



JSMCR-25-48

Prevalence and Prevention of Needle Stick Injuries Among Nurses in Tertiary Care Hospitals of Peshawar, Pakistan

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Abstract

Context: Needle Stick Injuries (NSIs) are a major occupational hazard for healthcare workers, particularly nurses, who are at risk of exposure to blood-borne pathogens such as hepatitis B virus, hepatitis C virus and human immunodeficiency virus.

Objective: To assess knowledge, attitudes and practices regarding NSIs among nurses in tertiary care hospitals in Peshawar and to identify preventive strategies and associations with demographic variables.

Methods: A cross-sectional study was conducted at Khyber Teaching Hospital and Northwest General and Teaching Hospital, Peshawar. A total of 216 nurses were recruited through convenient sampling (118 from Northwest Hospital and 98 from Khyber Teaching Hospital). Data were collected using a self-structured questionnaire and analyzed with SPSS version 21. The main outcome measures were levels of knowledge, attitudes and practices regarding NSIs and their associations with demographic characteristics.

Results: Most nurses (73.6%) reported not experiencing an NSI. Awareness of transmission risks was high (93.9%), with 86.6% demonstrating positive attitudes and 79.2% reporting excellent preventive practices. Almost all participants (99.5%) were knowledgeable about preventive strategies. Significant associations were found between gender and practice level ($p = 0.000$), designation and attitude level ($p = 0.006$), qualification and practice level ($\chi^2 = 10.522$) and infection control training and knowledge level ($\chi^2 = 22.179$).

Conclusion: NSIs were relatively uncommon among the study group, with high levels of knowledge and preventive awareness. Institutional training and support are essential to sustain and strengthen safe practices among nurses.

Keywords: Needle Stick Injuries (NSIs); Healthcare workers; Knowledge, Attitude and Practice (KAP); Preventive strategies; Nurses in tertiary care hospitals

List of Abbreviations: Blood Borne Pathogens (BBP), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Healthcare Worker (HCW), Human Immunodeficiency Virus (HIV), Khyber Teaching Hospital (KTH), Needle Stick Injuries (NSI), Northwest Hospital (NWH), Statistical Package for Social Sciences (SPSS)

Introduction

Centers for Disease Control and Prevention (CDC) defines a Needle Sticks Injury (NSI) as an accidental skin-penetrating stab wound from a hollow-bore needle (or any sharp object) containing another person's blood or body fluid (CDC 2008). The CDC estimates that about 385,000 sharps-related injuries occur annually among Healthcare Workers (HCW) in hospitals. It was also reported that 37.6% of hepatitis B, 39% of hepatitis C and 4.4% of Human Immunodeficiency Virus (HIV)/AIDS among HCWs around the world are due to NSIs (WHO2002) [1].

NSIs are associated with a number of different health hazards for HCWs; the most important of which is the risk of acquisition of potentially fatal diseases

such as Hepatitis Band C (HBV, HCV) and Human Immuno Deficiency Virus (HIV). Transmission of at least 20 different pathogens by injuries due to sharp instruments and needle sticks has been reported. The risk associated with transmission after percutaneous exposure to infected blood varies according to the specific blood borne pathogen. For HBV; this risk can be up to 30% depending on the presence of various serological markers in the blood of the patient. For HCV, the transmission rate is around 3-4%. At 0.3%, this risk of transmission is lowest for HIV [2].

Needle stick injuries reports vary in different countries. Based on are search in America, between 600,000 to 1,000,000 NSI reports (the proportion of



health employees in a year) were received from conventional needles and cutting objects, whereas this amount was 100,000 in Britain. Disease Control and Prevention (CDC) has estimated that half of these injuries have not been reported [3]. Estimated prevalence of Hepatitis B in the Pakistani population is 4% and Hepatitis C is 6%. The general population prevalence of HIV/AIDS in Pakistan was estimated as 0.1% while the high-risk population.

Prevalence as 1-2%. However, it is alarming to note that according to the latest figures, HIV/AIDS prevalence among Intravenous Drug Users (IDUs) has been reported to be from 7.6%-27%.

