

## A cross sectional study on needle stick injuries, its associated factors and prophylactic measures among nursing staffs and students of a tertiary care hospital in Chennai

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**Introduction:** Nurses have the highest rate of Needle Stick Injuries (NSIs) among health care workers. **Objectives:** 1. To determine the prevalence of NSIs in the past three months among nursing staffs and students of a Tertiary Care Hospital and the factors associated with it. 2. To assess the pre and post exposure prophylactic measures related to NSIs followed by them. **Methodology:** This cross-sectional study was conducted between May and June 2017 among 354 subjects including 218 staff nurses and 136 nursing students of a Tertiary Care Government Hospital in Chennai City. After the Institutional Ethics Committee approval, subjects were interviewed with a pre-designed semi structured questionnaire. Data was analysed using relevant descriptive and inferential statistics with trial version of SPSS.v.25.0 **Results:** Prevalence of NSIs in the past three months was 29.7% (n=105). Majority 79 (58.1%) nursing students had experienced NSIs. Two handed recapping of syringes was significantly associated with NSIs (P = 0.001, OR = 4.363, 95% C.I = 2.033 – 9.364). Around 40 (38.1%) of the NSIs had occurred most commonly at the In-patient wards. Majority 62 (59%) of them had never reported about their NSI while only 25 (23.8%) had reported regularly. Among those who got vaccinated with HBV vaccine (n = 57) for pre-exposure prophylaxis, only 13 (22%) had taken three doses of HBV. **Conclusion:** Two handed recapping of syringes, non-usage of gloves, lack of assistance and inattentiveness during procedures, especially among nursing students are the major associated factors for occurrence of NSIs.

**Keywords:** Needle Stick Injuries (NSIs), Post-exposure Prophylaxis (PEP), Recapping of syringes, Safe Injection practices.

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## Introduction

The National Institute for Occupational Safety and Health (NIOSH), USA defines needle stick injuries as injuries caused by objects such as hypodermic needles, blood collection needles, intravenous (IV) stylets and needles used to connect parts of IV delivery systems [1]. Health-care workers are at increased risk of infection with blood borne pathogens because of occupational exposure to blood and other body fluids.

Most exposures among health-care workers are caused by percutaneous injuries with sharp objects contaminated with blood or body fluids. These sharps include needles, scalpels, lancets and broken glass. The pathogens most commonly transmitted to health-care workers in occupational settings are the hepatitis B and C viruses (HBV, HCV) and the human immunodeficiency virus (HIV) [2].

According to World Health Report 2002, of the 35 million health-care workers, 2 million experiences percutaneous exposure to infectious diseases each year [3]. The rate of seroconversion after percutaneous exposure to HIV, HBV and HCV are 0.3 % (0.18 - 0.46 %), 18 % (6 - 30%) and 1.8 % (0.1-7%) respectively [4]. More than 90% of these infections occur in developing countries but most of these NSIs remain unreported.

It is also found that 37.6% of Hepatitis B, 39% of Hepatitis C and 4.4% of HIV/AIDS in Health-Care Workers around the world are due to needle stick injuries [3]. These blood borne infections have serious consequences, including long-term illness, disability and death [4].

Occupational percutaneous exposures to blood borne pathogens can be prevented by strategies that include: immunization against HBV; procedures to prevent percutaneous injuries; and post-exposure prophylaxis (PEP) to prevent the development of disease [2].

Nurses have the highest rate of needle stick injury among health care workers [5]. Studies conducted Worldwide [6-9] as well as in India [10-15] among healthcare workers, have shown that reporting of NSIs and acceptance of PEP measures is among them is poor.

Hence this study has been planned to assess the burden of NSIs and its associated factors along with prophylactic measures practiced among staff nurses and nursing students of this Hospital who assist

## Objectives

In patient care services. This would henceforth help to improve the health care delivery services being provided. With this background the study is proposed to be conducted with the following objectives:

01. To determine the prevalence of Needle Stick Injuries (NSIs) in the past three months among nursing staffs and students of a Tertiary Care Hospital and the factors associated with it.
02. To assess the pre and post exposure prophylactic measures related to Needle Stick Injuries followed by them.

