

NEEDLE STICK INJURY AND INADEQUATE POST EXPOSURE PRACTICES AMONG HEALTH CARE WORKERS OF A TERTIARY CARE CENTRE IN RURAL INDIA

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ABSTRACT

Introduction: Occupational exposure to pathogenic microbes as a result of needles stick injury is associated with significant risk to health care professional's career, health, families and also the patients.

Objective: This study was carried out to find out the incidence of needle stick injury (NSI), probable reasons for getting it and to determine barriers in seeking care after NSI among health care workers (HCWs) of a tertiary care centre in Northern India. It was also planned to assess awareness, acceptability and availability of post exposure prophylaxis (PEP) in the above population.

Method: A cross- sectional study was conducted among HCWs of MM Institute of Medical sciences and Research, Mullana. A total of 300 health care workers were selected for the study by simple random sampling method. A self designed, semi- structured interview schedule was used to collect data from the participants by interview method

Result: 80.5% of HCWs reported having had one or more NSI in their career, maximum among the nursing staff (94.2%). The average number of NSIs was found to be 1.85 per HCW per year (± 2.29 SD). 17.8% of HCWs had a NSI involving a high risk patient. 56.8% of the NSI were from a hollow-bore type of needle. Most of NSIs were while recapping a needle after use (27%) or bending the needle for breaking it before disposal (20%). Majority of the NSI were not

reported to the hospital administration. 72% of the respondents had heard about PEP and less than 10 % of them knew about the availability of PEP services in the hospital

Conclusion: Training of HCWs regarding safety practices needed to avoid NSI should be an indispensable ongoing activity at the hospital . Besides health promotion, there should be setting up of an adequate surveillance mechanism in every large hospital and also of facilities for prompt response and treatment of NSI.

Keywords: Needle stick injury, post exposure prophylaxis, health care worker

Introduction

Most health care workers (HCW) working around patients or biological samples stand the risk of accidental exposure to blood and blood borne pathogens¹. Occupational exposure to pathogenic microbes as a result of needles and other sharps are an important public health concern. Such accidents are associated with a small, but significant risk to health care professional's career, health, families and also the patients².

It has been estimated that 2 million needle stick injuries are reported each year and each needle stick has the potential to be infectious.³ The prevalence of blood-borne viruses such as hepatitis B, C and human immunodeficiency virus (HIV) continue to increase in general community putting their health care takers at risk. There are more than 23 infectious diseases that can be passed on by a needle stick or a sharps injury, but those most frequently discussed are human immunodeficiency virus (HIV) and hepatitis.³ A health care worker has a 0.1%–0.4% chance of contracting HIV through an infected needle.⁴ The likelihood of contracting hepatitis B or C through a contaminated needle is 1.2%–40% per needle stick⁵.

Needle stick injuries (NSI) are wounds caused by sharps such as hypodermic needles, blood collection needles, intra venous cannulas or needles used to connect parts of intra venous delivery systems.⁶ These injuries can occur during a variety of procedures like recapping activity, handling/transferring specimens, collision between HCWs or sharps, during clean-up and passing/handling devices or failure to dispose of the needle in puncture proof containers. It is also related to various factors like type and design of needle.

In India, it is not known exactly how many occupation related injuries occur each year, and as data are scarce, it is not possible to estimate an annual incidence^{3,7,8,9}. Data from the EPI net system suggest that in an average hospital, workers incur approximately 27 needle stick injuries / 100 beds / year.¹⁰ Injuries recorded through standard occupational reporting systems may underestimate the true injury rate, as much as 10-fold.⁷

Tertiary care institutions are the places where patient turnover is normally high. The HCWs have high work load and are more frequently involved in procedures which can lead to NSI. Gross under-reporting of NSI should not lead health care administrators to underestimate the problem. This study is an attempt to determine the prevalence of NSI among different categories of

HCWs, factors responsible for it and responses of the sufferers thereafter. The study also aims at assessing the awareness levels on issues like post exposure prophylaxis, disposal of sharps and the use and availability of safety devices to prevent NSI among various categories of HCWs. This will help in developing site-specific intervention strategies to prevent NSI.

Material and Method

The study was conducted among health care workers working at MM Institute of Medical Sciences and Research, Mullana. It was conducted from June 2010 to August 2010. A cross-sectional study design was adopted. As per the data available with the hospital record department, there were 120 senior doctors (faculty members), 285 junior doctors (post graduate students, medical officers, junior residents and interns), 150 staff nurses and 45 Lab technicians in the institution under study. All the above mentioned health care workers were included in the study.