According to the statistics from Center for Injection Safety, the prevalence of HBV infection in commercial blood donors in Pakistan is 10%. For HCV infection, this prevalence is 20% for commercial blood donors. Many of these patients come for admissions, consultations, procedures and biochemical investigations to hospitals daily where they are encountered by unsuspecting HCVs [2]. Burden of work has influenced the performance and protection of the nurses. Factors, for example, gathering of new patients, turnover of patients, documentation and performing surgical methods also other works for example, blood sampling all of which are of a high recurrence in the morning shift can expand the rate of workload and every day routine of nurse's activities that increase the errors or increase risk of needle stick injury.

Although infusion practices, for example, recapping needles has been denied by the USA Occupational Safety and Health Administration's (OSHA) blood borne pathogen standards [4]. A study conducted in Lahore, Pakistan revealed that the prevalence of needle stick injury is 44% in public and 26.4% in private hospital [5]. Another study revealed that 36.6% of the total respondent had a history of NSI and 23.3% of them had at least one total NSI per year [1]. A study revealed that 60.9% had NSI during recapping of needle and 26.6% had NSI during injecting medicine or drawing blood.

A majority *i.e.* 53.1% of health care workers mentioned that lack of protective measures contributed to NSI [6]. The best ways to prevent from needle stick injuries are: Bring standard-marked, leak-proof, cut safe sharps holders. Try not to accept such containers will be accessible there. Immediately discard utilized needle and sharps, which may be defiled, in the containers. Plan for the safe taking care of and transfer of needles before.

Utilize. Secure utilized sharps containers during transport to prevent from dropping. Follow standard safety measures, avoid infection and general hand hygiene practices regularly. Report any needle stick and

different sharps harm quickly [4].

Aim of the study

This study seeks to assess the knowledge, attitudes and practices of nurses regarding needle-stick injuries, as well as strategies for their prevention, in tertiary care hospitals of Peshawar. Findings from this research will help guide the development of effective preventive measures to safeguard healthcare workers.

Materials and Methods

A cross-sectional study was conducted in the tertiary care hospitals of Peshawar including;

- Northwest General and Teaching hospital (NWGH and NWTH)
- Khyber teaching hospital (KTH)
- Nurses from medicine and surgery departments of the above hospitals.

Sampling technique

Convenient sampling was used to carry-out this research. As our sample size was 216, we calculated the percentages and divided the sample accordingly to population of KTH and NWH. Total number of nurses in KTH was 350 and NWH was 426, of which 322 were from NWGH and 104 were from NWTH. The sample size for KTH turned to be 98 and 118 for NWH.

Sample size

We used Open Epi using the formula $n = DEFF * Np(1-p) / (d^2 / Z^2 * 1 - \alpha / 2 * (N-1) + p * (1-p))$ for calculating sample size which came out to be 216 for confidence interval of 95% and confidence limit of 5%. The anticipated frequency used (p) is 26.4% [7-27] (**Figure 1**).

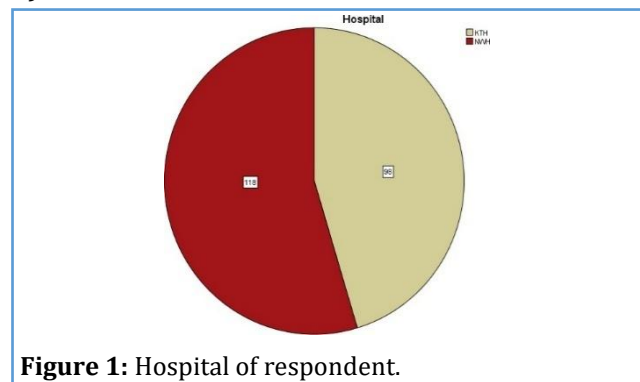


Figure 1: Hospital of respondent.

Study duration

The study duration of our research project was 6 months, from April 2021 to October 2021.

Inclusion criteria: The inclusion criteria was nurses who were willing to participate and available at the time of data collection.



Exclusion criteria: The exclusion criteria were Nurses who are not willing to participate and those who are off duty.