## Methodology

This cross-sectional study was conducted between May and June 2017 (two months) among the staff nurses and nursing students of a Tertiary Care Government Hospital in Chennai City. There were 232 staff nurses enrolled in the staff list of the Hospital and 198 nursing students. Among them, 218 staff nurses and 136 nursing students participated in the study.

Those study subjects who had more than three months of work experience in the Hospital were included as the study subjects. Informed Consent was obtained from all the study subjects, after explaining in detail about the study objectives and outcome. Those who were unwilling, and absentees during the period of study, were excluded. Prior approval for conducting the study was obtained from the Institutional Ethics Committee (IEC).

Data was collected by interview method with a pre-designed and semi structured questionnaire based on World Health Organization (WHO) safe injection practices and National AIDS Control Organization (NACO) guidelines.

Data related to work experience, knowledge on blood borne infections, site, frequency, cause and mode of occurrence of injury, first aid measures done, universal precautions followed, pre-exposure Hepatitis B vaccination status and Post-Exposure Prophylaxis (PEP) measures taken were collected through the questionnaire. Data collected was coded and entered in Microsoft Office Excel Worksheet.

Statistical analysis using descriptive statistics like proportions, mean, median, standard deviation and inferential statistics like Chi-square test, Fisher's Exact test were done with trial version of

SPSS.v.25.0.

## Results

Among the 354 study subjects, majority 152(42.9%) were in the age group of 21-30 years. There were 339 (95.8%) females and 15(4.2%) males. Of the study subjects there were 218 (61.6%) staff nurses and 136 (38.4%) were nursing students.

As shown in Table.1, among the 218 staff nurses only 26 (11.9%) of them had experienced NSIs in the past three months while among the 136 nursing students, majority 79 (58.1%) had experienced NSIs and this association was found statistically significant (P = 0.001, OR = 0.098, 95 % C.I = 0.057 – 0.166). Majority of the study subjects 210 (59.3%) belonged to nuclear family.

There were 134 (37.9%) day-scholars and 220 (62.1%) hostellers. Among the 134 day scholars only 11 (8.2 %) had NSIs while among the 220 hostellers 94 (42.7 %) had NSIs and this association between residence and occurrence of NSIs was found statistically significant (P = 0.001, OR = 0.120, 95% C.I = 0.061 – 0.235).

Of the total study participants majority of them 277 (78.2%) had a total work experience of 1-10years and in the present institution most of them 189 (53.4%) had a work experience of less than one year. Among the study subjects majority 352 (99.4%) were right handed persons. Occurrence of NSIs in the past three months was reported by 105 (29.7%) among the 354 study subjects interviewed.

Of the 105 study subjects who had experienced NSIs in past the three months, majority 103 (30.4%) were females while only 2 (13.3%) were males. But this association between sex and NSI occurrence was not statistically significant (P = 0.247, OR = 0.353, 95 % CI = 0.057 – 0.166).

**Table-1: Socio-demographic factors associated with Needle Stick Injuries (NSI):**

Factors	NSIs		Total (N = 354)	P value
	Occurred	Not occurred		
<b>Age category</b>				
≤ 20yrs	75 (59.1)	52 (40.9)	127	0.001*
21-30 yrs	24 (15.8)	128 (84.2)	152	
31-40 yrs	5 (8.2)	56 (91.8)	61	
41-50yrs	1 (11.1)	8 (88.9)	9	
>50 yrs	0	5 (100)	5	

<b>Sex</b>				
Male	2 (13.3)	13 (86.7)	15	0.247
Female	103 (30.4)	236 (69.6)	339	
<b>Category</b>				
Staff Nurse	26 (11.9)	192 (88.1)	218	0.001*
Nursing Student	79 (58.1)	57 (41.9)	136	
<b>Year of study</b>				
I Year nursing	28 (65.1)	15 (34.9)	43	0.001*
II Year nursing	22 (51.2)	21 (48.8)	43	
III Year nursing	29 (58.0)	21 (42.0)	50	
<b>Family status</b>				
Nuclear	81 (38.6)	129 (61.4)	210	0.001*
Joint	18 (13.3)	117 (86.7)	135	
Three generation	6 (66.7)	3 (33.3)	9	
<b>Marital status</b>				
Single	84 (51.2)	80 (48.8)	164	0.001†
Married	21 (48.8)	166 (88.8)	187	
Separated	0	2 (100.0)	2	
Widow	0	1(100.0)	1	
<b>Residence</b>				
Dayscholar	11(8.2)	123 (91.8)	134	0.001*
Hosteller	94 (42.7)	126 (57.3)	220	

