

Original Research Article

Prevalence of needle stick injury among post-graduate residents of medical college in North India: a cross-sectional study

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ABSTRACT

Background: Needle stick injury (NSI) is a major concern among healthcare professionals especially young resident doctors. As they navigate through their professional journey, these early-career healthcare workers (HCWs) may face heightened exposure to the risk of occupational injuries, including NSIs. Recognizing the importance of addressing this issue, this cross-sectional study was conducted with the objective of determining the prevalence of needle stick injuries among postgraduate students at a medical college in northern India.

Methods: A cross-sectional study was conducted among residents of medical college in North India. Data was collected for period of one month. A validated, pre-structured questionnaire was used. Data was compiled using Microsoft Excel and analyzed using Epi-info 7 (CDC USA) freely available online.

Results: The prevalence of NSI among post-graduate students was found out to be 55.2%. Half (50%) of these NSI were found out to be un-reported. More than half (58.62%) of study participants didn't get themselves tested for HBV/HCV/HIV after NSI.

Conclusions: High prevalence of NSI was found among post-graduate residents. The knowledge about intricacies of post-exposure prophylaxis (PEP) was found to be lacking. There is need to enhance educational efforts and have strict protocols in place amongst health-care professionals regarding NSI.

Keywords: Needle stick injury, Universal precautions, Post-exposure prophylaxis

INTRODUCTION

Needle stick injury (NSI) refers to an accidental penetration of the skin by a needle, which can be contaminated with the blood or other body fluids of another person. This injury is a significant concern within healthcare settings, as it can expose HCWs to potentially life-threatening bloodborne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). These injuries are classified as one of the most common occupational hazards faced by HCWs, who are regularly exposed to sharp instruments while performing medical procedures, such as blood draws, administering intramuscular or intravenous injections, or even during the process of recapping needles. While needle stick injuries are often perceived as minor due to the typically minor bleeding or

visible trauma associated with them, the risk of transmission of infectious diseases remains substantial. Even in the absence of visible injury or bleeding, the risk of infection through needle stick exposure persists at the same level.¹

A global study conducted in 2020, which analyzed 87 studies involving 50,916 HCWs from 31 countries, revealed concerning statistics about the prevalence of needle stick injuries. The results indicated that the one-year global pooled prevalence of NSIs among HCWs was 44.5%, with Southeast Asia experiencing the highest prevalence at 58.2%.² In India, the prevalence of NSIs ranged from 61% to 75.5%, with the frequency of such injuries ranging from 2.3 to 4.5 injuries per healthcare worker per year. In addition, data showed that the incidence density of needle stick injuries was 228.57 per

100 person-days, and an overwhelming 79.5% to 90.5% of HCWs reported experiencing at least one NSI during their career.³ Among the HCWs, doctors were found to be at the highest risk, with an exposure rate of 73.7%, followed by nurses at 19.1%.⁴

The risk of infection from needle stick injuries, particularly with bloodborne viruses such as HIV, has been well documented. According to prospective studies, the estimated risk of contracting HIV following a percutaneous exposure to HIV-infected blood is approximately 0.3%. In fact, it is estimated that more than three million HCWs worldwide experience percutaneous injuries from contaminated sharp objects every year. These exposures lead to approximately 1,000 HCWs becoming infected with HIV annually, highlighting the severe occupational health threat posed by NSIs.⁵ Research further estimates that 4.4% (ranging from 0.8% to 18.5%) of HIV infections among HCWs worldwide may be attributable to occupational sharps injuries.⁶

Postgraduate medical students represent a particularly vulnerable group within the healthcare profession. As young professionals, they are likely encountering patients for the first time during their clinical training. This phase of their medical education exposes them to stressful and high-pressure clinical situations, which may contribute to an increased incidence of needle stick injuries. As they navigate through their professional journey, these early-career HCWs may face heightened exposure to the risk of occupational injuries, including NSIs. Recognizing the importance of addressing this issue, this cross-sectional study was conducted with the objective of determining the prevalence of needle stick injuries among postgraduate students at a medical college in northern India. This research aims to shed light on the specific challenges faced by postgraduate students, enabling healthcare institutions to design more effective prevention and education programs tailored to this group of HCWs.

METHODS

This was a cross-sectional study conducted among postgraduate students of medical college in northern India. All post graduate students who were willing to participate via informed written consent were included in the study whereas those who didn't respond even after 2 consecutive visits or those who failed to give consent were excluded from the study. Time period for study was 1 month (September 2023 to October 2023).

Sample size and sampling technique

Sample size was calculated using formula for single proportion: $N > Z^2 PQ / D^2$, Where Z is 1.96, P is prevalence of NSI (36.3% or 0.36), Q is 1-P, D is absolute precision (10%). $N > 1.96 \times 1.96 \times 0.36 \times 0.064 / 0.1 \times 0.1 = 88.5$ i.e., 89.^{7,8} Assuming power of the study to be 80% and confidence interval of 95% the required sample size came out to be 89. Assuming the non-response rate to be 10% for study

population, sample size of 98 was calculated. This came out to be minimum sample size for the study. From list of 280 post-graduate students obtained, 105 were included for this study after applying relevant inclusion and exclusion criteria.