Data collection procedure

We first conducted a pilot study in NWH and KTH using our self-structured questionnaire. We made the necessary changes in the questionnaire according to the pilot study prior to performing the full-scale research project.

We took ethical approval from Department of Community Medicine and Department of Medical Education and Research of Northwest School of Medicine. Ethical Approvals were also taken (Annexure II, Annexure III) from the Ethical Committees of each hospital setting. Sample was nurses from medicine and surgery departments.

All the data was collected by authors. We did not face any refusals in our data collection procedure from any respondents. The hospital administration also did not hinder the process after considering our ethical approval which included our questionnaire.

Statistical Analysis

Data were entered and analyzed using SPSS version 21 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data: Means and standard deviations for continuous variables and frequencies and percentages for categorical variables.

Associations between demographic characteristics (such as gender, designation, qualification and infection control training) and outcome variables (knowledge, attitude and practice levels regarding needle-stick injuries) were assessed using the Chi-square test. A p-value of < 0.05 was considered statistically significant.

All questionnaires were completed in full and no missing data were encountered. Potential bias was minimized by:

- Conducting a pilot study to refine the questionnaire and reduce measurement errors.
- Using proportional sampling from both study sites to reduce selection bias.
- Ensuring anonymity of responses to limit reporting bias.

Results

Figure 1 shows the population of the respondents. Out of 216, 98 were from KTH and 118 from Northwest General and Teaching Hospital. The **Figure 2** show that majority of the respondents (56.48%) age range between 26 to 40 years, 29.17% age is more than 40 years and 14.35% were of age less than 25 year. Pie

charts in the **Figures 3** show the gender of respondents. Out of 216 respondents 37 were male and 179 were female. **Figure 4** shows the qualifications of respondents. Out of 216, 135 were diploma holders, 65 were bachelor holders and 16 were master's holders. Bar chart in the **Figure 5** shows the designation of respondents. Out of 216, 3 were student nurses, 130 junior staff nurses, 73 senior staff nurses, 10 in-charge nurses. The pie chart in **Figure 6** shows that majority of the respondents had less than 5 years of nursing experience with percentage amounting to 67.59%, 25.93% of nurses had experience ranging between 6 to 10 years and only 6.48% of nurses had more than 10 years of experience. Pie chart in the **Figure 7** shows the working departments of respondents. Out of 216, 138 were from medicine and 78 from the surgical department. Bar chart in the **Figure 8** shows that out of 216 respondents, 178 had attended the infection control training program while 38 had never attended. Bar chart in the **Figure 9** shows that out of 216 respondents, 57 had experienced needle stick injury while 159 never had NSI. Bar chart in the **Figure 10** shows that out of 216 respondents, 28 had experienced needle stick injury while drawing blood through injection, 11 during surgery, 9 during recapping of needle, 9 during handling uncooperative patients and 159 had never experienced needle stick injury. From **Figure 11** we can see that majority of the nurses (160) haven't received needle stick injury, 26 had received once, 16 twice and 14 received needle stick injury more than twice. As can be seen from the **Figure 12**, 212 the nurses are vaccinated against hepatitis B while only 4 haven't received hepatitis B vaccination. The pie chart in **Figure 13** shows that 93.98% of nurses have knowledge that needle stick injuries transmit HBV, HCV and HIV. 2.78% believe that HIV is transmitted by NSI, 1.85% and 1.39% have knowledge that NSI can transmit HCV and HBV respectively.

