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RESEARCH ARTICLE

Prevalence and Factors Associated with Needlestick Injuries Among Healthcare Workers in a Tertiary Care Hospital in South India: A Cross-Sectional Study

Shibilafebin Ok[1], Baraa Ali Abd Elrahim Osman[2], Samah Faisal Ali Saeed Almoosawi[3], Huda Zainab Nishat,[4], Dua Ibrahim[5], Mohammed Saleem Yousuf[6], Mohamed Gamal Abdelrahim Abdalla[6], Tayyaba Mubeen[7], Sofia Robab[8], Mariyam Khan[9], Shigha Rahman[10], Shadhra O Susheel[9]

[1]General Physician, Kerala, India
[2]General Physician, Abudhabi, UAE
[3]Medical doctor, King Hamad American Mission Hospital, Internal Medicine, Aali, Bahrain
[4]House Surgeon, SRM Medical College, Hospital & Research Centre,Chennai, TN India
[5-8]General Physician, Dubai & AbuDhabi, UAE
Corresponding Author: Huda Zainab Nishat, **E-mail**: hudaznishat@gmail.com

ABSTRACT

Needle stick injuries (NSIs) are important occupational hazards for health care workers (HCWs), which increase the risk of blood-borne infections. The incidence of NSI is high in India, yet the surveillance remains suboptimal. The studt aims to determine the proportion of HCWs who sustained NSI in Govt. Medical College, Ernakulam, has been in operation for over one year to identify factors associated with NSI among the study population and to assess preventive and post-exposure practices among HCWs. This cross-sectional study was conducted from May to July 2018 at Govt., including doctors, house surgeons, nurses, nursing students, lab technicians, and last-grade workers working at Govt. medical college, Ernakulam. 349 participants were included in the study with the convenient sampling method and data were collected by structured questionnaire. Statistical analysis was conducted with SPSS software. Most participants were aged between 21 and 40 (65.5%), and 75.5% of the study population were females. Out of 495 respondents, the majority (28.7%) were nursing students, followed by house surgeons (23.8%), technicians/paramedical students (16.65%), doctors (15.5%), attenders (8.9%) and nurses (6.6%). NSI lifetime prevalence was 51.9%, and NSI over the past year was 38.1%. Of these, 43.6% reported multiple NSIs in the past 1 year. Out of 9697 HCWs, 58 (0.52%; 95% CI, 0.40%-0.66%) tested positive and the incidence rate was 598.5 per 1,000 HCWs. Most NSIs occurred in emergency settings (44.98%) and within wards, particularly in Medicine and Surgery (43.1%). *Factors Associated with NSI***:** Healthcare workers aged 21–40 had the highest NSI incidence (p=0.00). Males were more affected. House surgeons, nursing students, and technicians were at higher risk. NSIs occurred during blood withdrawal, sharps disposal, and fluid tapping. Needle stick injuries is a significant occupational hazard in HCWs. Increased risk of NSI was significantly associated with younger age, male gender, and certain job roles. Before implementing this practice, it is important to acknowledge that there is a gap in availability of PPE (personal protective equipment) and standardized protocols, reporting systems, and proper training.

KEYWORDS

Needle stick injuries, health care workers, occupational hazard, post-exposure prophylaxis, blood-borne infections, health surveillance.

ARTICLE INFORMATION

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A needlestick injury occurs when a hypodermic needle or other sharp item penetrates the skin after coming into touch with blood, tissue, or other body fluids prior to exposure. These end up becoming serious occupational Hazards in the healthcare industry("Needlestick Injury," 2025). Infections with Hepatitis B (HBV), Hepatitis C virus, and Human Immunodeficiency Virus formulate the high-risk category of spread via body fluids like blood. These injuries usually occur when Healthcare workers (HCWs) puncture their skin with needles or other sharp materials contaminated with patient's bodily fluids, accidentally exposing themselves to these viruses. (Alfulayw et al., 2021; Goel et al., 2017) Such exposures can lead to severe consequences in some cases, leading to chronic infections, long-term morbidity, and occasionally, mortality (King & Strony, 2025)

According to the World Health Organization (WHO) estimate, about 2 million HCWs worldwide have incidental percutaneous exposure to NSIs, and > 90% of such incidents happen in developing countries like India. (Raj et al., n.d.) In a study carried out in a tertiary care teaching hospital based in North India, the self-reported incidence of NSIs in a 3-year study period was found, of which 73.7% were doctors and 19.1% were nurses. Furthermore, 26.3% of these HCWs had anti-HBS titers <10mIU/mL, considered to be non-protective against HBV infections. (Goel et al., 2017)

