NEEDLE-STICK AND SHARP INJURIES (NSIs) AMONG HEALTH CARE WORKERS: A CROSS SECTIONAL STUDY IN A TERTIARY HEALTH CARE INSTITUTION OF KOLKATA, INDIA

Epidemiology

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ABSTRACT

Background: NSI is an important but preventable occupational hazard among Health care workers (HCWs) all over the world.

Objective: To assess prevalence of NSIs and related knowledge and practices among HCWs of a tertiary health care institution.

Methods: It was an institution based, cross sectional study done among junior doctors (interns and house staffs) and nurses in a tertiary health care institution of Kolkata. Complete enumeration was done and sample size was 215. A self-administered questionnaire was used to collect data.

Results: The prevalence of NSIs was 22.3%, more among junior doctors compared to nurses (28.3% vs. 11.7%), majority experiencing 1-3 incidents in last 3 months. Recapping of needle was the most common activity leading to NSIs (56.3%). Only 14.6% reported their NSIs to their authority. 64.2% of the study subjects were vaccinated against Hepatitis B. The study subjects had fair knowledge about the diseases transmitted by NSIs, but their practice on post exposure prophylaxis (PEP) was poor. Heavy workload, fatigue, lack of protective measures and inadequate training contributed to NSIs, as they reported.

Conclusion: Greater awareness and willingness to adhere to the designed protocols for sharps management among HCWs are urgently needed to prevent this problem.

KEYWORDS

Health care worker, Needle-stick and sharp injuries, Post exposure prophylaxis

INTRODUCTION:

Needle-stick and sharp injuries (NSIs) are serious but preventable occupational hazards to health care workers (HCWs) all over the world. NSIs are also referred to as needle-stick injuries, sharps injuries, percutaneous injuries and sharps exposures. Such injuries may occur with hypodermic needles, blood collection needles, suture needles, scalpels, lancets, or other sharp objects that have been in contact with a source i.e. patient's blood or body fluids (semen, vaginal secretions, CSF etc).¹ And NSIs occur during various activities in clinical settings viz. invasive procedures, recapping the needles, unsafe collection and disposal of sharps etc. A large number of infections may be transmitted by NSIs. Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) are the most common among them.¹ The average risk of transmission of HIV, HBV, HCV to a HCW after percutaneous exposure is 0.1% to 0.3%, 10 to 30%, 3 to 10 % respectively.² The risk of infection following exposure depends on several factors--type of needle (hollow bore needle has a higher risk than solid needle), device visibly contaminated with blood or not, depth of injury (higher is the depth, more is the risk), viral load present in the source at the time of exposure, timely initiating first aid and post exposure prophylaxis (PEP) or not etc.¹ Besides infections, the long term outcome to HCWs who sustained NSIs includes substantial psychiatric morbidity such as anxiety, depression, post-traumatic stress disorder (PTSD) and adjustment disorder (AD).³ The consequences to these effects include missed work days which directly affect the health care services.

WHO estimates that about 2 million percutaneous injuries occur annually among HCWs around the world, mostly in developing countries.⁴ The actual incidence of NSIs is considerably higher than the current estimates, due to lack of surveillance systems and gross under-reporting (often less than 50%).⁵⁻¹⁰ So, a low injury rate should not be interpreted as a less serious issue.¹¹ In developing regions, 40-65% of HBV and HCV infections were attributable to percutaneous occupational exposure.¹² In developed regions, by contrast, the attributable fraction for HCV was only 8-27% and that for HBV was less than 10%, largely because of immunization and PEP.¹² The attributable fraction for HIV in various regions ranged between 0.5% to 11%.¹² While developed countries are busy with designing new protective devices such as – retractable lancets, safety lock syringes with a protective sheath and needleless IV systems etc. and improving their policies, the developing world still struggles with lack of basic equipments, inadequate policies and poor adherence to them.¹³ Factors associated with an increased risk of occupational exposure of NSIs are—lack of awareness among HCWs, policy on BMW handling including sharps not in place, negligence in strictly adhering to the protocols etc.

From the above backdrop, it is pertinent to conclude that NSIs is an important public health issue affecting large number of HCWs and a lot needs to be done to reduce its burden especially in a developing country like India.

There is limited, fragmented data available from India as well as West Bengal on NSIs among HCWs. So, this study was conducted to assess prevalence of NSIs and related knowledge and practices among HCWs of a tertiary health care institution of Kolkata.

MATERIALS AND METHODS:

Study type: It was an observational, analytical study.

Study design: It is an institution-based, cross sectional study.

Study setting: College of Medicine and Sagore Dutta Hospital, Kamarhati, Kolkata.

Study population :

All the junior doctors i.e. interns and house staffs and nursing staff working in the indoor and OPDs of CMSDH and having at least 3 months of working experience.