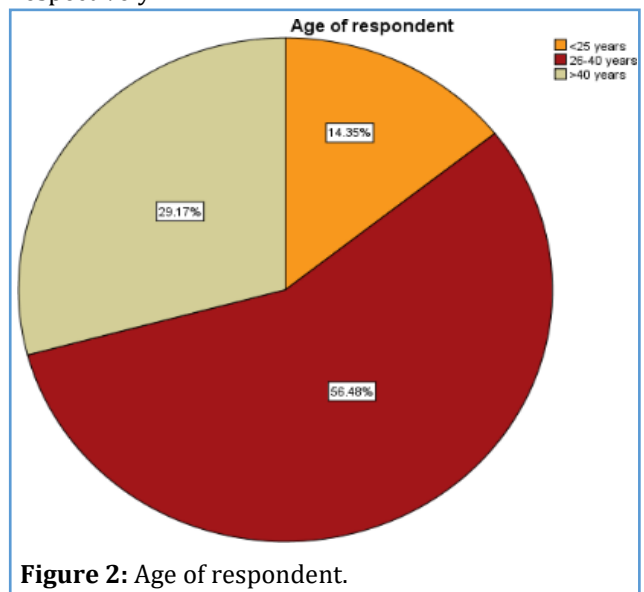


Figure 2: Age of respondent.

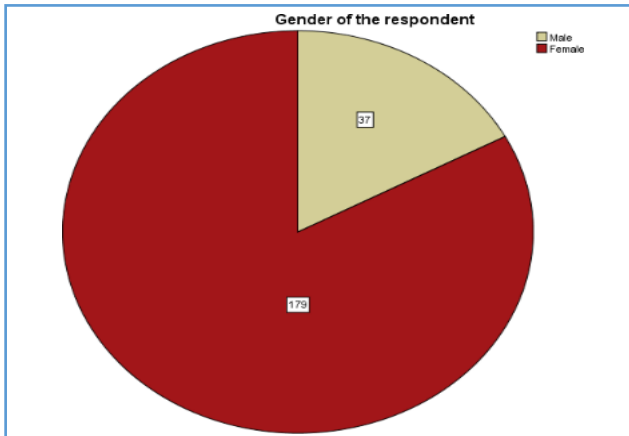


Figure 3: Gender of the respondent.

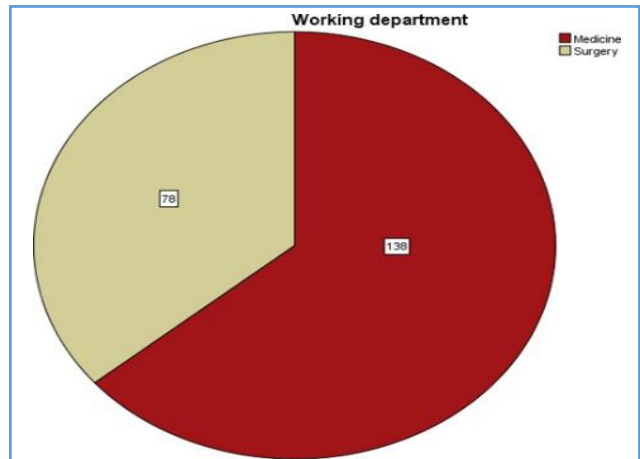


Figure 7: Working department of the respondent.

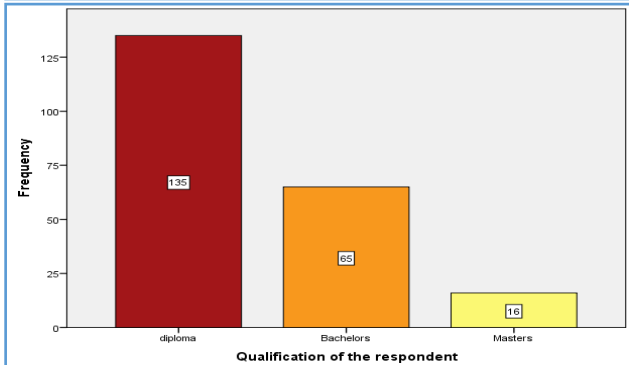


Figure 4: Qualification of the respondent.

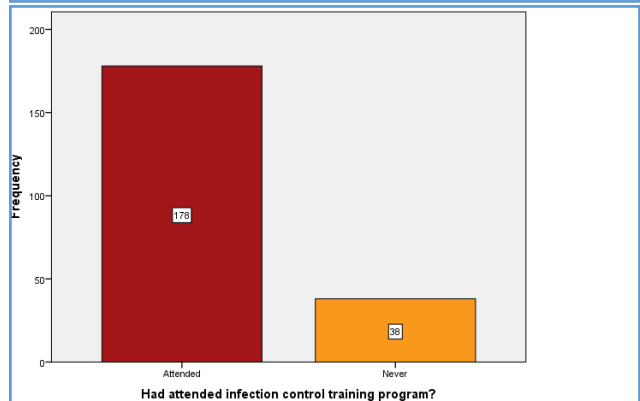


Figure 8: Had attended infection control training program?