Several factors contribute to the high incidence of NeedleStick Injuries (NSIs) among healthcare workers. Insufficient training, inadequate protocols for HCWs, and an understanding of the safe handling of sharp materials, along with failure to follow conventional precautions, drastically raise the risk of such injuries. Moreover, high workload and fatigue due to extended working hours and high staff-to-patient ratios lead to errors and lapses in these safety measures. Also, Improper disposal practices, such as failing to discard used needles promptly and correctly, increase the risk of accidental injury. Despite clear guidelines, the recapping of needles with both hands technique remains a common yet dangerous practice, substantially increasing the likelihood of NSIs. (*Needlestick Injuries Are Preventable | NIOSH | CDC*, 2024)

Needlestick injuries (NSIs) are not only a serious health risk but also source of psychological distress, absenteeism, and increased direct medical costs related to post-exposure prophylaxis (PEP) and serological testing. Another study from a tertiary care hospital in Kochi, India, found NSIs among 32 healthcare workers (HCWs) who were infected with HIV-seropositive patients; 87.5% of the infected HCWs were staff nurses, with a mean age of 26 years. Of these, 28 received a triple-drug antiretroviral regimen, and no subjects developed seroconversion over a follow-up period of six months(Arun Kumar Krishnan, n.d.) In another study from western India 56 NSI cases were recorded over three years; the incidence rate was 10.4 per 100 occupied beds per annum. 73.2% of injuries affected HCWs aged 20–40 years, with doctors (37.5%) and nurses (26.8%) being the most affected. Even though preventive measures exist, compliance remains low, with Hepatitis B vaccination coverage only at 64.2% among HCWs, and post-exposure antiretroviral completion only at 5.4%. (Naidu et al., 2023)

Extensive research has shown that needlestick injuries (NSIs) are a significant occupational hazard among healthcare workers (HCWs), and millions of exposures are estimated to occur worldwide per year (Raj et al., n.d.). Similar risks should be thoroughly known and practiced to avoid deep penetration needle stick injuries (NSIs), which are known to be a major cause of HIV transmission in South India, despite the extent of reasonably well-recorded injuries (Ksn et al., 2019).
While several studies have addressed the prevalence and risk factors of NSI in various parts of India, there is limited data on the same from South Indian scenarios like that of Govt. Medical College, Ernakulam, are few. This study aims to determine the prevalence of NSIs among HCWs at Govt. Medical College, Ernakulam, identifies associated risk factors and evaluates existing preventive measures to formulate effective strategies for reducing NSIs and safeguarding HCWs' health and well-being.

2. Methodology

2.1 Study Design and Setting

A cross-sectional study was conducted from May to July 2018 at Govt. Medical College, Ernakulam.

2.2 Study Population

The study included doctors, house surgeons, nurses, nursing students, lab technicians, and last-grade workers.

2.3 Sample Size and Sampling Technique

This sample size was calculated for the minimum eligible participants based on data from a previously conducted study at Malabar Medical College, Kozhikode. A total of 349 responses were ultimately collected. The sampling technique adopted was convenience sampling..

2.4 Data Collection

A semi-structured questionnaire was used for data collection. Self-administered questionnaires were given to HCWs, while last-grade workers were interviewed by investigators. Data was entered into MS Excel and analyzed using SPSS software.

3. Results

3.1 Demographic Profile

Our study included HCWS with differences in their roles and years of experience. The proportion of younger HCWs in the workforce is reflected in the high percentage of participants (65.5%) within 21-40 age group. The sample included 75.5% female respondents, which is consistent with the gender distribution typically seen in health care. Occupational distribution–Nursing students (28.7%) > House surgeons (23.8%) > Technicians and paramedical students (16.65%) > Doctors (15.5%) > Attenders (8.9%) > Nurses (6.6%). (Refer Figure 2,3)

3.2 Prevalence of NSI

The lifetime prevalence of NSIs among the study participants was 51.9%, indicating that more than half of the surveyed HCWs had experienced at least one NSI during their careers. The result shows that 38.1% of respondents within the past year sustained NSI which is still an occupational hazard. In addition, among those with NSIs in the previous 12 months, such injuries were repetitive in 43.6% of the subjects. Throughout the institution, the overall incidence rate of NSIs was calculated at 598.5 per 1,000 HCWs.

3.3 Risk Factors

Multiple risk factors associated with NSIs were identified in the study. It was found that the role of age is important, as HCWs aged 21-40 years had a maximum incidence of NSIs (p=0.00). Younger professionals probably less experienced and highly exposed to invasive procedures would be at greater risk. Differences between genders were also observed, as the number of male HCWs was smaller than that of females but still showed a higher risk for NSIs. This difference could be due to higher exposure to sharp instruments with patient interaction through the types of procedures performed by male HCWs, and their job roles.

