

INCIDENCE OF NEEDLE STICK INJURIES AMONG HEALTH CARE PERSONNEL IN A TEACHING HOSPITAL IN CENTRAL KERALA

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Received : 29/04/2024
Received in revised form : 17/06/2024
Accepted : 02/07/2024

Keywords: NSI in HCP

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DOI: 10.47009/jamp.2024.6.4.2

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (4); 5-11



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Abstract

Background: Needle stick injuries (NSI) is a major safety challenge in the healthcare system worldwide. More than 30 different pathogens have caused documented infection following exposure to blood or body fluids in health care personnel (HCP). The most important of these infective agents are hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). This study aimed to estimate incidence of NSI in a medical college hospital over a span of one year, the circumstances of Needle stick injury (NSI), knowledge of preventive measures of NSI and post exposure prophylaxis (PEP). **Materials and Methods:** We did a cross-sectional study on the incidence of needle stick injuries in HCP over one year between April 2022- April 2023. All strata of HCP who had sustained an accidental NSI were included in the study. **Result:** A total of 139 Healthcare Personnel had reported Needle stick injury. Majority of those inflicted were between 20-29 age group. 76% of NSI's were inflicted on female HCP. The commonest procedure attributing to NSI was injections, 75.5%. 92.2% was due to use of hollow needles, used for injections. 120 out of 139 pts suffered only superficial injury where there was only a minimal prick with or without minimal bleeding. 85.6% of NSI happened during a medical procedure. Out of the HCP who sustained NSI, 39.6% were nurses. 131 of HCP were wearing gloves at the time of NSI. 138 out of 139 HCP carried out first aid as per Standard operative procedure (SOP). At source identification, out of 139 NSIs, 123 were negative for HBV, HCV & HIV. 5 were positive for HIV, 1 was HCV positive, 3 were HBs Ag positive, 1 was positive for HBV & HCV, 1 was positive for all three and 5 were of unknown status. In the serology testing of the exposed HCP, 138 were negative for all 3 viruses, and one was HBsAg positive. 129 HCP out of 139 were vaccinated for Hepatitis B. 8 out of 139 pts were started on ART. 135 of the HCP had good knowledge of the risks from NSI, 95.7% had an appropriate attitude & 96.4% maintained good practise. **Conclusion:** Conducting orientation programmes for the newly inducted HCP, regular awareness sessions and hands on training when dealing with sharps, can make NSIs largely preventable. Occupational infection risk can nearly be targeted to zero for HIV & HBV & with timely assessment of a NSI & prompt initiation of PEP if warranted. In the case of HCV virus infection, vaccinations are not available as yet, however transmission risk is comparatively less and curative treatment is available.

INTRODUCTION

Needle stick injuries (NSI) in Health Care Personnel (HCP) remain an area of grave concern. It is a major safety challenge in the healthcare system worldwide.^[1]

More than 30 different pathogens have caused documented infection following exposure to blood or body fluids in HCP.^[2] The most important of these infective agents are hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).^[1]

Occupational exposure to blood and other infectious material poses a serious risk hazard with psychological consequences for HCP. Other potentially infectious material includes body fluids such as: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, amniotic fluid, that is visibly contaminated with blood.^[3] The main route of occupational exposure is through percutaneous needle stick injury and to a lesser extent, mucus membrane exposure.

Global statistics reveal more than 2 million sharp injuries annually among 35 million HCP.^[4,5] WHO statistics show that NSI cause 16000, 66000 and 1000 cases of HCV, HBV & HIV per year respectively.^[5] The risk of contracting the infection from this blood borne pathogens are affected by the vaccination rates, Personal protection equipment (PPE), Post exposure prophylaxis and compliance with Infection control standards.^[6]