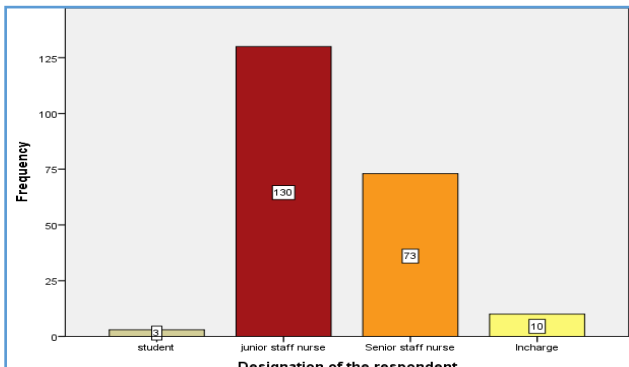


Figure 5: Designation of the respondent.

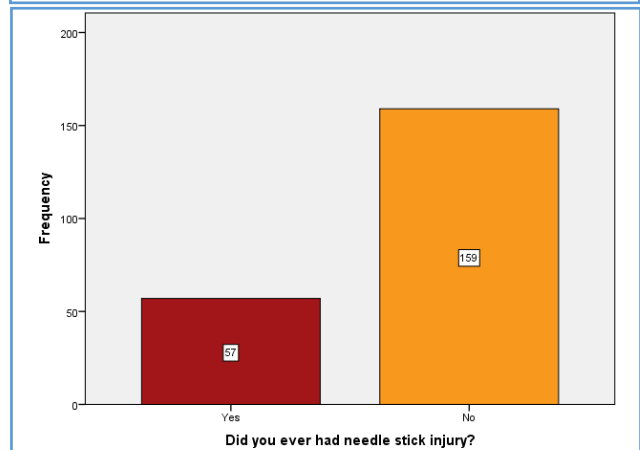


Figure 9: Did you ever have needle stick injury?

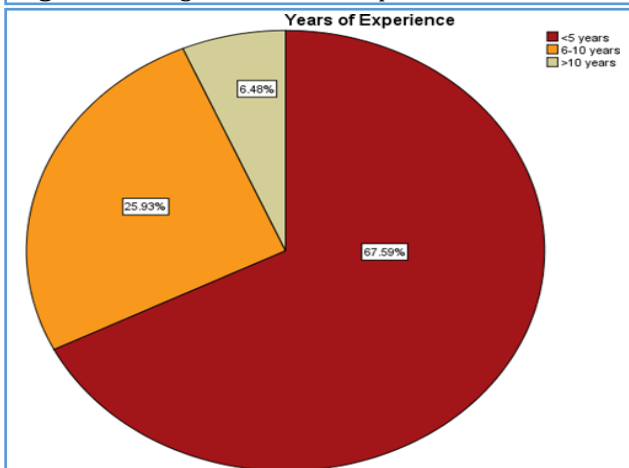


Figure 6: Years of experience of the respondent.

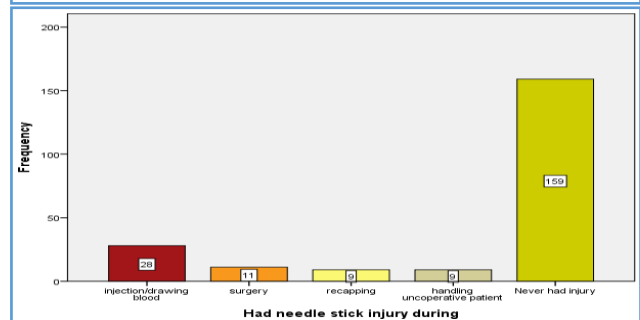


Figure 10: Had needle stick injury during?