For NSIs, house surgeons were most at risk, followed by nursing students and technicians. They are also the ones most susceptible to these kinds of invasive procedures because they are often involved in them. In a procedure-specific analysis of NSIs, injuries occurred during sharp disposal (33%), blood withdrawal (18%), fluid tapping (8%), and at other times (31%). With so many injuries occurring when disposing of the device, this highlights the need for better waste management and safety measures.

3.4 Post-Exposure Actions & Preventive Measures

Although training and the length of time in a job were evaluated in relation to whether they pre-dispose a worker to sustaining an NSI, no significant association was found. This finding denotes that training is needed, however, training by itself is insufficient to deter NSIs. Lack of implementation of protective measures, especially PPE, was frequently documented. This was especially the case for HCWs who did not follow guidelines on wearing PPE, and who are at a heightened risk of exposure to bloodborne pathogens after an NSI. (Refer figure 5,6)

4. Discussion

The implication of the results of this research highlights the common nature of needle stick injuries inside the health care setup. Over half of subjects(51.9%) of subjects had a history of some NSI at any time during their career, and almost 38.1% had an NSI within a year. Even more worrying, 43.6% of those with an NSI over the preceding year had repeated injuries, giving an overall incidence rate of *598.5 per 1000 HCWs.* Such a high incidence rate not only quantifies the frequency of NSIs but also characterizes the exposure to risk HCWs confront every single day.

A closer inspection of demographic characteristics showed that most were aged 21–40 years (refer Table 2), potentially demonstrating that younger, less experienced HCWs are more affected by these injuries. As far as this age group they are probably beginning the early stages of their career, and learning how to adapt to the fast pace of the healthcare setting. Although the study population was overwhelmingly female, the data ironically indicated that male HCWs were at a greater risk(refer Figure 1). This is probably attributed to the difference in the work that different job roles entail. That is, NSIs were found in a larger number of groups like house-surgeons, nursing students, and technicians—who are routinely engaged in high-risk tasks like handling and disposal of sharps. (Refer Figure 3)

Those observations in the real world from the study setting further underscore the complexity of NSI risks. Nearly 45% of the NSIs were emergency situations, where decisions need to be made quickly and sometimes even within seconds. These rigorous situations, compounded in high-stress working conditions, lead to lapses in safety measures and protocols quite often. Second, ward-based activities—especially in Medicine and Surgery—were seen as our major NSI hot spots. This risk only escalates further, given the nature of the OT, ED, and ICU departments, where HCWs see large patient volumes and intervention frequency

In fact the analysis showed no influence of length of working experience or pre-employment training on the occurrence of NSIs. That would seem to either indicate that even the most experienced HCWs are at risk, be it due to complacency or perhaps the unpredictable nature of impromptu emergencies and too many other frontline medical facilities where established standards of

care are compromised. These results highlight an urgent need to re-assess existing training strategies and a challenge to create more adaptable, context-dependent safety measures. The aim is to make sure that these protocols are up to the task of facing the unknown adversities that high-risk clinical settings certainly entail.

Another aspect that our study highlights is procedural vulnerability, whereby routine tasks like blood withdrawal and sharps disposal are responsible for most of the NSI — 18% and 33% of injuries, respectively. Combined together, fluid tapping and additional processes accounted for almost 39% of the occurrences (refer Table 1). This disaggregation defines the procedures in which NSIs take place but also acknowledges the types of routine operations that require particular focus to prevent needle stick injuries. The rate at which the injury happens during these procedures necessitates a statistical and reasonable effort from medical healthcare professionals to enhance the quality and availability of protective equipment and studies on its strict enforcement. Making PPE usage better and implementing more stringent procedural checks prevent the risk of NSIs.

Further, these discoveries highlight the need for adopting a holistic method to counter NSI risks. This cannot be just another training, but a revolution on how the workplace is monitored in real-time. Such training could include periodic refresher courses, training updates that reflect current safety standards, and anticipatory courses that prepare staff for emergency and high-stakes clinical situations that lead to human error. Overall, this study gives a holistic insight to methods of overcoming needle stick injury in a clinical set up. It stresses on the common and high incidence of NSIs in the healthcare workforce, particularly among younger healthcare workers and those who perform high-risk procedures, whilst also identifying key areas for improvement in training and safety protocols. This is golden information as to health institutions need to have a safer working environment. Implementing targeted interventions, improving PPE usage and establishing dynamic training programs to recognize and mitigate such challenges could help reduce the occurrence of NSIs, thus minimizing the risk of HCWs and improving patient care in general.

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