Data collection tool

A pre-tested semi structured google form-based questionnaire was used which consisted of 4 components: General details and sociodemographic profile, knowledge-based questions, attitude-based questions and practice-based questions.

Methodology

Prior to selection of study participants, list of all post graduate students was obtained from principal office. Minimum sample size as calculated was 98. From list of 280 post-graduates obtained, 105 were included in the study. An informed consent was obtained before interview from every participant after explaining the purpose of the study and was ensured about the strict confidentiality of the information collected. Besides, respondent who did not give consent or did not cooperate during study were excluded.

Statistical analysis

Data was compiled using Microsoft excel and analyzed using Epi-info 7 (CDC USA) freely available online. The distribution of categorical/nominal variables was represented through frequencies and proportions whereas, for continuous variables mean $\pm$ SD were calculated.

RESULTS

Total 105 study participants were included in the present study. Out of all participants, 59% had completed their MBBS from government medical colleges whereas 41% of study participants have done their MBBS from private medical colleges. The representation of study participants from various departments was in a manner that our study consisted maximum participants from the department of community medicine (10%) and general medicine (10%) whereas minimum participants were from the department of anatomy (1%), ENT (1%), biochemistry (1%), and psychiatry (1%).

Table 1: Distribution of study participants according to their knowledge regarding universal precautions and diseases transmitted by NSI (n=105).

Variables	N (%)
Knowledge about universal precautions	
Yes	100 (95.24)
No	5 (4.76)
Knowledge about the diseases transmitted by NSI	
Yes	103 (98.09)
No	2 (1.90)

Table 1 shows that majority of study participants 95.24% (100) had knowledge regarding universal precautions. Out of all study participants, majority, i.e. 98.09 % were aware about the diseases transmitted by NSI.

Table 2: Distribution of study participants according to their practices of observing universal precautions (n=105).

Variables	N (%)
Wearing gloves during sample collection	
Always	71 (67.61)
On/off	11 (10.47)
Depending on availability	19 (18.09)
Only on confirmed cases	4 (3.8)
Practice of recapping or bending the needles after use	
Yes	82 (78.09%)
No	23 (21.91%)

Table 2 shows that out of all participants, 67.61% always wear gloves, 10.47% wear gloves on and off, 18.09% wear gloves depending upon availability, whereas 3.8% wear it only in confirmed cases with positive viral markers.

Majority (78.09%) of participants practice recapping or bending the needles after use (Table 2).

Table 3: Distribution of study participants on the basis of history of NSI (n=105).

Variables	N (%)
History of NSI	
Yes	58 (55.2)
No	47 (44.7)
Procedures during which NSI was incurred, (n=58)	
During sampling	30 (51.7)
During injection	5 (8.6)
Suturing	23 (39.7)
Reported NSI, (n=58)	
Yes	29 (50)
No	29 (50)
Status of viral load of patient after getting NSI, (n=58)	
Checked	49 (84.48)
Not checked	9 (15.51)
Immediate measures taken after NSI, (n=58)	
Washing	38 (65.5)
Ignored	11 (18.9)
Immediate reporting	5 (8.7)
Antiseptic application	2 (3.5)
Wiping	1 (1.7)
Squeezing out blood	1 (1.7)

Out of 105 participants, 55.2% had history of NSI. Amongst those study participants with history of NSI, almost half (51.7%) had experience NSI during sampling, 39.7% during suturing and 8.6% while administering

injections. Half of study participants with history of NSI reported their injury. Majority (84.48%) of study participants with NSI got viral load of patient checked. Out of all study participants with NSI, majority of them (65.5%) washed the site of injury immediately after injury whereas only a small percentage (1.7%) wiped the area of injury and squeezed out the blood (1.7%).

Table 4: Distribution of study participants based on frequency of NSI from 1st year MBBS till date (n=58).

Frequency of NSI	N (%)
Once	23 (39.65)
One-two times	29 (50)
Two-three times	5 (8.62)
More than three times	1 (1.73)

Table 4 shows that out of all study participants with history of NSI half of them had experienced NSI one-two times from MBBS 1st year till date.

Table 5: Distribution of study participants regarding knowledge about post and pre-exposure prophylaxis for HIV (n=105).

Variables	N (%)
Status of awareness	
Yes	96 (91.4)
No	09 (8.6)
Knowledge regarding PEP duration	
Yes	11 (10.47)
No	94 (89.53)
Knowledge regarding pre-exposure prophylaxis	
Yes	07 (6.67)
No	98 (93.33)

Majority (91.4%) of study participants were aware about the availability of post exposure prophylaxis for HIV but most (89.53%) of them didn't have knowledge regarding duration of PEP against HIV.

On the other hand, majority (93.33%) of study participants had no knowledge regarding pre-exposure prophylaxis against HIV (Table 5).

Table 6: Distribution of study participants for duration after which they got tested for HBV/HCV/HIV after NSI (n=58).

