



Original Research Article

Prevalence of needle stick injuries among health care workers in a tertiary care hospital in Delhi, India

Avnisha¹, Ilanchezhian¹, Parul Garg², Shalini Malhotra^{1*}, Nirmaljit Kaur Bhatia¹, Amarjit Kaur¹, Atul Anand³

¹Dept. of Microbiology, ABVIMS and Dr. RML Hospital, New Delhi, India

²Dept. of Microbiology, S.N. Medical College, Agra, Uttar Pradesh, India

³ART Centre, ABVIMS and Dr. RML Hospital, New Delhi, India

Abstract

Background: Healthcare professionals commonly sustain occupational injuries from needles and other sharp objects. Needle stick injuries raise the risk of contracting infections from different blood borne pathogens such as HIV, Hepatitis B and C and others. The aim of the present study was to ascertain the prevalence of needle stick injuries among different healthcare professionals.

Materials and Methods: This cross-sectional study was conducted from January 2020 to June 2022 in a tertiary care hospital of New Delhi. According to 2018 NACO guidelines, exposure to needle stick injury has been classified into mild (Exposure code 1), moderate (EC 2) and severe (EC 3).

Results: In this study, prevalence of Needle stick injury (NSI) was 1.02%. Among the exposed healthcare workers, doctors (62.5%) had the maximum exposure of needle stick injuries. 85.12% of exposed healthcare workers sustained mild type of NSI (EC 1) and the most common site of injury was finger (83.33%). Healthcare workers working in the casualty & ICUs had the maximum exposure of NSI (47.02%). Most of the injuries occurred during collection of blood samples (42.86%).

Conclusion: Prevalence of NSI is reported low in our study which can be attributed to the standard precautions followed in the hospital. Healthcare workers are regularly trained for careful handling of needles and sharps and disposal of biomedical waste. Early reporting and timely initiation of Post Exposure Prophylaxis is the key to occupational safety of HCW from NSI.

Keywords: Needle stick injury, Healthcare workers, Occupational injuries, Blood-borne diseases.

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1. Introduction

Needle stick injuries (NSIs) are injuries caused by needles such as hypodermic needles, intravenous (IV) cannulas, blood sampling needles, and needles used in intravenous delivery systems.¹ Needle stick infections are the most prevalent kind of occupational risk for healthcare workers, and they lead to the spread of several blood borne viruses, including Human Immunodeficiency Virus (HIV), hepatitis B and C and others.² Over 3 million health-care workers (HCWs) are exposed to blood and body fluids every year in the US alone, leading to 6 million NSIs, according to CDC.³

The majority of needle stick injuries occur while giving injections, blood collection, handling biomedical waste,

recapping and disposing of needles and transferring blood/body fluid from collection syringe to a specimen container.⁴

For HBV infections, the chance of transmission following needle stick exposure ranges from 9-30%; for HCV infections, it ranges from 1-1.8%; and for HIV infections it is 0.3%.⁵ Around 66,000 new cases of HBV, 16,000 cases of HCV and 200 to 5000 cases of HIV are reported annually among healthcare professionals as a result of NSIs, according to World Health Organization.⁶

Tertiary care hospitals have higher workload and more casualties, so health care workers are at higher risk of developing these injuries.⁷ In addition to the transmission of

*Corresponding author: Shalini Malhotra
Email: malhotra439@gmail.com

blood-borne diseases, NSI can also lead to depression, anxiety, fear and post-traumatic stress disorder which may lead to various behavioural changes.⁸ Needle stick injuries are under reported, therefore less reporting should not be construed as low NSI rate by health care facilities. Injuries recorded as per standard occupational injury reporting systems may undervalue the actual NSI rate, by 10-fold.⁹

The present study was conducted to know the prevalence and to study the occurrence of NSI amongst health care workers in a tertiary care hospital in Delhi.

2. Materials and Methods

This cross-sectional study was conducted in a tertiary care hospital of New Delhi from January 2020 to June 2022 involving healthcare workers which included doctors, nursing staff, laboratory staff, OT technicians and hospital attendants etc.