A self designed, semi- structured interview schedule was used to collect data from the participants. This questionnaire was pretested in the study group and modified accordingly to elicit the desired results. It aimed to record the sex of the respondent, years of clinical training, details of needle stick injuries during the last one year, the HBV vaccination status, needle stick injuries involving a high-risk patient, the perceived causes and circumstances of injury, whether it was reported or not and reasons for not reporting. A high-risk patient was defined as one with a history of infection with HIV, hepatitis B, hepatitis C or injection-drug use. Respondents were also asked about common blood-borne infections, whom to contact in event of a NSI, first aid procedure to be performed to NSI site and post exposure prophylaxis schedule. An enquiry regarding availability of PEP drugs was also done. The current sharp disposal policy of the hospital was also recorded. Data was collected by interview method. Approval of ethical committee of the institution was sought before conducting the study. Proforma was kept anonymous and informed and written consent was taken from the participants. All analyses were performed with the use of SPSS software, version 17.0. Percentages and means were calculated. Chi-square test was used to study association between dependent and independent variables.

Results

A total of 483(80.5%) health care workers reported having had one or more needle stick injury(NSI) in their career, maximum among the nursing staff (94.2%). The average number of NSIs was found to be 1.85 per HCW per year (± 2.29 SD).

Thirty four percent of the respondents received a NSI within the last one year. The incidence was highest(42.63%) in junior doctors followed by lab technicians(32%) and nurses(24%). On univariate analysis using chi-square test the needle stick injury was significantly associated with type of occupation.($p=0.0001$) Among the respondents, 17 (17.8%) reported having ever had a NSI involving a high-risk patient. Such incidents were higher (64%) among the junior doctors (SRs, JRs and interns) followed by nurses(22%) and the lab technicians (9.7%) who are less

likely to be knowing the clinical history of the patient. The incidence was least among senior faculty members.

To find out the possible reasons for NSIs, post event behaviour and to reduce recall bias, only those respondent who gave history of NSI in last one year were further enquired about it. Out of the 204 respondents, 64(31.3%) attributed NSI as having been self-caused, while the remaining 140(68.6%) reported that it was due to carelessness of patient, assistant or co-worker. A majority 116(56.8%) of the NSI were from a hollow-bore type of needle, with solid-bore needle being involved in only 74(36.2%) of incidents of injury. Information was also elicited regarding the timing of the injury. In 44.8% the injury occurred during use of the needle, with the greater part of injuries (48%) occurring after use but before disposal and 6.8% during disposal of the needle. Recapping was observed to be the most frequent procedure involving NSI.(Table 1) Index finger was the commonest (68%) site of injury followed by thumb (21%), palm (7%) and hand (4%).

HCWs were also enquired about the perceived cause of their recent needle stick injury. Seventeen percent ascribed fatigue as a cause of their injury. 28(13.7%) of those who suffered cited lack of assistance as their reason for getting the needle stick injury. 9.8% accepted that they lacked the skills required for performing *the activity*. 46(22.5%) considered the NSI due to being rushed. (table2)

Twenty four (11.7%) out of 204 health care workers who sustained needle stick injury did report the NSI to hospital administration, 166(81.3.3%) respondents did not report the same. Various reasons were cited by respondents for not reporting NSI to the concerned authority. Lack of time, low incidence of HIV/Hep B/Hep C in the patient group, did not know where to report, fear of positive result affecting the career, no utility in reporting and fear of being considered unskilled were cited as reasons for not reporting needle stick injury.(Table 3)

Seventy four per cent of HCWs were wearing gloves at the time of NSI, which included senior doctors (83.3%), interns (45%), junior residents (42%), staff nurses (71%), student nurses (60%) and laboratory technicians(62%). Regarding practices that the HCW thought should be performed after sustaining the NSI, 580(96.67%) respondents were of the opinion that washing the wound immediately with soap and water should be performed. 464(77.33%) preferred to use antiseptics while 424(70.67%) considered use of alcohol/chlorine/caustic agents after sustaining the NSI. 206(34.3%) considered replacing gloves as an option while 164 stated that there is no harm in putting the pricked finger into the mouth after sustaining NSI. Only 4 out of 204 HCWs got their blood tested immediately after the injury. They got themselves investigated for hepatitis surface antigen.

