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Prevalence And Factors Associated With Needle Stick Injuries Among Health Care Providers Of A Tertiary Care Teaching Hospital In South India.

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Abstract:
Background: Needle stick injury (NSI) is a type of preventable occupational hazard. Accidental NSI among Health Care Workers (HCW) can result in transmission of serious life threatening infections caused by blood borne viruses (BBV) such as Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) & Human Immunodeficiency Virus (HIV) and other infections.
Objective: To estimate the prevalence of NSI and to study the various factors associated with NSI, among different categories of Health Care Workers (HCW). To identify the lacunae and to implement the preventive measures.
Materials and Methods: A retrospective, cross-sectional, study on prevalence and factors associated with Needle stick Injuries among Health care Providers of a Tertiary care teaching Hospital in South India. Analysis of data, from the documented NSI reporting forms, over a period of one year from June 2021-May 22.
The Statistical tool of ratio and proportion was employed.
The study protocol was approved by The Institutional Ethics Committee.
Result: A total of 19 cases of NSI were reported among 558 HCWs, over a period of one year. Prevalence rate per annum was 3.40%. Per month prevalence rate was 1.58%.Majority of NSI had incurred among doctors 7(36.8%), followed by nursing staffs 4(21.05%). Most of NSIs were from emergency department 04(21.05%), obstetrics & gynecology (OBG) 04 (21.05%). The most common patient care activity resulting to NSI was, during the act of using the device 5(26.3%). A large number of NSI were incurred by hollow-bored needles (78.9%). More than 50% of HCWs had washed, the site of injury with soap and water 12(63.1%). During the occurrence of NSI, 8(42.1%) had used gloves. Among the identified source patients, 3(20%) were HIV reactive and 2(13.3%) were HBs Ag reactive. Among the 19 documented NSI cases, vaccination status of HCWs against HBV were, 12(63.1%) completely vaccinated, 4(21%) partially vaccinated and 3(15.8%) not vaccinated. Zero sero-conversion was observed at the end of six months of follow-up.
Conclusion: Frequent educational and training sessions, in small groups. Promotion of vaccination campaign, to improve upon vaccination among all HCWs. Motivate to seek PEP through early reporting.
Key words: *Needle Stick Injury (NSI), Prevalence, Health Care Worker.*

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I. Introduction:

Needle stick injury (NSI) is a type of preventable occupational hazard1, 2. Accidental NSI among Health Care Workers (HCW) can result in transmission of serious life threatening infections caused by blood borne viruses (BBV) such as Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) & Human Immunodeficiency Virus (HIV) and other infectious diseases3. Post needle stick injuries there are chances of transmission of BBVs such as HBV (3%–10%), HCV (3%) & HIV is about 0.3%1, 4. According to a study conducted by WHO, per annum prevalence of NSI was 4 in Asian and Africa countries2, 4.

NSI is an important parameter indicating Infection prevention and control (IPC) measures adhered within Laboratories & Hospitals, in National Accreditation Board for testing and calibration Laboratories (NABL) and Hospital Infection Control Prevention (HIC) program in National Accreditation Board for Hospitals (NABH).

This study is conducted to estimate the prevalence and to study the various contributing factors of NSI, among different categories of Health Care Workers (HCW).

II. Materials and Methods:

A cross-sectional, retrospective study on prevalence and factors associated with Needle stick Injuries among Health care Providers of a Tertiary care teaching Hospital in South India. Analysis of data was done from the documented NSI forms, from healthcare workers, over a period of one year from June 2021-May 22.

For NABH, classes on needle stick injuries were conducted by HIC team, to all categories of health care providers. A NSI reporting form was used as a tool for collection of data1, 5. NSI form is a questionnaire, consisting of open ended, semi-open ended and multiple choice types. NSI forms were provided to health care workers who had sustained injuries from needles, sharps and splash injuries. Forms were also filled by infection control nurse (ICN), when the injuries were reported over the phone or when injuries were among hospital attenders and housekeeping staffs. Post exposure follow ups were done, according to NACO guidelines1.

III. Result:

Nineteen health care providers had reported NSI, among 558 HCWs, over a period of one year. Prevalence rate of NSI, in our tertiary care teaching institute was 3.40% per annum. Socio-demographic characteristic such as age, sex, profession and department and other factors associated with NSI were analyzed.

Different age groups of HCWs sustained NSIs were 12(63%) in 21-30 years of age, 3(15.7%) in 31-40,2(10.5%) in 41-50,2(10.5%), 2(10.5%) in 51-60. As shown in the table 1.More of Females 13(68.4%) had suffered NSI than Male 6(31.6%) HCWs. Male is to female sex ratio was 1:2.2.

Various categories of profession experienced NSI were Doctors 7(36.8%), Nursing staffs 4(21%), and Technicians 4 (21%), Ward & OPD Attendees 3 (15.8%) and House-keeping staff 1 (5.26%), as shown in figure 1.

