
- Mengistu DA, Tolera ST, Demmu YM. Worldwide prevalence of occupational exposure to needle stick injury among healthcare workers: a systematic review and meta-analysis. *Can J Infect Dis Med Microbiol.* 2021;2021(1):9019534. doi:10.1155/2021/9019534.
- Alharazi R, Almutary H, Felemban O, Alariany AS,

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Alshamrani FA, Hawsawi EH, et al. Prevalence of needle stick injuries among nurses in Jeddah, Saudi Arabia. Nurs Res Rev. 2022;12:235-46. doi:10.2147/NRR.S376343.