Duration after which getting tested	N (%)
Not done	34 (58.62)
3 months	11 (18.96)
6 months	8 (13.79)
1 year	5 (8.62)

Table 6 shows that more than half (58.62%) of study participants didn't get themselves tested for HBV/HCV/HIV after NSI.

Table 7: Distribution of study participants according to NSI awareness sessions held in their department (n=105).

NSI awareness sessions held in their department	N (%)
Yes	49 (46.6)
No	56 (53.3)

Out of total participants (n=105), NSI awareness sessions were held in department of 49 (46.6%) participants whereas such sessions were not held in the department of 56 (53.3%) study participants.

DISCUSSION

NSI is widely prevalent health hazard among doctors. Even though knowledge about universal precautions is present amongst post graduate students working in medical colleges but the intricacies of post-exposure prophylaxis like the exact duration for which drugs are to be taken are not known to them. Our study has shown that though majority of study participants 95.24% (100) had knowledge regarding universal precautions but still most of them (89.53%) didn't have knowledge regarding duration of PEP against HIV. This gap could be attributed to several factors like inadequate educational efforts focusing on details of PEP. This finding suggests the need for enhanced educational efforts with programs that specifically target the detailed aspects of HIV post-exposure prevention. The practices of wearing protective gear like gloves was not found to be universal with only 67.61% of study participants who always wear gloves while 10.47% wear gloves on and off, 18.09% wear gloves depending upon availability and remaining 3.8% wear it only in confirmed cases with positive viral markers. Along with this, majority (78.09%) of study participants practice recapping or bending the needles after use. The variation in glove usage practices suggest that despite knowledge of universal precautions adherence to these practices is not consistent, thus increasing the risk of exposure to harmful pathogens. This inconsistent use of gloves could be due to factors such as workload, perceived urgency, insufficient stock as well lack of enforcement of safety protocols in the workplace.

More than half (55.2%) of study participants had history of NSI. Majority of these NSI took place during sampling. Out of all study participants who suffered from NSI, only half of them reported these injuries. The fact that over half of the study participants reported having a history of NSI points to the high risk that HCWs face in environments where sharp instruments are frequently used. In present study, out of all study participants with history of NSI half of them had experienced NSI one-two times from MBBS 1st year till date.

Despite advances in safety protocols and better training, NSIs remain common. This could indicate:

Inadequate adherence to safety precautions: Despite knowing the risks, HCWs might not consistently follow universal precautions (such as proper disposal of needles or use of safety-engineered devices).

Environmental or situational factors: Workload pressures, staffing shortages, or inadequate equipment (e.g., improper needle disposal systems or poorly designed tools) could contribute to the high number of injuries.

Similarly high prevalence of NSI were reported from different other studies as well. A study conducted among nursing professionals found prevalence of NSI among them as 40.97% with highest prevalence in Southeast Asia as 49.9% and lowest in United States of America.⁹ Another study conducted in China found high prevalence of NSI among health care workers being 32.86% with 28.53% of NSIs being unreported.¹⁰ Similarly, in a study conducted by Sharma 59% of medical students reported having sustained a needlestick injury during residency with median number of injuries per injured resident being. Additionally, 47% of residents did not report their injury.¹¹ Thus, high prevalence and massive non-reporting of NSI among healthcare professionals is alarming matter of concern.

In present study majority (91.4%) of study participants were aware about the availability of post exposure prophylaxis for HIV but most (89.53%) of them didn't have knowledge regarding duration of PEP against HIV. This finding again highlights the lacunae of proper educational efforts and trainings.

In present study more than half (58.62%) of study participants didn't get themselves tested for HBV/HCV/HIV after NSI. This is concerning as it highlights a significant gap in post-exposure care and prevention practices. One potential explanation for this could be a lack of awareness regarding the risk of infection following an NSI. Some individuals may not fully understand the implications of exposure to bloodborne pathogens or may underestimate the likelihood of transmission. This could be further compounded by inadequate training or inconsistent safety protocols, which might leave workers uncertain about the necessary steps to take after an injury.

Present study also highlights the lack of proper educational sessions for adequate prevention and management of NSI as awareness sessions regarding NSI were only held in departments of 46.6% of study participants.

CONCLUSION

There was general awareness in majority (95.24%) of study participants regarding universal precautions. There were lacunae between knowledge and practice as out of all participants, 67.61% always wear gloves, 10.47%

wear gloves on and off, 18.09% wear gloves depending upon availability, whereas 3.8% wear it only in confirmed cases with positive viral markers. Out of 105 participants, 55.2% had history of NSI. Amongst those study participants with history of NSI, almost half (51.7%) had experience NSI during sampling, 39.7% during suturing and 8.6% while administering injections. Half of study participants with history of NSI reported their injury. Thus, high prevalence and under-reporting of NSI is evident from present study. Majority (91.4%) of study participants were aware about the availability of post exposure prophylaxis for HIV but most (89.53%) of them didn't have knowledge regarding duration of PEP against HIV. More than half (58.62%) of study participants didn't get themselves tested for HBV/HCV/HIV after NSI. NSI awareness sessions were held in department of 49 (46.6%) participants only.

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