(Note: Figures in parenthesis denotes percentages; \* - Pearson Chi-square test; †- Fisher’s Exact test; P value < 0.05 is considered as statistically significant)

**Table-2: Distribution based on occurrence of NSIs:**

Factors	n (%)
<b>NSI Experience (N = 354)</b>	
Yes	105 (29.7)
No	249 (70.3)
<b>Frequency (n = 105)</b>	
Once	63 (60.0)
Twice	30 (28.6)
Thrice	7 (6.7)
Four times	4 (3.8)
Five times	1 (1.0)
<b>Site (n = 105)</b>	
Upper limb	96 (91.4)
Lower limb	4 (3.8)
Not sure	8 (6.8)
<b>Type NSI (n = 105)</b>	
Pierced	7 (6.7)
Puncture	72 (68.6)
Cut	11 (10.5)
Scratch	15 (14.3)
<b>Instrument (n = 105)</b>	
Sterile instrument	50 (47.6)
Non instrument	38 (36.2)
Both	17 (16.2)

Time of occurrence (n = 105)	
Day	59 (56.2)
Afternoon	13 (12.4)
Evening	11 (10.5)
Night	7 (6.7)
Not sure	15 (14.3)

Table 2 shows that, among those who had NSIs (n=105) majority 63 (60%) had experienced at least once, followed by 30 (28.6%) of them who had experienced at least twice. Of the reported NSIs the major site of occurrence was upper extremity 96 (91.4%) followed by lower extremity 4 (3.8%).

Majority 72 (68.6%) of the NSIs were Punctured wounds whereas pierced wounds were the least common 7 (6.7%) type of NSIs. Most of the NSIs, 50 (47.6%) were caused due to a sterile instrument followed by non-sterile instruments 38 (36.2%). Maximum 59 (56.2%) of the NSIs had occurred during daytime while only 7 (6.7%) of the injuries had occurred during night.

(Note: Figures in parenthesis denotes percentages)

Table.3 shows that, Recapping the syringes by 21 (20.0%) subjects was the most common cause of NSIs followed by administration of an I.M injection 17 (16.2%) and 13 (12.4%) after administering an I.V injection and least 2 (1.9%) while blood withdrawal and 1 (0.9%) had while suturing. Among the type of needles that caused the NSIs needle of disposable syringe were most common 76 (72.4%) while only 4 (3.8%) of them were injured by needle of auto-disable syringes.

Of the various reasons for occurrence of NSIs reported, majority 22 (21%) were due to inattentiveness during a procedure followed by 21 (20%) of them due to procedures during an emergency situation. As shown in Fig.1, In-patient wards were the most common 40 (38.1%) location where NSIs had occurred in the hospital while only 3 (2.9%) had occurred in OTs.

**Table-3: Distribution based on procedures, instruments and reasons for NSIs:**

Factors	n (%)
<b>Procedure that Caused a NSI (n = 105)</b>	
Blood withdrawal	2 (1.9)
Recapping	21 (20.0)
Suturing	1 (1.0)
vaccination	6 (5.7)
Sample collection	5 (1.9)
Transfer of sample	2 (1.9)
Accessing IV cannulation	9 (8.6)

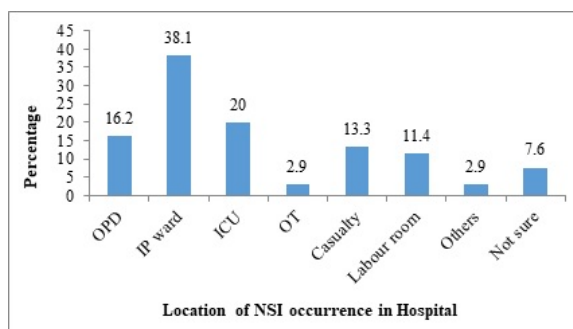
Administering IM injection	17 (16.2)
Administering IV injection	13 (12.4)
Administering SC injection	4 (3.8)
Administering ID injection	1 (1.0)
Disassembling a device	13 (12.4)
Biomedical waste handling	12 (11.4)
Others	15 (14.3)