The incidence of NSI's is higher in the developing world but unfortunately it is under reported. Approximately around 75% of the NSIs in developing countries are not reported.^[7] The prevalence and frequency of NSI in India ranged from 61 % to 79.5% and 2.3 to 4.5 per HCW per year respectively. The incidence density was 228.57 per 100 person days. 79.5% to 90.5% HCWs reported having at least one NSI in their career.^[8] Data from Exposure Prevention Network (EPINet) revealed that, the rates of sharp object injuries were greater in teaching hospitals (34.4 per 100 ADC) compared with nonteaching hospitals (18.4 per 100 ADC .ADC is Average Daily Census).^[9]

The main concern of underreporting of NSI is that the HCW's who are exposed cannot be given appropriate postexposure prophylaxis (PEP) to prevent the development of infection. PEP for HIV is shown to be more than 80% effective in preventing the development of the infection.^[10]

NSIs are very common and in many instances unavoidable among healthcare providers when they are delivering patient care.^[11] However it goes without saying that NSI's are one of the most preventable occupational hazards in health care.^[12] Knowledge and implementation about best practice should be adhered to avoid NSI. Published evidence recommend that contaminated needles should not be recapped, but studies from developed countries showed that recapping of needles is occurs frequently among the healthcare workers.^[13,14]

The Ministry of Health and Family Welfare of the Government of India recommends that the healthcare providers of each institution must be made aware of the safety protocols, Standard operative procedures (SOP), practises to avoid NSI and immediate action to be taken if there is an NSI. Adequate training to the healthcare workers to handle sharp objects is equally vital.^[15]

Education to raise awareness among health workers, training them on universal safety precautions, safe injection practices, sharp waste disposal, and provision of engineered safety devices have been

reported to reduce such incidents by 62% in a meta-analysis study.^[16]

Aim: To study the incidence of NSI amongst hospital clinical staff over a span of one year, circumstances and knowledge of preventive measures of NSI and post exposure measures.

Objectives:

Primary Objective: To determine the proportion and profile of needle stick injuries (NSI) in Government Medical College Hospital, Ernakulam.

Secondary Objective:

1. To identify the associated factors of needle stick injuries
2. To assess the knowledge, attitude and practice of Health care workers who present with needle stick injuries.
3. To determine the proportion of those who are started on post exposure prophylaxis.

MATERIALS AND METHODS

Study period and duration: One year study; April 2022- April 2023

Study Area: Casualty of the Medical College Hospital, Ernakulam

Study Design: Descriptive Prospective Cross-Sectional study

Study population: The hospital has a Health care worker strength of around 1050, which includes staff nurses, head nurses, nursing interns, nursing assistants, attenders, cleaning staff, nursing students, house surgeons, lab technicians, DMLT students, clinical doctors, forensic; who are at risk of NSI. Amongst these, those HCW's who report to casualty with needle stick injury between April 2022- April 2023 was enrolled in the study.

Inclusion criteria

All HCP who sustained NSI's and reported to our hospital casualty.

Exclusion criteria

- Body fluid splash was not included in the study.
- NSI with a sterile needle or sharp.

Data collection:

The Institutional Ethics committee and Institutional Review board approved the study. Informed consent from each self-reported HCP was taken. A structured questionnaire was developed by the investigators. Questionnaire consisted of 23 variables. The first part dealt with the demographics of the HCP. The second part dealt with the clinical setting, site of the NSI and depth of injury. The third part dealt with the post exposure measures, vaccination and post exposure prophylaxis. The fourth part dealt with the knowledge, attitude and practise to NSI. The technique for data collection was self-reporting.

Statistical analysis:

Data was entered in Microsoft Excel 365 Software and analysed using R software version 4.2.0. Age was summarised as mean and standard deviation and categorised to 10-year bands. Categorical variables were summarised as frequency and proportions.

RESULTS

A total of 139 Healthcare Personnel had reported Needle stick injury between April 2022 to April 2023.

Age: The study involved patients between 19 years and 69 years of age. Majority of the NSIs were on the age group between 20-29 age group; 100 HCP. The mean (SD) age of the participants was 25.5 (7.0) years.