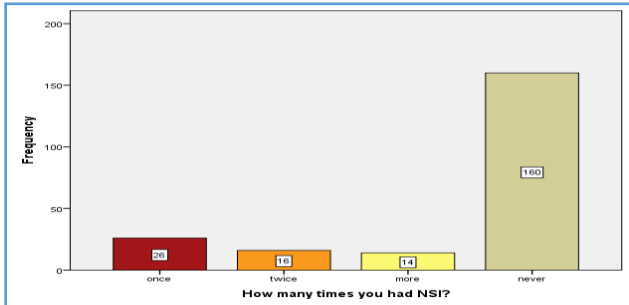


Figure 11: How many times you had needle stick injury?

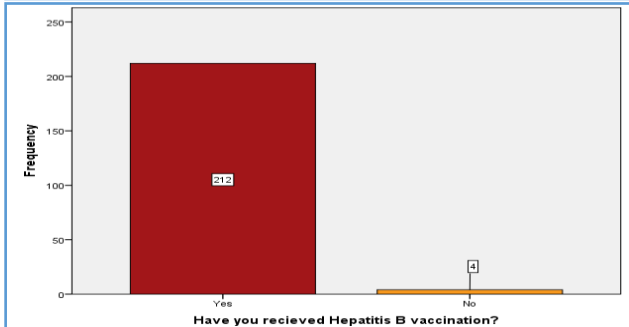


Figure12: Have you received hepatitis B vaccination?

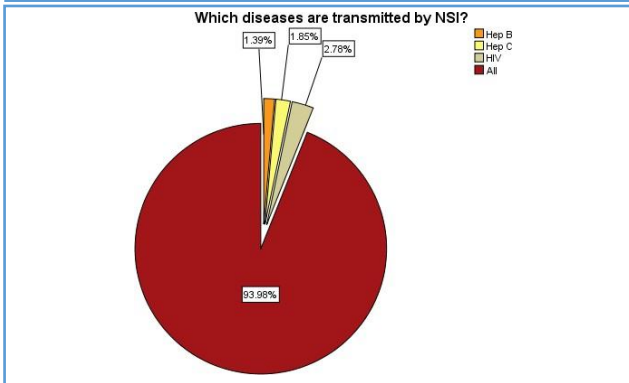


Figure 13: Which diseases are transmitted by needle stick injury?

From **Table 1** and **Table 2**, it is revealed that majority of nurses had knowledge that all (HBV, HCV, HIV) are transmitted by NSI with number amounting to 203. 6 of the respondents indicated that only HIV is transmitted, 4 reported that HCV is transmitted and only 4 responded that HBV is transmitted by NSI with mean of 3.89 and standard deviation 0.465.

Table1: Which diseases are transmitted by NSI?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hep B	3	1.4	1.4	1.4
	Hep C	4	1.9	1.9	3.2
	HIV	6	2.8	2.8	6
	All	203	94	94	100
	Total	216	100	100	

Table2: Statistics: Which diseases are transmitted by NSI?

Valid	216
N	
Missing	0
Mean	3.89
Std. Deviation	0.465
Minimum	1
Maximum	4

From the **Figure 14** we see that majority of the respondents have excellent attitude, 12.50% have good attitude, 0.46% have average attitude and 0.46% have poor attitude regarding needle stick injuries.

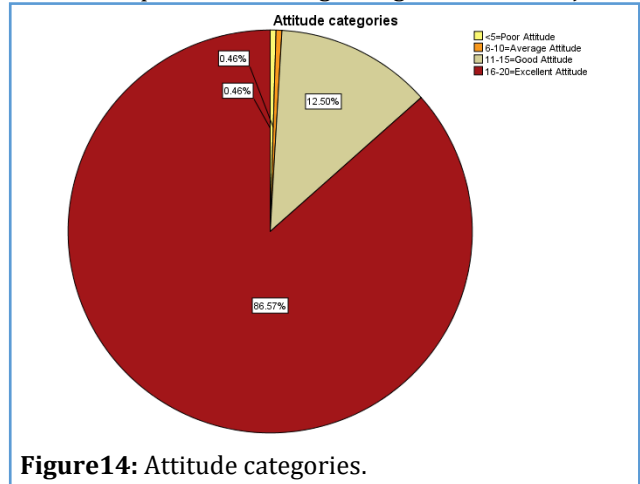


Figure14: Attitude categories.