Specific instrument-needle (n = 105)	
Disposable syringe	76 (72.4)
Auto disable syringe	4 (3.8)
Scalp vein set	7 (6.7)
IV set	8 (7.6)
Others	2 (1.9)
Not sure	8 (7.6)

Presumed Cause for NSIs (n = 105)	
In-attentiveness	22 (21.0)
Inflicted by colleague	6 (5.7)
Self-inflicted	12 (11.4)
Poor visibility	2 (1.9)
Inadequate space	4 (3.8)
Hurried-late	20 (19.0)
Hurried-emergency	21 (20.0)
Patient aggressiveness	7 (6.7)
Others	1 (1.0)
Not sure	20 (19.0)

Presumed reason for NSIs (n = 105)	
Fatigue	22 (21)
Vision problems	4 (3.8)
Lack of guidance	4 (3.8)
Lack of training	1 (1.0)
Lack of assistance	24 (22.9)
Lack of experience	14 (13.3)
Others	36 (34.3)

(Note: Figures in parenthesis denotes percentages)



**Fig. 1: Distribution based on the Location of NSI occurrence in Hospital (n = 105)**

It is seen from table.4, immediately following the NSIs maximum 90 (85.7%) of them had washed their injured site as a first aid measure of which mostly 41 (45.5%) had washed with spirit. Among the study subjects 3 (2.9%) had sucked the injured

Site following an injury.

After the NSIs majority 78 (74.3%) had carried on their duty as usual while 6 (5.7 %) of them had cried or left their work location immediately. Of the various probable reasons cited for NSIs mostly 24 (22.9%) of them had reasoned NSIs due to lack of assistance followed by 22 (21.0%) of them to fatigue while 4 (3.8%) to problems in vision and lack of guidance in safe injection practices.

Reporting following a NSI is an important factor in analysis of the seriousness of the NSI and to decide upon the appropriate Post-exposure prophylactic measure. Of the study subjects who had NSIs majority 62 (59.0%) of them had never reported about the NSI while only 25 (23.8%) had reported regularly and 18 (17.1%) had reported occasionally.

Among those who reported NSIs (n=53) majority 27 (50.9 %) had reported immediately while 10 (18.8 %) of them had reported later than a week and only 6 (11.3 %) of them had reported within a week of occurrence of NSIs.

Of those who had reported of their NSIs (n=53) maximum 31 (58.4%) had reported it to their senior nursing staff and 17 (32 %) to their colleagues while only 5 (9.4%) of them had reported to ICTC.

**Table-4: Distribution based on measures taken following a NSI:**

Factors	n (%)
<b>First aid done (n = 105)</b>	
Ignored	7 (6.7)
squeeze	14 (13.3)
Sucked	3 (2.9)
Did nothing	5 (4.8)
Not sure	3 (2.9)
Washed	90 (85.7)
<b>Washed NSI site with (n = 90)</b>	
With Water	17 (18.8)
With Soap	9 (10.0)
With Spirit	41 (45.5)
With Antiseptic	23 (25.5)
<b>Reaction following a NSI (n = 105)</b>	
Cried	6 (5.7)
Called for help	11 (10.5)
Left work area immediately	6 (5.7)
Carried duty as usual	78 (74.3)
Others	4 (3.8)
<b>Reporting of NSI (n = 105)</b>	
Yes regularly	25 (23.8)
Yes occasionally	18 (17.1)
Never	62 (59.0)

<b>Timing of reporting a NSI (n = 53)</b>	
Immediately	27 (50.9)
Within a day	10 (18.8)
Within a week	6 (11.3)
Later than a week	10 (18.8)
<b>Person to whom NSI was reported (n = 53)</b>	
Senior staff nurses	31 (58.4)
ICTC	5 (9.4)
Others	17 (32.0)