The evaluation included the details of all the healthcare workers who reported needle stick injuries, sharp injuries (e.g broken ampoules, intravenous catheters, surgical scalpels), and splashes on wounds and mucosa by potentially infected materials (e.g blood and other body fluids). The hospital NSI proforma was required to be completed by the exposed HCWs, which included information regarding the site of injury, procedure during which injury occurred, whether individual was involved in routine or emergency health care, use of personal protective equipment at the time of exposure, type of exposure, status of hepatitis B vaccination, immediate postexposure steps taken.

Moreover, the status of source of exposure and HCW of HBV, HCV, and HIV if known, were also written in the proforma. As per revised NACO guidelines 2018, exposure to needle stick injury has been classified into mild (Exposure code 1), moderate (EC 2) and severe (EC 3). According to this definition, a needle stick injury is ‘any prick or cut to the health care worker by a needle previously used on a patient, is work related and sustained within the hospital premises.’

All exposed HCWs signed written consent and their blood samples were gathered alongside those of the patient (source of exposure). According to NACO recommendations, HIV 1 and 2 screening was carried out. Furthermore, samples were immediately tested for Hepatitis B antigen and antibodies against HCV by immunochromatographic tests. Following counselling, all exposed HCWs were suggested for repeat testing after 3 weeks, 3 months and then after 6 months.

3. Results

A total of 168 cases of Needle stick injuries were reported over a period of 30 months (Jan 2020- June 2022). The prevalence of Needle stick injury in our study was 1.02% which was calculated as number of exposed healthcare workers per 100 occupied hospital beds.¹⁰ Prevalence can

also be calculated as number of exposed healthcare workers per 100 healthcare workers in the hospital. The number of NSIs was highest among doctors (62.5%) followed by nursing personnel (26.78%) among the exposed HCWs (**Table 1**). The laboratory staff and OT/hospital attendants comprised 10.71% of the exposed HCWs who sustained NSI. There was no significant correlation between gender and needle stick injuries in this study; nevertheless, more females than males reported injuries (54.76% vs 45.24%).

Table 1: Needle stick injury reported by health care workers (n=168)

Distribution of hospital staff	Number (168)	Percentage (%)
Doctors	105	62.50
Nursing staff	45	26.78
Laboratory staff	8	4.76
OT/Hospital attendants/Others	10	5.95
Distribution according to gender		
Males	76	45.24
Females	92	54.76
Type of Exposure		
Mild (EC 1)	143	85.12
Moderate (EC 2)	15	8.93
Severe (EC 3)	10	5.95
Site of injury		
Finger	140	83.33
Hand other than fingers	18	10.71
Face/eye	4	2.38
Others	6	3.57
Place of occurrence		
Casualty and ICUs	79	47.02
General wards	25	14.88
Operation theatre	11	6.55
Others	53	31.55
Procedure in which injury occurred		
Blood sample collection	72	42.86
IV cannulation	62	36.90
Detaching needle after use	12	7.14
Surgery/Procedure	22	13.09
Use of gloves		
No gloves	13	7.73
Single pair	122	72.62
Double Pair	23	13.69
Not applicable	10	5.95
Immediate actions undertaken by HCW following exposure		
No action	3	1.78
Squeezed the affected part	2	1.19
Washed with water	26	15.48
Washed with soap and water	109	64.88
Cleaned with disinfectant like spirit	28	16.67

Mild type of exposure (EC 1) was observed in 85.12% of exposed health care workers followed by moderate (8.93%) and severe (5.95%) types. Finger (83.3%) was the most common site of injury followed by other parts of hand except fingers (10.71%). Healthcare workers working in the casualty & ICUs had the highest exposure of NSI (47.02%) as compared to those working in General wards (14.88%), OT (6.55%) and OPDs. Injuries happened most frequently during blood sample collection (42.86%), IV cannulation (36.90%) and surgical procedures (13.09%). Among health care workers who got needle stick injuries, 7.73% did not use gloves while 72.62% HCW were wearing single pair of gloves. Health care professionals who had NSI, majority of them (64.88%) immediately began washing the affected area with soap and water. Chemical disinfectants like hypochlorite, methylated spirit were also used, as were running water to wash the affected region and squeezing the injured area. Because they did not know what the NSI protocol entailed and believed the damage was superficial, 1.78% of the HCWs did not act immediately.

