Needle stick injuries among health care workers in a tertiary care hospital of India

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Background & objectives: Percutaneous injuries caused by needlesticks, pose a significant risk of occupational transmission of bloodborne pathogens. Their incidence is considerably higher than current estimates, and hence a low injury rate should not be interpreted as a non existent problem. The present study was carried out to determine the occurrence of NSI among various categories of health care workers (HCWs), and the causal factors, the circumstances under which these occur and to, explore the possibilities of measures to prevent these through improvements in knowledge, attitude and practice.

Methods: The study group consisted of 428 HCWs of various categories of a tertiary care hospital in New Delhi, and was carried out with the help of an anonymous, self-reporting questionnaire structured specifically to identify predictive factors associated with NSIs.

Results: The commonest clinical activity to cause the NSI was blood withdrawal (55%), followed by suturing (20.3%) and vaccination (11.7%). The practice of recapping needles after use was still prevalent among HCWs (66.3%). Some HCWs also revealed that they bent the needles before discarding (11.4%). It was alarming to note that only 40 per cent of the HCWs knew about the availability of PEP services in the hospital and 75 per cent of exposed nursing students did not seek PEP.

Interpretation & conclusions: The present study showed a high occurrence of NSI in HCWs with a high rate of ignorance and apathy. These issues need to be addressed, through appropriate education and other interventional strategies by the hospital infection control committee.

Key words Disposal practices - health care workers - needlestick injury - recapping practices

Percutaneous injuries, caused by needle sticks and other sharps, are a serious concern for all health care workers (HCWs) and pose a significant risk of occupational transmission of blood borne pathogens. Needle stick injuries (NSI) are wounds caused by sharps such as hypodermic needles, blood collection needles, iv cannulas or needles used to connect parts of iv delivery systems. The causes include various factors like type and design of needle, recapping activity, handling/transferring specimens, collision between HCWs or sharps, during clean-up, manipulating needles in patient line related work, passing/handling devices or failure to dispose of the needle in puncture proof containers1. Because of the environment in which they work, many HCWs from physicians, surgeons, and nurses to house keeping personnel, laboratory
technicians and waste handlers are at an increased risk of accidental needle stick and sharps injuries. As a result, these workers are prone to occupational acquisition of various blood borne pathogens, including the microorganisms causing HIV/AIDS, hepatitis B and C, malaria, infectious mononucleosis, diphtheria, herpes, tuberculosis, brucellosis, spotted fever and syphilis\(^1\).

The incidence of NSI is considerably higher than current estimates, due to gross under-reporting (often less than 50%)\(^2,3\). In USA 6,00,000 to 10,00,000 receive NSI from conventional needles and sharps every year, while in UK it is 1,00,000 HCWs/year\(^4\). In India, authentic data on NSI are scarce. It is known that around 3-6 billion injections are given per year, of which 2/3rd injections are unsafe (62.9%) and the use of glass syringe is constantly associated with higher degree of unsafety\(^5\).

The financial impact of NSI includes both direct and indirect costs\(^6-8\). The average percutaneous transmission rates for hepatitis B (HBV) and C (HCV) are 33.3 (6-33%) and 3.3 per cent (1-10%), respectively, while the seroconversion risk for HIV is 0.31 per cent\(^9\). Although HBV exposures pose the highest risk for infection, it has an effective vaccine and post exposure prophylaxis (PEP) for HCWs which can dramatically reduce the risk. This is not so for HCV and HIV. Therefore, prevention is the only recourse for these.

Preventing NSI is an essential part of any blood borne pathogen prevention programme in the work place. Every healthcare facility should have an infection control programme in place through a working hospital infection control committee. The present study addresses the important issue of NSI and aims at determining the occurrence of NSI among different categories of HCWs, the various factors responsible, the circumstances under which these occur and explores the availability and possibilities of measures to prevent these through improvement in knowledge, attitude and practice. The study also aims at assessing the awareness levels among various categories of HCWs, on issues like NSI policy, segregation of sharps at source and the use and availability of safety devices to prevent NSI.

**Material & Methods**

This study was carried out among the HCWs (both males and females) of a large, 1600 bedded, Vardhman Mahavir Medical College and Safdarjang Hospital, a tertiary care, teaching hospital in New Delhi, India. The study group consisted of various HCWs including senior residents, junior residents, interns, undergraduate medical students, staff and student nurses and staff and student laboratory technicians. The study was carried out over two months from July to September of 2007 with participation from 428 HCWs.

Subjects were fully informed about the design and purpose of the study and a written informed consent was obtained. The study was carried out with the help of an anonymous, self-reporting questionnaire structured specifically to obtain both qualitative and quantitative data to identify predictive factors associated with NSIs. Questions relating to awareness regarding preventive measures like HBV immunization, use of safety devices and course of action in the event of a NSI from an unknown source, were also included.