Fig 1Different categories of HCWs sustained NSI

Table 1 Socio-demographic characteristics

Sl. no	Demographic Characteristics	Number, N=19 (Percentage n= (%))
A.	Age	
1.	21-30	12(63.1%)
2.	31-40	3(15.7%)
3.	41-50	2(10.5%)
4.	51-60	2(10.5%)
B.	Sex	
1.	Male	6(31.5%)
2.	Female	13(68.4%)
C.	Profession	
1.	Doctor	7(36.8%)
2.	Nursing staff	4(21.0%)
3.	Technician	4(21.0%)
4.	Attendees	3(15.7%)
5.	House-keeping staff	1(5.2%)
D.	Department	
1.	House keeping	1 (5.2%)
2.	Surgery	1 (5.2%)
3.	Cath- lab	1 (5.2%)
4.	Emergency department	4 (21.0%)
5.	Central lab	3 (15.7%)
6.	ICU	3 (15.7%)
7.	OBG	4 (21.0%)
8.	Major OT	2 (10.5%)

Eight department staffs had NSI in the past one year and the departments were Emergency department 04(21%), OBG, from minor operation theatre (OT) and labor room 04(21%), followed by Intensive care unit (ICU) 3(15.7%), Central laboratory 3(15.7%), Major OT 2(10.5%), Surgery department 1(5.2%), Catheterization-laboratory (cath-lab) 1(5.2%) and Housekeeping department 1(5.2%).Table 2 Various Factors of Needle stick injuries and splash injuries.

Factors associated with Needle stick injury shown in table 2.

Type of injuries were two, by needle prick 14(73.6%) and exposure to splash injuries 05(26.3%). Eight (42%) of healthcare worker had used of gloves and 11(57.8%) had not used gloves, during the incident. Various actions during which NSI had occurred were, while using the device 5(26.3%), while recapping used needles 2(10.5%), while discarding needle 4 (21.05%), while cleaning dressing table and patient's bed 3(15.7%), during collection of BMW 1 (5.2%). Other incidences were splash of amniotic fluid, while conducting emergency labor 2(10.5%), accidental spill & splash after collection of blood sample 2(10.5%). Fig.2

Fig. 2 Various actions performed during NSI

Table 2 Various Factors of Needle stick injuries and splash injuries.

Sl. no.	Factors Number, N=19 (Percentage, n= (%))	
A	Type of injuries	
1.	Needle prick	14 (73.6%)
2.	Splash injury	05 (26.3%)
B	PPE	
1.	Gloves worn	8(42.1%)
2.	Gloves not worn	11(57.8%)
C	Actions performed during NSI	
1.	During use of device	5(26.3%)
2.	While recapping used needle	2(10.5%)
3.	While discarding needle	4(21.0%)
4.	While cleaning	3(15.7%),
5.	Collection of BMW covers	1(5.2%)
6.	Others	4(21.0%)
D	Site of NSI	
1.	Right hand	12(63.1%)
2.	Left hand	3(15.7%)
3.	Right foot	1(5.2%)
4.	Abdominal wall	1(5.2%)
5.	Eyes	2(10.5)
E	First Aid steps	
1.	Washed the site with soap & water	12(63.1%)
2.	Sanitizer	3(15.7%)
3.	Washed the site with soap &water, later applied sanitizer	3(15.7%)
4.	Squeezed the site of injury	1(5.2%)
F	Source	
1.	Known	15(78.9%)
2.	Unknown	4(21.0%)
3.	HIV Reactive	3/15, (20%)
4.	HBs Ag Reactive	2/15, (13.3%)
G	Vaccination Against HBV	
1.	Completely vaccinated	12(63.1%)
2.	Partially	4(21.0%)
3.	Not vaccinated + Unknown	3(15.8%)

Most of the injuries were incurred on right hand (index finger, palm ventral and dorsal aspect) 12(63.1%), followed by left hand 3(15.7%) due to jerking of patients, after manipulation by technicians due to inexperienced staffs. Other locations were due to accidental fall of needle on foot 1(5.2%), before discarding it and one more was on abdominal wall 1(5.2%), due to failure of discarding the needle, by the medical personnel, after generation and the needle had been placed inappropriately on the dressing table. Above information

emphasizes on use of PPE like gloves, robust boots or crocs and thick rubber aprons. Provision of PPE and reinforcement on use PPE can reduces the occurrence of NSI.

First aids steps performed immediately after NSIs were washing the site of injury with soap and water 12(63.1%), few had washed the site of injury with soap and water followed by used hand sanitizer 3 (15.7%) and some had applied sanitizer 3(15.7%). Unsafe and hazardous practice of squeezing the site of injury 1 (5.2%) was also reported, though rare.