From **Table 3** and **Table 4**, it is revealed that majority of nurses 187 (86.6%) had excellent attitude, 27 (12.5%) of respondents had good attitude, 1(0.5%) of nurses had average and 1 (0.5%) had poor attitude.

Table 3: Attitude level.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=5=Poor Attitude	1	0.5	0.5	0.5
	6-10=Average Attitude	1	0.5	0.5	0.9
	11-15=Good Attitude	27	12.5	12.5	13.4
	16-20=Excellent Attitude	187	86.6	86.6	100
	Total	216	100	100	



Table 4: Statistics: Attitude categories.

Valid	216
N	
Missing	0
Mean	3.85
Std. Deviation	0.405
Minimum	1
Maximum	4

Figure 15 shows that 79.17% of nurses had good practice of needle stick injuries, 17.13% of respondents had excellent practice and 3.70% had average practice.

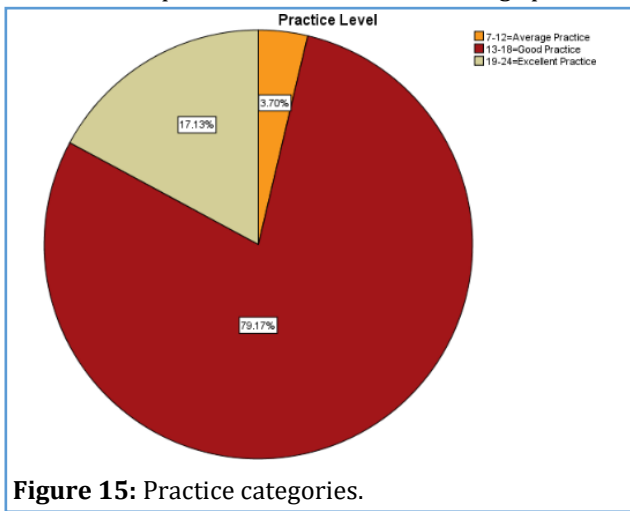


Figure 15: Practice categories.

Table 5 and Table 6, reveals that out of 216 respondents, 171 had good practice, 37 had excellent practice while only 8 respondents had average level of practice regarding needle stick injuries with mean of 3.13 and standard deviation 0.437.

Table 5: Practice level.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7-12=Average Practice	8	3.7	3.7	3.7
	13-18=Good Practice	171	79.2	79.2	82.9
	19-24=Excellent Practice	37	17.1	17.1	100
	Total	216	100	100	

Table 6: Statistics: Practice categories.

Valid	216
N	
Missing	0
Mean	3.13
Std. Deviation	0.437
Minimum	2
Maximum	4

Figure 16 shows that majority of the respondents (99.54%) were aware of the prevention strategies and only 0.46% of the respondents did not know about the strategies that can help in prevention of NSI.

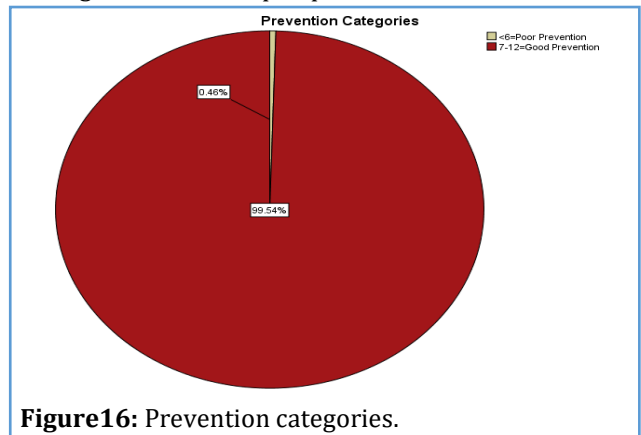


Figure 16: Prevention categories.