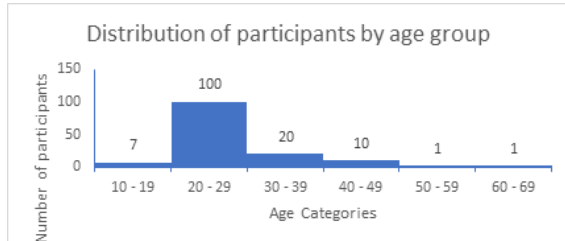


Figure 1 Distribution of participants by age group (N = 139)

Gender: Most of the NSI were sustained by female HCP (76%). Our hospital has a significant proportion of female HCP.

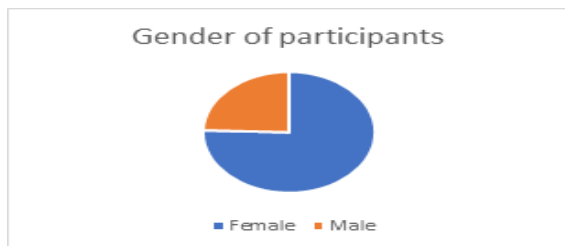


Figure 2 Sex of participants (N =139)

Time of exposure: The peak time of exposure was between 12 PM & 1 PM. Most procedures are carried out during this time.

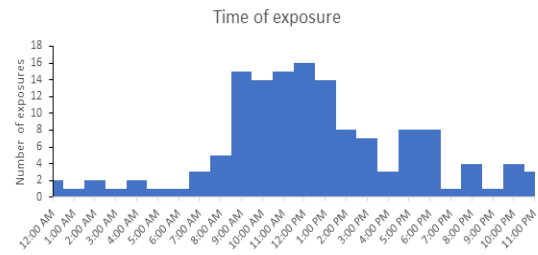


Figure 3 Distribution of time of exposure (N = 139)

Most exposures happened between 7:00 am to 6:00 pm.

Place of exposure: 38.1% occurred in the wards mainly, medical foremost followed by surgical & obstetric ward. This was followed by casualty.

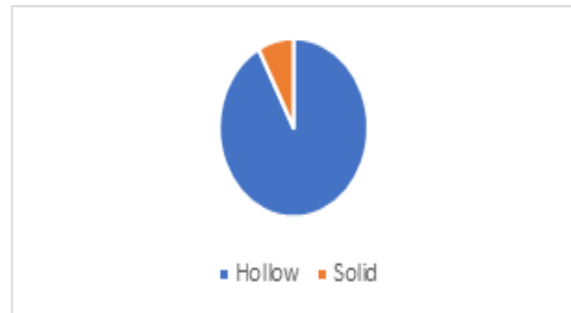


Figure 4 Type of needle among those who were exposed from a needle (N =115)

Most needle exposures were associated with a hollow needle (106 of 115, 92.2%).

Table 1: Place of exposure of staff.

Place of exposure	n	%
Ward	53	38.1
Casualty	29	20.9
Medical OP	26	18.7
ICU	14	10.1
OT	7	5.0
Lab	7	5.0
Labour room	3	2.2
Total	139	100

Procedures: The commonest procedure contributing to NSI was injections, 75.5%.

Table 2: Procedure while exposure happened

Procedure	n	%
Injections	105	75.5
Splash	11	7.9
Blade injury	9	6.5
Suturing	9	6.5
Patient scratching	2	1.4
Disposal of iv needle	1	0.7
Shaving blade	1	0.7
Splinter piercing	1	0.7
Total	139	100

Most exposures (105 of 139, 75.5%) happened while an injection was administered.

Site of exposure: Most exposures (123 of 139, 89.8%) happened in the upper limb of the staff.

Table 3: Site of exposure

Site	N	%
Upper limb	123	89.8
Face	10	7.3
Lower limb	4	2.9
Total	139	100

Type of needle: 92.2% was due to use of hollow needles, used for injections.

Grade of injury: 120 out of 130 patients suffered only superficial injury where there was only a minimal prick with or without minimal bleeding. 2 sustained severe injury with a blade.

Table 4: Grade of exposure

Grade	N	%
Superficial stab	120	86.3
Mild	1	0.7
Moderate	16	11.5
Severe	2	1.4
Total	139	100

Most exposures were of superficial stab type (120 of 139, 86.3%).