A total of 259(43.1%) respondents out of 600 were completely (three doses) immunized against Hep B and the rest 57% were either partially immunized or not immunized against this disease. The rate of immunization was 20% among those who got the needle stick injury and 43% among those without history of NSIs. Thus hepatitis B immunization was significantly ($p=0.0004$) lower in health care workers with history of NSIs.

Twenty three percent of participants thought that PEP is needed by all those who had had NSI whereas 56% were not sure about who should be given PEP. Total duration of 28 days for PEP was correctly known to 23% of study subjects. After exposure testing should be done

immediately, at three months and six months was known to 2% of the health care workers. Post exposure prophylaxis is available in their hospital was known to 10% of the study participants. That PEP can also be given for hepatitis B was known to 22% of the study participants only.

Sharp disposal policy of the hospital was also studied. It was found that needle destroyer was available in 80 % of the wards and outdoor clinics for disposal of waste at the point of generation but 30% of those were out of order. 68% of the workers reported that they have never attended reorientation and motivational trainings on universal work precautions after joining the institute. 57% of the interns did not know about safe disposal of sharps. 86% reported that disposable syringes were being used almost everywhere in the hospital and for vaccination auto disable syringes were also available. On enquiry from administration the researchers found that there was a hospital infection control committee too. Though, only 12% of the health care workers were aware about existence of such a committee in the institution.

Discussion

With the HIV epidemic, occupational exposures to HIV infection is a cause of concern to all health care workers especially those in hospitals. The present study addressed certain aspects of needle stick injury in a tertiary care hospital attached to a rural medical college in North India. It was found that 80.5 % of HCWs had experienced NSI at some point in their careers. Among the HCWs, nurses were most prone to NSI with 94.2% per cent of them having experienced it in their professional career. These figures are nearly twice the figures of Exposure Prevention Information Network (EPI net) data.¹¹ 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 nurses¹².

Other authors too have consistently found that a very high proportion of HCWs have received NSIs while performing their work, both in India and internationally^{3,8,9,13}. A large multinational study by WHO on global burden of sharps injury estimated the average number of injuries per HCW to be 0.2-4.7 sharps injuries per year.¹⁴ In our study, the average number of NSIs ever for a HCW was 1.85 per HCWs per year.

It was observed that over last one year the incidence of needle stick was highest among junior doctors including interns and post graduates. Muralidhar et al and Cervini and Bell had also made similar observations^{9,15}.

Among the HCWs studied, 17% of them reported having a NSI from a high risk patient. Makary et al¹³ conducted a study on surgeons in training and observed that the incidence of NSI from high risk group was as high as 45% among final year post graduates. 66% of the respondents attribute their NSI to mistake or carelessness of patient, assistant or co-worker.

In the present study 56.8%% of the injuries among study subjects were from a hollow bore needle, which is same as a study by EPI net in 1999.¹⁶ It was seen that out of 5000 percutaneous injuries due to sharps, 62 % involved hollow bore needles. Muralidhar et al (71%)⁹ and Sharma et al (70%)¹³ have reported a higher number of incidence by hollow bore needle. 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. Similar to finding of other authors^{9,15} majority of the needles associated with NSI were of medium size, as this was the size most commonly used in patient care.

We observed that the greater part of injuries (48%) occurred after use but before disposal of the needles. In the EPInet¹⁰ study too, 38 per cent NSI occurred during needle use, while 42 per cent occurred after use of needle and before its disposal. Muralidhar et al⁹ observed that 60% of NSIs were during post needle use but prior to disposal stage. This stage is the most potential stage for transmitting infection from patients to health care workers. These findings point to inadequate training of HCWs regarding safety measures to be practiced while handling sharps or refusal to follow correct procedures despite having knowledge. The training programs on methods of dealing with needles and sharps, usually jump directly from precautions during use to safety during discarding the needle. During safety training programs, it should be emphasized that there is need to observe utmost care and caution during the in-between period also.

Understanding the epidemiology of NSIs in the target population is critical in implementing control measures. This study allowed identification of the major activities leading to these injuries. In the present study most of the events of NSI occurred while recapping a needle (28.4%) after use or bending the needle for breaking it before disposal (19.6%). Several studies have shown recapping to be an important cause of NSI.^{9,17,18} The recapping of needles has been prohibited under the Occupation Safety and Health Administration (OSHA) blood-borne pathogen standard.⁷ In the present survey, 66% of the workers were aware of the universal precaution guidelines, similar observation was also made by Alam et al¹⁹ (61%).