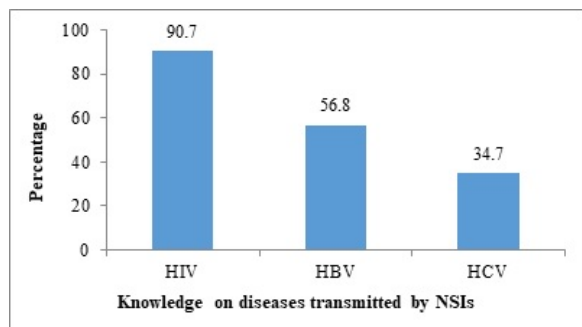
(Note: Figures in parenthesis denotes percentages)

Of the total 354 study subjects, 337 (95.2%) knew that certain diseases were transmitted by NSIs. Of them (n=337), 321 (90.7%) knew HIV, 201 (56.8%) knew HBV and 123 (34.7%) knew HCV could be transmitted by NSIs, as shown in Fig. 2. Majority 273 (77.1%) members of the total study subjects knew that Post exposure prophylaxis (PEP) measures were available for NSIs.

Among those who had NSIs (n = 105), most of them 38 (35.2%) had not got assessed for PEP following NSIs followed by 31 (29.5%) who had self-investigated without reporting while only 12 (11.4%) of them got assessed for PEP following a NSI.

From table.5 it is evident that, of those who had NSIs (n = 105), 57 (53.3%) had been vaccinated with HBV as Pre-exposure prophylaxis, of which only 13 (22.8%) had taken all the three doses of HBV.

Among those who had NSIs (n = 105), only 15 (14.2%) had been vaccinated with HBV as a PEP measure of which only 3 (20.0 %) of them had taken three doses of HBV vaccine. Around 33 (31.4 %) study subjects had never taken HBV vaccine for prophylaxis. Of those 105 subjects who had NSIs, 37 (35.2%) of them knew about the HBV status of their source and 43 (41.0%) of them knew about the HIV status of their source.



**Fig.-2: Distribution based on Knowledge on diseases transmitted by NSIs (N=354)**

Of those who got assessed for NSIs (n=12), only 2 (16.6 %) were prescribed PEP and had completed the course of PEP for HIV.

**Table-5: Distribution based on Prophylactic measures taken for NSIs:**

Factors	n (%)
<b>Awareness on PEP for NSI (N = 354)</b>	
Yes	273 (77.1)
No	81 (22.9)
<b>Assessment for PEP (n = 105)</b>	
Done	12 (11.4)
Not done	38 (35.2)
Don't know	24 (22.9)
Self-investigated without reporting	31 (29.5)
<b>Immunoprophylaxis for HBV (n = 105)</b>	
Took pre exposure prophylaxis	57 (53.3)
Took post exposure prophylaxis	15 (14.2)
Never	33 (31.4)
<b>No. of Pre exposure doses of HBV vaccine taken (n = 57)</b>	
1 dose	12 (21.1)
2 dose	32 (56.1)
3 dose	13 (22.8)
<b>No. of Post exposure doses of HBV vaccine taken (n = 15)</b>	
1 dose	7 (46.6)
2 dose	3 (20.0)
3 dose	3 (20.0)
Booster	2 (13.3)
<b>HBV Status of the source (n = 105)</b>	
Known	37 (35.2)

Unknown	68 (63.8)
<b>HIV Status of the source (n = 105)</b>	
Known	43 (41.0)
Unknown	62 (59.0)
<b>PEP for HIV (n = 105)</b>	
Not necessary	22 (21.0)
Yes	2 (1.9)
No	81 (76.2)
<b>Course completion of PEP for HIV(n = 2)</b>	
Completed	2 (100)
Not completed	0

(Note: Figures in parenthesis denotes percentages)

Safe injection practices are primarily involved in preventing the occurrence of NSIs. Among the total study participants (N = 354),

136 (38.4%) of them used gloves always before an injection of which only 19 (14.0%) of them had experienced NSIs while among the 24 subjects who never used gloves 14 (58.3%) had experienced NSIs.

This association between non-usage of gloves and NSIs was found to be statistically significant (P = 0.001). Of the study participants (N = 354), majority 256 (72.3%) had destroyed the needle safely by a hub cutter followed by 76 (21.5%) who had disposed them in a puncture proof container while at least 31 (8.8 %) of them recapped the needle with two hands in an unsafe manner.