Exclusion Criteria :

- Those who refused to participate in the study.
- Those who were absent during the period of data collection.

Sampling:

The study was conducted among the junior doctors and nursing staff of CMSDH. It was intended to include all the junior doctors and the nursing staff working in this college for this study. So, complete enumeration was done for selecting the study subjects.

Sample size :

The total number of junior doctors and nursing staff in the college was found to be 160 and 103 respectively. Pre-testing of the questionnaire was done among 15 junior doctors and 15 nursing staff. Excluding them, the number of junior doctors became (160-15=145) and nursing staff (103-15=88). Among the junior doctors, 5 refused to give consent and 2 were absent during data collection period and for nursing staff these figures were 6 and 5 respectively. So finally the sample size of the study was (138+77) i.e. 215.

Study Tools :

A pre-designed, pre-tested, structured questionnaire in English and local language (Bengali) was used.

Study Techniques

The questionnaire was self-administered i.e. filled up by the participants and data were collected.

Analysis :

The collected data was entered in the MS Excel spreadsheet. Analysis was done using SPSS software version 20.0

Ethical approval:

Approval from Institutional Ethics Committee (IEC) was taken. Informed written consent was taken from each study subject at the onset of the study.

Operational definitions:

Needle-stick and sharp injury (NSI): It is penetration of skin by a needle or other sharp object that was in contact with blood, tissue or other body fluid prior to the exposure.

Universal Precautions: An approach to infection control that treats all human blood and other potentially infectious materials as if they were infectious for HIV and HBV or other blood-borne pathogens.

Post Exposure Prophylaxis (PEP): Any preventive medical treatment started after exposure to pathogen i.e. HIV, HBV etc in order to prevent infection.

RESULTS:

Majority of the study subjects (64.2%) were in the age-group of 21-25 years. The majority of junior doctors (72.5%) had work experience of less than one year compared to nurses, 76.6% of them were working for more than one year.

Table 1: Distribution of study subjects according to background information. n=215

Parameters	Junior doctors(%)	Nurses (%)	Total (%)
Age (Years)			
21-25	111(80.4)	27(35.1)	138(64.2)
26-30	25(18.2)	28(36.4)	53(24.6)
31-35	1(0.7)	10(12.9)	11(5.1)
36-40	1(0.7)	11(14.3)	12(5.6)
>40	0(0.0)	1(1.3)	1(0.5)
Sex			
Male	80(57.9)	0(0.0)	80(37.2)
Female	58(42.1)	77(100.0)	135(62.8)
Category of staff	138(64.2)	77(35.8)	215(100.0)
Work experience			
3 months--1year	100(72.5)	18(23.4)	118(55.0)
1--5 years	38(27.5)	49(63.6)	87(40.5)
5--10 years	0(0.0)	10(13.0)	10(4.5)

The prevalence of NSIs in last 3 months were 22.3%, significantly more among junior doctors compared to nurses (28.3% vs. 11.7%, $p=0.005$). Recapping of needle was the most common activity leading to NSIs (56.3%) followed by while doing the procedure (54.2%).

Table 2: Distribution of study subjects according to NSIs and circumstances leading to NSIs.n=215

Parameters	Junior doctors (%)	Nurses (%)	Total(%)
Needle stick injuries in last 3 months**			
Yes	39(28.3)	9(11.7)	48(22.3)
No	99(71.7)	68(88.3)	167(77.7)
No of NSIs in last 3 months			
1-3	33(84.6)	8(88.9)	41(85.4)
4-6	6(15.4)	0(0.0)	6(12.6)
>6	0	1(11.1)	1(2.0)
Circumstances leading to NSIs(n=48)*			
Recapping of needle	22(56.4)	5(55.6)	27(56.3)
While performing procedure	19(38.5)	7(77.8)	26(54.2)
Routine care of sharp instrument	3(7.7)	0(0.0)	3(0.1)
During disposal of sharps to container	2(5.1)	2(22.2)	2(0.0)
During insertion of cannula	2(5.1)	0(0.0)	2(0.0)
Reported the needle stick injury (n=48)	06(15.4)	01(11.1)	07(14.6)

*multiple response

**Chi square test: $p: 0.005$

The study subjects had fair knowledge about common diseases transmitted by NSIs, but they practiced poorly for PEP. Heavy workload, fatigue, lack of protective measures and training are some factors raised by the study subjects for occurrence of NSIs among them. And adhering to protocols of safe disposal of sharps, avoiding recapping or bending of needles, organising separate injection work area etc are some suggestions cited by them to curb this menace.