The circumstances leading to NSIs depend partly on the type and design of the device and certain work practices. Wearing gloves is known to be an important line of defense but a fewer (34%) number of HCWs were wearing gloves at the time of NSI, a figure which is much lower than what has been reported by other researchers¹⁸.

Fatigue due to long working hours was the commonest reason cited by respondents for getting NSI. Similar observations were also made by Norsayani¹⁵ and Sharma et al¹³. Long working hours have been found to be an important risk factor for NSI.²⁰ The health care environment in a tertiary care hospital is a hectic and stressful one and long duty hours are common. It must be ensured that people putting in long hours continuously get short breaks in between to refresh themselves up.

Majority of the HCWs who suffered NSI did not report to the hospital administration. The commonest reason cited for this was fear of being considered unskilled followed by not knowing where to report and lack of time. Another author has also reported that 90% never reported because they were not aware of the importance of post-exposure prophylaxis.¹⁴

The risks of underreporting and thus delaying or forgoing treatment are significant. Reporting the injury to an employee health service enables counseling regarding the risk of exposure and prevention of secondary transmission including possible transmission to patients and may alleviate associated anxiety.²¹ It also allows medical evaluation including testing and, if warranted, antiretroviral therapy or administration of the HBV vaccine containing hepatitis B immunoglobulin.

72% of the respondents had heard about PEP and less than 10 per cent of them knew about the availability of PEP services in the hospital. This was much lower than the figures reported by other researchers.²²

The rate of hepatitis B immunization was low in the group which got the needle stick injury. This needs attention since the risk of transmission of infection can multiply and the number of sufferers will be high if action is not taken in time.

In the present study, 79% were aware of the fact that hepatitis B can be transmitted by needle-stick injury, but over 84% were not aware that hepatitis C also be transmitted by this. Almost all (94.6%), HCWs were aware that AIDS 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.

By and large hospital waste management rules were being followed in the hospital but sharp disposal policy was not up to the mark. 30% of needle destroyers were out of order and reorientation trainings of the HCWs were not being held regularly. The good practice that is worth mentioning and has a definite role in reduction of blood borne infection is the use of disposable and auto disable syringes for injections. There is a hospital infection control committee too but it needs to be more responsive and actively working towards welfare of the hospital staff.

LIMITATIONS: Since all informations were self-reported, misclassification is possible, though the anonymous nature of the survey would be expected to facilitate an accurate reporting. NSIs are the most common type of exposure but other percutaneous and splash exposures represent additional hazards to the HCWs. We did not collect data on these exposures. Another limitation of this study was the recall bias whereby the HCWs might not remember exactly the number of NSIs they had had in past one year.

Conclusion

Needle stick injuries were observed in all categories of HCWs. This survey revealed that knowledge of HCWs about the risks associated with NSIs and use of preventive measures was inadequate. Seeking alternatives to use of needles wherever possible, using newer devices with safety features, ensuring adequate and continuous education and training in safe use and disposal of needles can reduce the incidence to a great extent. To reduce the burden of occupationally acquired infections in HCWs, an adequate NSI surveillance mechanism must be developed in the hospital and preventive practices like vaccinations for hepatitis B, institution of appropriate PEP, psychological support and counselling of affected HCWs and stringent follow-up must be ensured.

Conflict of Interest: None declared. (Or mention here if any)