**Table-6: Distribution based on factors associated with NSIs**

NSI associated factors	NSIs		Total (N = 354)	P value	X <sup>2</sup>	OR	95% CI
	Occurred	Not occurred					
<b>Work experience in present hospital</b>							
< 1 year	49(25.9)	140(74.1)	189	0.104	2.711	0.681	0.431-1.077
≥ 1 year	56(33.9)	109(66.1)	165				
<b>Total Work experience</b>							
< 10 years	103 (31.9)	219 (68.01)	322	0.002*	9.242	7.055	1.654 -30.087
≥ 10 years	2(6.3)	30(93.8)	32				
<b>HandednessM</b>							
Right	105(29.8)	247(70.2)	352	0.0582	0.848	0.702	0.656-0.751
Left	0	2(100.0)	2				
<b>Glove usage</b>							
Always	19 (14.0)	117 (86.0)	136	0.001*	30.67	-	-
Sometimes	72(37.1)	122(62.1)	194				
Never	14(58.3)	10 (41.7)	24				
<b>One handed recapping</b>							
Yes	2(22.2)	7(77.8)	9	0.621	0.245	0.671	0.137-3.286
No	103(29.9)	242(70.0)	345				

<b>Two handed recapping</b>							
Yes	19 (61.3)	12 (38.7)	31	0.001*	16.291	4.363	2.033-9.364
No	86(26.6)	237(73.4)	323				
<b>Hub cutter</b>							
Yes	74(28.9)	182(71.1)	256	0.615	0.252	0.879	0.531-1.455
No	31(31.6)	67(68.4)	98				
<b>Puncture proof container used</b>							
Yes	12(15.8)	64 (84.2)	76	0.003*	8.926	0.373	0.192-0.725
No	93(33.5)	185(66.6)	278				
<b>Disposal in a nearby bin</b>							
Yes	2 (100)	0	2	0.087	4.770	3.417	2.905-4.020
No	103(29.3)	249(70.7)	352				
<b>Posters on Injection safety</b>							
Sufficiently	52 (27.4)	138(72.6)	190	0.576	1.102	-	-
Rarely	28(31.5)	61(68.5)	89				
Not available	25(33.3)	50 (66.7)	75				
<b>Injection safety training</b>							
Yes	62(32.0)	132 (68.0)	194	0.297	1.086	1.278	0.805-2.028
No	43(26.9)	117 (73.1)	160				

(Note: Figures in parenthesis denotes percentages; \* - Pearson Chi-square test; P value < 0.05 is considered as statistically significant)

Among those 76 subjects who had disposed the syringe in a puncture proof container, only 12 (15.8%) of them had NSIs while 93 (33.5%) of the 278 subjects who did not dispose the needle in a puncture proof container had experienced NSIs and this association between usage of puncture proof container and prevention of NSIs was found to be statistically significant (P = 0.003, OR = 0.373, 95 % C.I = 0.192 – 0.725).

As shown in table.6, among those 31 subjects who had recapped the syringe using two hands, NSIs had occurred in 19 (61.3%) of them. There exists a statistically significant association between recapping of syringes with two hands and occurrence of NSIs (P = 0.001, OR = 4.363, 95% C.I = 2.033 – 9.364).

Of all the study subjects, majority 190 (53.7%) had reported that sufficient awareness posters on safe injection practices were available in their work place. In total, maximum 194 (54.8%) subjects had undergone dedicated training on safe injection practices of which, majority 138 (71.1%) had attended lecture on safe injection practices while only 37 (19 %) of them had ever undergone a hands-on training workshop on safe injection practices.

But the association between training on safe injection practices and occurrence of NSIs was not statistically significant. (P = 0.297, OR = 1.278, 95

% C.I = 0.805 – 2.028)

## Discussion

In the present study majority 59.1% of the NSIs had occurred in the age group of 20 years or less but the study done by Kruger et al [8] had reported that 40.6 % had occurred in the age group of 21-30 years. Inclusion of nursing students in our study could be a reason behind this difference. NSIs decreases with years of work experience.

In our study, those with a total work experience of 10 years or less had more NSIs (31.9 %) in similar to the study of Laishram J et al [16]. In our study prevalence of NSI was 29.7 % which was in similar to Laishram J et al [16] study which reported NSI prevalence among nurses as 28.1%.