Use of gloves/ PPE: 131 of 139, (94.2%) of HCP were wearing gloves at the time of NSI.

Table 5: Use of PPE

PPE	N	%
No PPE	7	5.0
Gloves	131	94.2
Full PPE	1	0.7
Total	139	100

First Aid: 138 out of 139 HCP carried out first aid as per Standard Operative Procedure

Status of source: Out of 139 NSIs, 123 were negative for HBV, HCV & HIV. 5 were positive for HIV, 1 was HCV positive, 3 were HBs Ag positive, 1 was positive for HBV & HCV, 1 was positive for all three and 5 were of unknown status.

Table 6 Status of source

Status of source	N	%
Negative	123	88.5
HIV +	5	3.6
HCV +	1	0.7
HBsAg +	3	2.2
HBsAg +, HCV +	1	0.7
HIV +, HBsAg +, HCV +	1	0.7
Unknown	5	3.6
Total	139	100

Out of 139 NSI exposures, 123 patients had a negative status (88.5%), 5 were positive for HIV, 3 for HBV, 1 for HCV alone, 1 patient was positive for all 3 viruses & 1 patient for HBV, HCV & 3 NSI were from unknown source

Status of exposed prior to exposure: 138 were negative and one was HBsAg positive

Table 7: Status of exposed staff

Status of exposed staff	N	%
Negative	138	99.3
HBsAg +	1	0.7
Total	139	100

Table 8 Category of staff

Category of staff	n	%
House Surgeon	49	6.5
Doctor	9	35.2
Nursing staff	55	39.6
Lab staff	12	8.6
Sanitary worker	14	10.1
Total	139	100



Figure 5 Handwashing after exposure (N = 139)

Vaccination status: 129 out of 139 were vaccinated for Hepatitis B
Among the staff who were exposed, only one of 139 (0.7%) was HBsAg +ve.

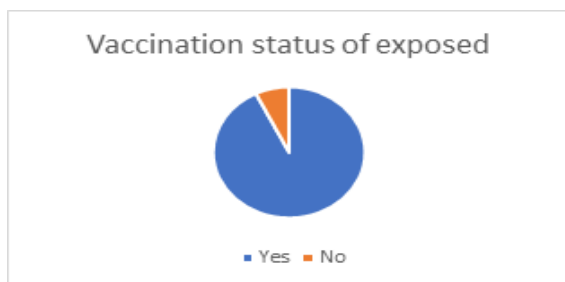


Figure 6 Vaccination status of exposed (N = 139)

Among the exposed staff, most (129 of 139, 92.8%) were vaccinated against Hepatitis B virus and 10 HCP were not vaccinated. The unvaccinated were contract staff who had joined work recently. They were started on the vaccine series following the NSI.
Post Exposure Prophylaxis: 8 out of 139 pts were started on ART. That is all those who were exposed to HIV positive patients and 3 of those whose exposure was from an unknown source.

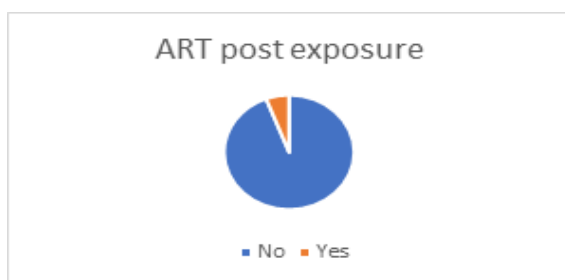


Figure 7 ART post exposure (N = 139)

Among the exposed staff, 8 (5.8%) received Anti-retroviral therapy.

Counselling: All of them were counselled prior to starting ART.



Figure 8 Counselling post-exposure (N = 139)

Knowledge, Attitude, Practice: 97.1% of the exposed HCP had good knowledge of the risks from NSI, 95.7% had an appropriate attitude & 96.4% maintained good practise.