Table 3: Distribution of study subjects according to knowledge and practice related to NSIs.(n=215)

Parameters	Junior doctors(%)	Nurses (%)	Total(%)
Presence of knowledge about universal precaution guidelines	67(48.6)	26(33.8)	93(43.2)
Diseases transmitted by NSIs*			
Hepatitis B	136(98.6)	68(88.3)	204(94.8)
Hepatitis C	127(92.0)	51(66.2)	178(82.7)
HIV/AIDS	133(96.4)	68(88.3)	201(93.4)
All of the above	125(90.6)	49(63.6)	174(80.9)
History of PEP in the past			
Yes	13(9.4)	5(6.5)	18(8.4)
No	79(57.3)	45(58.4)	124(57.7)
Not exposed	46(33.3)	27(35.1)	73(33.9)
Diseases against which PEP was taken in the past*			
Hep B	6(26.1)	3(33.3)	9(28.1)
HIV	8(34.8)	4(44.5)	12(37.5)
Presence of knowledge regarding using hub cutter	88(63.8)	62(80.5)	150(69.7)
Frequency of using hub cutter			
Always	48(54.6)	60(96.8)	108(72.0)
Occasionally	40(45.4)	02(3.2)	42(28.0)
Believe that recapping of the needle after injection is a standard procedure	56(40.6)	16(20.8)	72(33.5)
Factors leading to NSIs*			
i. Heavy workload	96(69.6)	33(42.9)	129(60.0)
ii. Inattention	56(40.6)	29(37.7)	85(39.5)
iii. Fatigue	79(57.2)	37(48.1)	116(53.9)
iv. Lack of protective measures	55(39.9)	33(42.9)	88(40.9)
v. Lack of proper and regular training	46(33.3)	32(41.6)	78(36.3)
vi. Others	4(2.9)	3(3.9)	7(3.3)
Opinion regarding possible methods for prevention of NSIs*			
i. Organising physical layout of injection work area	55(39.9)	24(31.2)	79(36.7)
ii. Minimize handling of injection equipments	24(17.4)	7(9.1)	31(14.4)
iii. Don't recap or bend	65(47.1)	47(61.0)	112(52.0)
iv. Cleaning the injection environment before & after injection	21(15.2)	12(15.6)	33(15.3)
v. Safe disposal of sharps to prevent injuries	96(69.6)	53(68.8)	149(69.3)
vi. Others	2(1.4)	0(0.0)	2(0.9)
History of vaccination against Hep B	91(65.9)	47(61.0)	138(64.2)
History of training on NSIs prevention in last one year	25(18.1)	29(37.7)	54(25.1)

*Multiple response

DISCUSSION:

In the current study the prevalence of NSIs was quite remarkable i.e. 22.3%; more NSIs among junior doctors might be due to lesser work experience compared to nurses. However several studies from different parts of the world among HCWs reported varying results viz. from 10.8 % to 92%.¹⁴⁻²² Such wide variation of NSIs were due to heterogeneity of study subjects, time span considered for recall, different age groups and study settings and/or other factors. The number of NSIs in three months was 1-8 in the present study compared to wider variation (i.e. 1-30) in another study of one year duration, from Tamil Nadu.¹⁵ In the current study, recapping of needle was the most common activity leading to NSIs (56.3%) followed by while doing the procedure (54.2%)—this was consistent with other studies.^{17,18,21,22}

In the current study, less than half of the study subjects (43.2%) had comprehensive knowledge about universal precaution guidelines in comparison to better knowledge reported by studies from Tamil Nadu and China (73.2% & 75.1% respectively).^{16, 24} The present study showed majority of the study subjects know HIV/AIDS, Hepatitis B and Hepatitis C (93.4%, 94.8% and 82.7% respectively) are transmitted by NSIs which is consistent with studies from Assam & Tamil Nadu.^{23, 24} Another study from Mauritius reported not so good response in this regard.¹⁹ Only 8.4% of the study subjects of this study took PEP in the past, which is similar to the study from Tamil Nadu.²⁴ More than half (i.e. 64.2%) of the study subjects had been vaccinated against Hep B in the present study compared to a study from Mauritius, which recorded better practice (82.9%) and another from Lithuania which elicited poor vaccination profile (13.8%) among nursing staff.²¹ The health personnel in the present study were negligent in reporting the NSIs—only 14.6% reported the incidents, which is consistent with some studies.^{18, 21, 23, 24} However, other studies found greater reporting (i.e. 34% --76%) among the HCWs.^{16, 19, 24} Only one quarter of the health personnel were trained in last one year on NSIs in this study, while another study from China reported 'often training' given among 43.1% of HCWs.¹⁶

CONCLUSION:

More than one fifth of the HCWs suffered from NSIs in this study, that too merely within three months. Awareness on NSIs and its adverse consequences is important; more so regarding the compliance to the protocols laid down by the Government for BMW management especially sharps. Repeated training among the HCWs is the need of the hour to reduce this preventable menace.

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