4. Discussion

Needlesticks and other occupational injuries with sharps are common in healthcare workers practicing in tertiary care hospitals. This is accompanied by a risk for the acquisition of different types of blood-borne infections. The study was done on our hospital's healthcare workers to understand the prevalence of needle stick injuries. 168 HCWs were exposed to NSI in the 30 months under observation. This corresponds to a prevalence of 1.02% which is less than the study conducted by Nagao *et al* (3.6%).¹⁰ Controlled NSI rates in our study can be attributed to the dedicated team of Infection Prevention Control (IPC) which ensures strict compliance to standard precautions and other IPC measures. Induction training regarding infection control practices is being given to all the HCWs at the time of joining. Training and teaching programs include topics such as use of puncture-proof containers for disposal of sharp, the use of safety devices, use of needle cutter and avoiding hand-to-hand passing of sharps, use of colour coded bins for biomedical waste, and the importance of following established protocols and practices. Educational programs create awareness among workers and can help to highlight the potential consequences of NSI. Regular classes are being conducted separately for each group in various wards and ICU by hospital infection control nurses, microbiology residents and trained technical staff. By ensuring that healthcare professionals are well-trained in these areas, this can significantly reduce the risk of NSI in the workplace. Regular rounds of all the wards and ICUs is being done by the infection control nurses to check the implementation of various IPC practices.

NSI was reported more frequently by females (54.76%) compared to males (45.24%). Similar findings which also state that female HCWs are most likely to sustain NSI have been seen in many studies.^{11,12}

Mostly doctors were reported as the main perpetrators of the NSIs, 105(62.5%) and this is in good agreement with many India-based reports.¹³⁻¹⁵ A comparable study conducted in our hospital in 2016 reported highest NSI rate in doctors at 68.8% when compared to other health workers.¹⁶ As seen in different studies from India,¹⁷⁻¹⁹ Saudi Arabia,²⁰ Ireland,²¹ and the USA,²² NSI was less frequently seen (19.2–28.5%) among doctors as compared to nurses. This contrast can be attributed to the increased work load and pressure in tertiary care hospitals, especially in casualty, ICUs and OPDs where resident doctors are regularly performing clinical procedures as in the current study. Doctors experience more NSIs than other healthcare professionals due to the high frequency and complexity of procedures they perform, such as suturing, IV insertions, and biopsies, which often involve deep tissue penetration. The high-pressure environments of emergency rooms and ICU demand rapid decision-making, increasing the likelihood of injuries. Additionally, they frequently perform procedures in uncontrolled settings where patients may be uncooperative, further raising NSI risk. Prolonged working hours contribute to fatigue, impairing focus and adherence to safety measures. Surgeons, anaesthetists, and critical care physicians face higher exposure to bloodborne pathogens due to the frequent use of large-bore needles and increased blood contact.

While 10.7% of the HCWs sustained injuries on their hands other than fingers, 83% suffered NSI to their fingers. Results were comparable in a different study done by Khursheed *et al*.²³ NSIs most commonly occur on the fingers due to several anatomical, procedural, and ergonomic factors. The fingers are the primary point of dexterity and control, making them the closest body part to the needle's trajectory. Additionally, re-capping needles, improper disposal, or sudden patient movement can contribute to unintentional punctures.

Hazard and near miss reporting is a proactive way to intervene to prevent injuries before incidents happen. It helps to identify hazards and unsafe conditions (e.g. improperly discarded sharps) in the workplace. A clear process for reporting hazards and near misses can encourage reporting and help to identify areas for improvement.

In the present study, casualty/ICUs were the most common area where HCWs experienced 47.02% NSI, whereas operation theatres and wards reported 6.55% and 14.88%, respectively. According to Goel V *et al*., the majority of sharp/NSIs were recorded from the ICUs at 48.1% followed by general ward at 29.8%, operation theatre at 3.3%, labour room at 8.1% and treatment room at 9%.²⁴ Thus, it points out that HCWs working in emergency or critical care settings are more prone to sharp/NSIs, of which the primary cause is high work load, less manpower and many emergencies in such critical areas. Another study performed by Rishi E *et al*²⁵ showed contrasting results who

reported sharp/NSI most frequently in operation theatres (67%).