Figure 9 Knowledge attitude and practice of the participants (N = 139)

Timing of exposure with respect to procedure: 85.6% of NSI happened during the procedure



Figure 10 Time of exposure with respect to procedure (N = 139)

Most exposures (119 of 139, 85.6%) happened during the procedure.

Category of staff: Significant NSI's were reported by doctors in training which included House surgeons, Postgraduates and Senior residents (58 of 139, 41.7%). Amongst nursing staff (55 of 139, 39.6%), majority were nursing interns. 14 of the exposed staff were hospital waste disposal staff who were not involved in direct patient care.

DISCUSSION

Health care providers are a big community with a multitier system where multitasking due to staff shortages and time constrained workloads are a routine.

In this hard-pressed environment, different strata of HCP are working with sharps of varied sizes and forms, as a consequence of which accidents bound to happen. Awareness of risks of infection during these mishaps & the imperative need to practise caution must be emphasised.

In our tertiary hospital with more than thousand HCP, we did a cross-sectional study on the incidence of

needle stick injuries in HCP over a time frame of one year between April 2022- April 2023. All strata of HCP who had a NSI were included in the study.

Time of injury and time of reporting the NSI was used to assess knowledge of NSI. Awareness of the reporting framework, use of PPE, universal precautions & care after NSI were used to assess attitude & practise in NSI.

Fortunate to say, majority of cases of NSI did not sustain major injury or significant exposure. PEP was offered to all who sustained NSI from virus positive source or in those whose source was unknown.

Our study showed that student nurses and House surgeons sustained most NSI either due to lack of expertise, period of their medical progress and erring at caution. This is comparable to the study done by Bouya et al on the global prevalence of NSI.^[1] Despite this, all HCP attended the casualty, checked the status of the source, and the exposed and sought proper medical advice.

The first step in planning, to prevent NSI's is to determine its precise prevalence rate, which is difficult due to a range of factors including lack of national surveillance systems, and suspected frequency of NSI under reporting seen in many countries including India, China, Saudi Arabia and on a global level. Despite the importance of this issue, and despite individual studies, there are currently no accurate statistics on the global prevalence of NSIs among HCWs, especially in developing and less developed countries.^[1]

Our Hospital Infection Prevention and Control (HIPCC) Committee conducts an active PEP programme with an integrated approach to prevention, including awareness raising, training, use of protective equipment such as gloves, banning of recapping, sharps containers, coloured-coded waste bins, vaccination as well as round-the-clock sharps and splashes reporting and blood testing facility based on the guidelines of the National AIDS Control Organization of India NACO.^[17]

Regular classes as a part of study curriculum are conducted separately for each group of HCW's via didactic/interactive lectures, audio-visual aids and hands-on practice, especially amongst newly inducted staff at least once a year in the form of induction training and orientation programme being conducted to all internees every year. The standard tests as prescribed in the NACO guidelines for each occupational exposure are followed.

Hospital infection control nurses, clinical microbiology faculty, residents and trained technical staff are actively involved in follow-up and counselling of each exposed HCP in our PEP programme. After obtaining informed written consent, details regarding blood sample collection of HCWs and of source were collected for HIV, HCV and HBV viral markers. Screening for HIV 1 and 2 was done as per NACO guidelines.

139 HCW reported from different levels of health care with NSI over 1 year. All the NSIs reported to the concerned supervisor. All of them got screened &

their follow up after 3-month period confirmed negative for contracting infection. Compared to other studies, nationally, our HCW reported NSI, did first aid & sought assessment for need to take PEP. Knowledge, Attitude and Practice was fairly good amongst the HCP

Despite caution against recapping of needles, some still tend to do it by force of habit.^[7] Common devices were needles. Safety protocols to avoid NSI, immediate steps for care of NSI should be in place in all hospitals.^[18]

CONCLUSION

Needlestick injuries can be avoided by

- Conducting regular training programmes for HCP, especially amongst newly inducted staff at least once a year
- Ensuring all staff are trained on correct needle disposal.
- Regular review of prevalence of NSIs in the institution may ensure NSI incidence reduction, safe work environment, and maintained provision and supervision of post exposure prophylaxis for HCPs.

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