Case definition of NSI in the present study included injuries caused by sharps such as hypodermic needles, blood collection needles, iv cannulas, suture needles, winged needle iv sets and needles used to connect parts of the iv delivery systems.

The HCWs who gave a history of NSI were directed to seek advice on PEP and infection control measures from the Regional STD Centre, Safdarjang Hospital which has a NSI protocol in place.

Clearance of study protocol was obtained from the institutional ethics committee before the start of the study. Findings were analyzed under different headings to uncover various aspects of NSI. The statistical tools employed were-ratio, proportion pie charts, histograms and other basic methods of data interpretation.

**Results**

A total of 428 HCWs participated in the study, including senior residents 60 (14%), junior residents-24 (6%), interns-75 (17%), undergraduate medical students-75 (18%), staff and student nurses -49 (11%) and 75 (18%) respectively, staff and student laboratory technicians -70 (16%).

Of these, 343 (80.1%) gave a history of NSI in the preceding one year. Nineteen received the NSI outside the healthcare facility. Among the HCWs with NSIs, nurses had the highest percentage 49(100%), followed by junior residents 21(87.5%), nursing students 64(85.3%), laboratory technicians 59(84.3%), interns 62(82.7%), senior residents 48(80%) and undergraduate students 40(53.3%).
Seventy four per cent of HCWs were wearing gloves at the time of NSI, which included senior residents (83.3%), interns (85%), junior residents (62%), undergraduates (59%), staff nurses (71%), student nurses (60%) and laboratory technicians (85%).

The length of the needle in most cases of NSI was medium sized (66.3%), while large (13.7%) and small sized needles (20%) were also implicated. Seventy one per cent of the needles involved were hollow bored, with only 29 per cent being non-bored or curved.

Types of needles included injecting needle (50%), suturing needle (33%), cannula (13%), other types of needles (4%). Procedures performed at the time of NSI included intravenous injections (60%), intramuscular (37%), subcutaneous (2%) and CSF withdrawal (1%). The degree of penetration of the needle in the HCW was subcutaneous (68%), intramuscular (16%), intradermal (13%) or intravenous (3%). The majority of HCWs received the NSI after use but before disposal of the needles (60%) (Fig. 1).

The commonest clinical activity to cause the NSI was blood withdrawal (55%), followed by suturing (20.3%) and vaccination (11.7%). About 13 per cent of the HCWs received the NSI due to patient aggressiveness. Recapping needles was a common cause of NSI (39%) (Fig. 2).

After a NSI, majority of HCWs took action instantly (60%), while 14 per cent took action later on the same day and 26 per cent did not take any action.
The action taken included washing the site with soap and water and/or cleaning the site with appropriate agents like alcohol, dettol or other antiseptic agents, reporting the incident to senior staff and seeking advice on NSI protocol (testing for HIV/HBV/HCV and PEP) from Regional STD Centre. It was noticed that 54 per cent of NSI occurred in second 1/3 rd of the duty period, while 25 per cent occurred in the first 1/3 rd and 21 per cent in the third 1/3 rd of duty period. A large number of HCWs suffered stress after NSI (67%).

A total of 9 HCWs acknowledged receiving NSI from known HIV seropositive patients (3 were senior residents, 2 interns and 4 student nurses). None of them became HIV seropositive over the next three months. Except 3 student nurses, all these HCWs had full course of ART drugs.

The effect of NSI on work efficiency reveals that 48 per cent became more cautious, 48 per cent took better precautions, 1 per cent avoided such procedures, while in 2 per cent the NSI had no effect and 1 per cent of HCWs became more casual. Most of the HCWs were aware of the possibility that NSI could lead to the acquisition of diseases like HIV, hepatitis B and C, but not any other diseases. About 34 per cent said that they had read articles about NSI and thus knew how to avoid them (mainly senior and junior residents).

Sixty two per cent of HCWs confirmed that they would wash the area if needle contaminated with HIV seropositive blood came in contact with skin, whereas 22 per cent said that they would take PEP. When questioned about the steps to be taken after NSI, 14 per cent opted for PEP, while 34 per cent felt that a shot of tetanus toxoid was sufficient, 5 per cent felt that taking analgesics was enough and 45.5 per cent preferred to wash the area with soap and water. A small percentage of HCWs (1.5%) said that they would tie the part with some material. When questioned about the response to bleeding at the site of NSI, 66 per cent said that they had washed the area with soap and water, while 47 per cent applied spirit/alcohol, 19 per cent used band aid, 0.5 per cent said that they expressed the blood from the spot, 21.4 per cent scratched the NSI spot, 4 per cent applied pressure to stop bleeding and 2 per cent left it as it was.