Post reporting, Patients or the sources were traceable in 15(78.9%) cases & sources were not recognizable in 4 (21.0%) cases. Among the 15 known sources, 3(20%) HIV reactive and 2 (13.3%) HBs Ag reactive. Majority of HCWs were completely vaccinated against HBV 12(63. 15%) while few were partially vaccinated 4 (21.05%) and 3(15.8%) not vaccinated.

IV. Discussion:

Needle stick injuries includes per-cutaneous injuries incurred by needles and sharps, exposure of open wounds, non-intact skin and muco-cutaneous membranes of eyes, nose and mouth, to blood and body fluids5. Needle stick and splash injury is an avoidable occupational injury. In this study prevalence of NSI and various factors associated with it was analyzed. There are various factors related with NSI such as age, sex, profession, work experience, working location, knowledge, work practices, attitude, psychological and emotional factors.

Prevalence rate of NSI in our institute was 3.40%.Similar prevalence rate was registered by Sharma R et al 3.47%3. A lower incidence rate of 2.4% was reported by Pournaras S et al6. Higher prevalence rates of around 10- 50% were recorded in many studies, such as 9.7% in Alharazi R et al7,11.57% in Alsabaani A et al8, 22.2% Abalkhail A et al9, (25.15%) Datar UV et al10 and 54% Jahangir M et al2. As compared with above mentioned national and international prevalence rate data, our study showed a lesser prevalence rate. This is an indicator of underreporting, which is a subject of concern, as there can be chances of acquiring not only HBV, HCV or HIV but also other blood borne infectious pathogens. Average NSI per month was 1.58%.

NSI due to percutaneous injuries were maximum 73.6% and exposure to blood or body fluid splashes accounted to 26.3%1,5. Female health care provider had experienced more NSI than male HCWs2. 11, 12. Observed male and female ratio was 1:2.2. Among all genres of health care workers, doctors had reported high 36.8%. This finding was in correlation with several studies1, 2, 5.Next highest were nurses 21% 1, 5 whereas in other studies nurses, had endured NSI, most frequently than doctors12, 13.Laboratory technicians had also suffered same rate of NSI as that of nurses of 21% Lab technicians had reported second highest in a study conducted by Mbaisi EM et al12.

The most common age group was between 21-30 years, 63.1%1, 12. This age group of HCWs were freshers and not with much of experience.

Many cases of NSIs had occurred in Emergency department(ER) 21%, 5, 14. NSI happened in Labor room were also equally high 21%. These are the areas where health care providers are in the utmost urgency and tensed situations. Least occurrence was seen in surgery department 5.2%, as documented in a study conducted by Goel et al5. In various other studies surgical departments had shown the peak incidence of NSI.8, 15, 16.

Bulk of articles had mentioned recapping of needles as, the lion's share of NSIs2, 3, 17, 18, 19, 20. On the contrary, in this study recapping of the needles accounts less, 2(10.5%). Devices causing percutaneous injuries in our study were disposable syringe needles, blood collection needles, intra venous (IV) cannula needles, anesthesia needles and lancet 21, 22. Most of the NSIs, in this study were induced by hollow bored needles (78.9%) 1, 2, 3, 17.

We have observed that most of the injuries had occurred on hands 17(89.4%). This is in accordance with the studies done by Sastry AS et al1 and Goel et al5 which shows fingers and hands as the major sites of exposure to NSIs. Other locations listed in our study were right foot, due to accidental fall of needle from patient's bed side table 1(5.2%), and right side of the abdominal wall 1(5.2%). This was due to failure to discard the needle immediately by medical personnel, after generation, needle been placed inappropriately on the dressing table. Most of the injuries had occurred due to jerky movements of patients, collisions and inexperience of medical personnel. Adherence to use of appropriate PEP and proper biomedical waste segregation are the preventive measure to reduce NSIs.

Frequent practice of hand washing, post covid-19, would have led to the most commonly performed first aids step, as washing the site of injury with soap and water by (63%) 4, 20. Delayed reporting times were seen in 11(57.8%) cases2. Reasons for delayed reporting were busy work schedule, lack of knowledge, negligence and fear.

Source or patient was identified in 15(78.9%). Similar rate of 73% of known source was reported in Al Shaikh Het al9. Lower rate of 38.5% of source patient were recognized in Alsabaani A et al8.Among the 78.9% of known source patient, 20% were HIV reactive. Post exposure follow up were done, according to NACO guidelines1, 23. Anti-retroviral medication, were provided for 28 days. But there were delay in reporting and administration of first dose of ART. Thirteen percent of healthcare workers who were exposed to HBV positive

source patient, were not vaccinated against HBV. As a measure of PEP, Hepatitis B vaccinations were administered.

V. Conclusion:

Adherence to Standard Precaution such as use of gloves, and safe injection practices. Frequent educational and training sessions, in small groups to be conducted. Promotion of vaccination campaign, to improve upon vaccination among all HCWs. To emphasize on early reporting, to seek appropriate PEP. Implementation of possible engineering control measure.

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