Also majority of the study subjects had encountered NSIs atleast once in both the studies. NSIs occur most often in fingers. As found in our study where 80% of NSIs occurred in fingers Rais N et al [17] reported in 72.7% of the cases.

In our study majority 21 % had perceived that NSIs occurred due to their inattentiveness followed by 20 % due to procedures done in an emergency. Similarly Nagandla K et al [18] have reported that 52.6% of the NSIs occurred during emergency care procedures.

Recapping of the needle is a major cause for NSIs. Especially two handed recapping has more risk over one handed recapping technique. As reported in our study where 20.0 % of the NSIs occurred during recapping of the needle, most other studies [19,20,21] in India and worldwide have reported recapping as the most common cause of NSIs.

In our study, most of the NSI (38.1%) had occurred at the In-patient wards which was similar to the studies of Rais N et al [17] (41.6%) and Buraidah A.Q et al [22] (42.5%). In our study, majority 22.9% of the NSIs occurred due to lack of assistance, similar to 23.3 % in Laishram J et al [16] study.

In Rogers B et al [23] study, it has been shown that lack of experience in many procedures, insufficient training and fatigue leads to occupational sharp injuries. In our study 23.8% of them reported their NSI regularly while 59% did not report their NSI. Only 12 % of them reported the NSIs regularly in Mohapatra D et al [24] study whereas 80% of them reported in Beker J et al [7].

95.2% had known that the diseases were transmitted by NSI similar to Beker J et al [7] study (92.9%). In our study 90.7% knew about HIV, 56.8% knew about HBV and 34.7% knew about HCV as the diseases transmitted by NSIs this was higher when compared to Laishram J et al [16] study where only 72.1 %, 29.1 % and 19.8 % knew about HIV, HBV and HCV respectively.

In our study, of the 105 subjects who had NSIs, only 11.4 % of them had got assessed for their NSIs whereas it was 20 % of them as reported by Rajput PS et al [19] study. Our study reported that 53.3% were vaccinated with HBV vaccine as a pre-exposure prophylaxis whereas Kruger et al [8] had reported as 89.6 %. In our study 14.2 % had been vaccinated with HBV as a PEP measure while 31.4% had never been vaccinated with HBV.

In contrast, Rajput PS et al [19] study shows that 11.2 % of them had HBV vaccine as a PEP measure while only 21.2% of them had never been vaccinated for HBV. This shows the need for increase in awareness on prophylaxis for HBV among our nurses.

In our study only 20 % of them had taken all three doses of HBV vaccine as PEP whereas Kruger et al [8] have reported that 60.2 % had taken all three doses of HBV vaccine which shows the need to improve adherence to vaccination schedule among

Our nurses.

The study done by Mohapatra D et al [24] showed that 46 % of them knew about the HIV status of their source similar to our study where 41% of them knew about the HIV status of their source. In our study 38.4% of them had used gloves always before an injection while Mohapatra D et al [24] showed that 43 % had used gloves always.

In our study majority 72.3% had destroyed the needle safely by a hub cutter while only 21.5% had disposed them in a puncture proof container whereas Karthik et al [25] study had reported only 21 % had used a hub cutter while 65 % had disposed them in a puncture proof container. In our study only 8.8 % of them had recapped with two hands in an unsafe manner whereas Rais N et al [17] study had reported it to be 42 %.

In our study 54.8% of them had undergone dedicated training on safe injection practices while Laishram J et al [16] study had reported it to be 69.9%. So there is a need to increase those trained in safe injection practices.

## Conclusion

NSIs poses an important occupational hazard for health care workers, especially for the nursing personnel who are involved in day to day bedside medical care procedures like administration of injections, intravenous cannulations, blood sample collection etc. Two handed recapping of syringes, non-usage of gloves, lack of assistance and inattentiveness during procedures, especially among nursing students are the major associated factors for occurrence of NSIs.

Increase in awareness on diseases transmitted by NSIs, its pre-exposure and post-exposure prophylactic measures, need for reporting for immediate assessment of NSIs, compliance towards prophylactic measures and periodic hands on training on safe injection practices for nursing students and staff nurses would reduce the occurrence of NSIs and thereby the diseases transmitted due to them.

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