The practice of recapping needles after use was still prevalent among HCWs (66.3%), with 59 per cent using both hands. Some HCWs also revealed that they bent the needles before discarding (11.4%).

When the HCWs were asked about the factors responsible for NSI, 57 per cent felt that they themselves were responsible, 12 per cent held the patient responsible, while 5 per cent complained of employer being responsible and 26 per cent blamed the facility.

The requisites stated by HCWs for reporting of NSIs included-type of exposure-64 per cent, type of device-55 per cent, activity at the time of exposure-32 per cent, type/amount of fluid on the needle-30 per cent, duration of the exposure-23 per cent and HIV status of the source-60 per cent. Only 39 per cent of HCWs knew about PEP to be taken after NSI.

Discussion

The present study addressed certain aspects of NSI in a busy tertiary care government hospital and derived some equivocal and some contrasting results. It was found that 80 per cent of HCWs had experienced NSI at some point in their careers. Among the HCWs, nurses were most prone to NSI, with 100 per cent of them having experienced it in the preceding one year. These figures are nearly twice the figures of Exposure Prevention Information Network (EPInet) data. This may be attributed to patient overload and different work culture in the Indian scenario. Several other studies had also shown high occurrence of NSI among nurses. Apart from nurses the NSIs were more among nursing students, interns and resident doctors. Cervini and Bell, have shown that post-exposure practices for NSI are inadequate among medical students and our findings corroborate this fact. Another study showed that increasing surgical experience lowered NSI rates, and that specific training and passive prevention solutions seem more important than enhanced training and reporting guidelines in preventing NSIs.

Among the HCWs studied, 74 per cent were using gloves at the time of NSI, a figure which fell short of the figures shown by Askarian et al (96.2%) in Iran. Majority of the needles associated with NSI were of medium size, as this was the size most commonly used in patient care. Our study showed 71 per cent of NSI to be associated with hollow bore needles, which is almost the same as shown by Askarian et al (72.2%) and Nee et al (62.2%). According to one study by EPInet in 1999, out of 5000 percutaneous injuries due to sharps, 62 per cent involved hollow bore needles. This association can have an impact on transmission of pathogens, as hollow bore needles are associated with higher fluid content and pathogen load, with a higher risk of disease transmission.

Certain clinical practices such as recapping needles were related more to the likelihood of being injured.
This points to inadequate training of HCWs, or their refusal to follow correct procedures. Other studies have also condemned the practice of recapping needles and offered remedial measures.30-32.

In >50 per cent NSI cases, the HCW was involved in withdrawal of blood, as it is the most common activity involving manipulation of needle in patient. In the EPInet study, 38 per cent NSI occurred during needle use, while 42 per cent occurred after use of needle and before its disposal. The comparative figures in the present study were 34 and 60 per cent, respectively.

About 67 per cent of HCWs suffered stress as a result of the NSI, by their own admission. Other studies showed similar statistics of stress (55% in EPInet study).10

Less than 50 per cent HCWs knew about the availability of PEP services in the hospital. This was higher than the figures in a study by Chacko and Isaac (31.6%)23.

Almost all HCWs were aware that AIDS and hepatitis B and C can spread by NSI, but very few were aware of the large number of other diseases linked to NSI. Thus, increasing staff awareness and educating them on NSI issues is a felt need, as only 34 per cent read textbooks or articles about NSI and only 29 per cent were aware of the average risk of HIV/AIDS from NSI as against 87.8 per cent in a study from Iran.24

Most HCWs in the present study were of the opinion that education, training, better safety devices, decreased patient load per HCW, positive work environment and following standard precautions can help prevent NSI. According to a CDC report, use of safety engineered devices would reduce NSIs by 76 per cent.25 There is much room for improvement in protecting the HCWs from NSI, which can be accomplished through a combination of comprehensive programmes, including stress on institutional behaviour and device related factors that contribute to the occurrence of these injuries, seeking alternatives to use of needles wherever possible, using newer devices with safety features, ensuring adequate training in safe use and disposal of needles, putting in place a culture of accident reporting, especially sharps-related, and following preventive practices like vaccinations for hepatitis B, as also stressed by several others.25-27

Some institutions in India, have a staff student health service facility in place, which maintains records, and registers the incidence of NSI and has protocols for management and follow-up of NSI cases. This is a dire necessity in all large health care facilities with a large turnover of patients and a high rate of NSI.

In conclusion, NSIs were observed in all categories of HCWs. There is a scope for improvement in safety protocols. Preventive strategies have to be devised and reporting of NSI need to be made mandatory. Issues requiring attention include use of safety engineered devices (SED), recording and reporting of incidents, training of all HCWs in handling and disposal of sharps, establishing a staff student health service and inculcating a responsible attitude among HCWs.

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References


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