Research shows that between 34-65% of health care workers get NSI while handling and disposing of used needles.^{26,27} According to the findings of our study, the majority of the injuries (92.86%) occurred during procedures rather than sharp disposal (7.14%). A higher percentage of NSI during sharp disposal has been reported in studies conducted at Vellore (18.6%)²⁸ and Goa (31.7%).¹⁵ This indicates strict adherence to safe infection prevention and control practices and use of safer needle disposal methods at our institute.

In the present study, venepuncture during the blood sample collection was the most common procedure (42.86%) during which NSI occurred which is in concordance with the previous study conducted in our hospital (24%).¹⁶ Surgical procedures contributed only 13.09% of the NSI. Nevertheless, many researches indicated that suturing (29–46%) was the predominant method responsible for needle stick injuries, followed by blood sample collection (19%).^{11,26,29} This disparity can be attributed to superior medical equipment facilities and enhanced clinical oversight of residents by the hospital infection control staff during surgical procedure at our institution.

It is generally established that personal protective equipment, especially gloves, is crucial for healthcare workers to safeguard against infection and prevent the transfer of infectious diseases to patients and visitors. In this study, 7.73% of HCWs reported that they were not wearing gloves which is quite less than that reported by Khursheed *et al.*²³ This can be attributed to awareness among HCWs in our institute about use of gloves during various procedures. Wearing double gloves is another way which protects healthcare workers from patient's blood and body fluids. When the outer glove is punctured, the inner glove can protect the HCW's hand from contamination. However, lack of comfort, restriction of dexterity and impaired sensation of touch can negate the benefits of double gloving. Although proportion of HCW who were not wearing gloves at the time of NSI is small, the lack of awareness amongst all HCW, non-availability of gloves, unavailability of appropriate size gloves and cost issues of gloves are the major challenges as far as glove usage is concerned.

In the current study, 64.88% washed the site of injury with water and soap which is in unison with the findings of Goel V *et al.*²⁴ A matter of concern is that 1.78% of HCWs did nothing following NSI which implicates further IEC training for HCWs regarding NSI protocols. NSIs pose significant psychological consequences for healthcare workers (HCWs), often leading to immediate and prolonged distress. The fear of contracting bloodborne infections such as HIV, hepatitis B, or hepatitis C induces acute anxiety, even when post-exposure prophylaxis (PEP) is available. Studies indicate that HCWs experience heightened stress, sleep

disturbances, and symptoms of post-traumatic stress disorder (PTSD) following NSIs, particularly when the source patient has a known infectious disease.³⁰ Additionally, the stigma surrounding NSIs, coupled with self-blame or workplace scrutiny, exacerbate emotional distress and may contribute to decreased job satisfaction and burnout. In some cases, persistent anxiety about seroconversion can lead to long-term psychological strain, affecting concentration, clinical performance, and overall well-being. Institutional support, timely counselling, and robust preventive strategies are critical in mitigating these psychological repercussions among HCWs.

Our hospital has a standard operating procedure (SOP) for providing post-exposure prophylaxis to HCW immediately following NSI or exposure to blood and body fluids, as an integral part of the incident reporting system. The hospital also has a strong pre-exposure prophylaxis programme which includes vaccination against Hepatitis-B and annual follow-up of all HCW's for antibody detection.

5. Conclusion

Although highly preventable with proper handling of equipment and disposal of sharp waste, NSIs continue to be a significant issue among HCWs. Prevention of NSI is the most effective way to prevent many blood-borne infections in healthcare workers. Infection prevention and control programme in the hospital including education of HCWs regarding safety practices is indispensably required to be an actively ongoing activity in the hospital. Training on Infection control and biomedical waste management which also includes NSI prevention and management should be mandatory for all new HCWs joining the hospital and awareness regarding the same should be reinforced from time to time.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

8. Informed Consent

Written and informed consent was taken from all the healthcare workers who were included in the study.

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