References

1. Elmiyeh B, Whitaker IS, James MJ, Chahal CA, Galea A, Alshafi K. Needle-stick injuries in the National Health Service: a culture of silence. *J R Soc Med*. 2004; 97:326–7.
2. Wig N. HIV : awareness of management of occupational exposure in health care workers. *Indian J Med Sci* 2003; 57:192-8.
3. Calver J. Occupational Health Services. *Am J Infect Control* 1997; 25:363-5.
4. Jayanth ST, Kirupakaran H, Brahmadathan KN, Gnanaraj L, Kang G. Needle stick injuries in a Tertiary Care Hospital. *Indian Journal of Medical microbiology*. 2009; 27:44-47.
5. Arnold B. Needle stick and other safety issues. *Anesthesiology Clin N Am* 2004; 22: 493-508.
6. National Institute for Occupational Safety and Health (NIOSH) Alert: Preventing needlestick injuries in healthcare settings. Washington DC: NIOSH 1999.
7. Elder A, Paterson C. Sharps injuries in UK health care: A review of injury rates, viral transmission and potential efficacy of safety devices. *Occup Med (Lond)* 2006; 56:566-74.
8. Rele M, Mathur M, Turbadkar D. Risk of needle stick injuries in health care workers – a report. *Indian Journal of Medical Microbiology* 2002; 20 (4):206-207.
9. Muralidhar S, Singh KP, Jain R.K, Malhotra M, Bala M. Needle stick injuries among health care workers in a tertiary care hospital of India. *Indian journal of Medical Res* 2010; 131:405-410.
10. Pery J, Parker G, Jagger J. EPINET report: 2003 percutaneous injury rates. *Adv Exposure Prev* 2005; 7: 2-45.
11. International Health Care Workers Safety Center. Exposure prevention information network (EPI net) Data reports; Charlottesville: University of Virginia; 1999.
12. Pruss-Ustun A, Rapiti E, Hutin Y. Sharps injuries: Global burden of disease from sharps injuries to health-care workers. Geneva, World Health Organization, 2003 (WHO Environmental Burden of Disease Series, No. 3).
13. Sharma R, Rasania SK, Verma A, Singh S. Study of Prevalence and response to Needle Stick Injuries among health Care workers in a tertiary care hospital in Delhi, India. *Indian J Community Med* 2010; 35:74-7.
14. Cervini P, Bell C. Brief report: Needlestick injuries and inadequate post exposure practice in medical students. *J Gen Intern Med* 2005; 20: 419-21.
15. Norsayani MY, Hassim IN. Study on incidence of needle stick injury and factors associated with this problem among medical students. *J Occup Health* 2003; 45:172-178.
16. Makary MA, Attar AA, Holzmüller GC, Sexton BJ, Syin D, Gilson MM, Sulkowski SM, Pronovost JP. Needle Stick injuries among Surgeons in Training. *N Engl J Med* 2007; 356:2693-9.
17. Chia H P, Koh D, Chong R, Jeyaratnam J. A Study of Needle Stick Injuries Among House Officers in a Major Institute. *Singapore Med Journal* 1994; 35:41-43.
18. Ilhan MN, Durukan E, Aras E, Türkçüoğlu S, Aygün R. Long working hours increase the risk of sharp and needlestick injury in nurses: The need for new policy implication. *J Adv Nurs* 2006; 56:563-8.

19. Alam M. Study on Knowledge Attitude & Practices among Health Care workers On Needle Stick Injuries. *Annals of Saudi Medicine* 2002; 22:5-6.
20. Ruben FL, Norden CW, Rockwell K, Hruska. Epidemiology of accidental needle puncture wounds in hospital workers. *Am J Ed Sci* 1983; 286:26-30.
21. Cardo DM, Culver DH, Ciesielski CA, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. *N Engl J Med* 1997; 337:1485-90.
22. Bairy KL, Ganaraja B, Indira B, Thiyagar N, Choo CM, See CK. [Awareness of post-exposure prophylaxis guidelines against occupational exposure to HIV in Hospital Sungai Petani.](#) *Med J Malaysia*. 2005 Mar;60(1):10-4.

Table 1: Table 1: Procedures in different stages of needle use involving needle stick injuries

S no.	Stages and Procedures	Frequency	%
During use of needle			
1	Passing a needle	12	5.8
2	Administrating injection	14	6.8
3	Drawing blood	14	6.8
4	Cleaning a needle with a swab	10	4.9
5	Suturing	20	9.8
6	Doing a specific procedure	22	10.7
After use but before disposal			
7	Recapping a Needle	58	28.4
8	Bending or breaking by hand before disposal	40	19.6
During disposal			
9	Handling trash and dirty linen	10	4.9
10	Others	4	1.9
	Total	204	100

Table 2: Reasons cited by respondents for getting needle stick injury

S no.	Reasons	Frequency	%
1	Lack of assistance	28	13.7
2	Lack of skill required	20	9.8
3	Fatigue	35	17.1
4	Due to being rushed	46	22.5
5	Negligence	24	11.7
6	Non cooperation from patient	27	13.2
7.	Other	24	11.7
	Total	204	

Table 3: Reasons cited by participants for not reporting needle stick injury

S no.	Reasons	Frequency	%
1	No spare time	30	14.73
2	Low incidence of HIV/HepB/Hep C in the patient group	16	7.82
3	Not knowing where to report	40	19.6
4	Not knowing how to report	24	11.7
5	Fear of positive result affecting the career	4	1.96
6	No utility in reporting it	28	13.7
7	Fear of being considered unskilled	52	25.4
8	Other	10	4.96
	Total	204	