Table 7 and Table 8, shows that out of 216 respondents, 215 were aware of the preventive strategies and only 1 respondent had poor prevention awareness with mean of 2 and standard deviation 0.068.

Table 7: Prevention categories.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<6= Poor Prevention	1	0.5	0.5	0.5
	7-12=Good Prevention	215	99.5	99.5	100
	Total	216	100	100	

Table 8: Statistics: Prevention categories.

Valid	216
Missing	0
Mean	2
Std. deviation	0.068
Minimum	1
Maximum	2



Table 9 shows that out of 216 respondents, 3 (1.4%) were having knowledge about Hep B transmission through NSI, out of which 1 (2.7%) male and 2 (1.1%) were females, 4 (1.9%) were having knowledge about Hep C transmission out of which 1 (2.7%) male and 3 (1.7%) were female, 6 (2.8%) were having knowledge about HIV transmission out of which 2 (5.4%) were male and 4 (2.2%) were females, 203 (94%) were having knowledge about transmission of all diseases out of which 33 (89.2%) were males and 170 (95%) were females. The P value 0.583 is more than 0.05, which shows that there is no significant statistical difference between gender of respondents and their knowledge about diseases transmitted by NSIs. **Table 10** shows that out of 216 respondents, 1 (0.5%) was having poor attitude out of which 1 was female, 1 (0.5%) having average attitude out of which 1 was female, 27 (12.5%) having good attitude which 8 (21.6%) were males and 19 (10.6%) were females, 187 (86.6%) were having excellent attitude out of which 29 (78.4%) were

male and 158 (88.3%) were females. The p value 0.292 is more than 0.05 which shows there is no significant statistical difference in association between gender of respondents and their attitude level. **Table 11** shows that out of 216 respondents, 8 (3.7%) were having average practice out of which 4 (10.8%) were males and 4 (2.2%) were females, 171 (79.2%) were having good practice out of which 18 (48.6%) were males and 153 (85.5%) were females, 37 (17.1%) were having excellent practice out of which 15 (40.5%) were males and 22 (12.3%) were females. The p value 0.000 is less than 0.05, which shows significant statistical difference in association between gender of respondents and their practice level. **Table 12** shows that out of 216 respondents, 1 (0.5%) was having poor prevention and was female, 215 (99.5%) were having good prevention, out of which 37 were males and 178 were females. The p value 0.649 is more than 0.05, which shows there is no significant statistical difference in association between gender of respondents and their prevention level.

Table 9: Association between gender of the respondent and their knowledge regarding the diseases transmitted by needle stick injuries.

			Which diseases are transmitted by NSI				Total	Chi square value
			Hep B	Hep C	HIV	All		P value
Gender of the respondent	Male	Count	1	1	2	33	37	1.948
		% within Gender of the respondent	2.70%	2.70%	5.40%	89.20%	100.00%	
	Female	Count	2	3	4	170	179	0.583
		% within Gender of the respondent	1.10%	1.70%	2.20%	95.00%	100.00%	
Total	Count	3	4	6	203	216		
	% within Gender of the respondent	1.40%	1.90%	2.80%	94.00%	100.00%		

Table 10: Association between gender of the respondent and their attitude level.

			Attitude Categories				Total	Chi square value
			<5= Poor Attitude	6-10=Average Attitude	11-15=Good Attitude	16-20=Excellent Attitude		P value
Gender of the respondent	Male	Count	0	0	8	29	37	3.732
		% within Gender of the respondent	0.00%	0.00%	21.60%	78.40%	100.00%	
	Female	Count	1	1	19	158	179	0.292
		% within Gender of the respondent	0.60%	0.60%	10.60%	88.30%	100.00%	
Total	Count	1	1	27	187	216		
	% within Gender of the respondent	0.50%	0.50%	12.50%	86.60%	100.00%		



Table 11: Association between gender of the respondent and practice level.

			Practice categories			Total	Chi square value
			7-12=Average Practice	13-18=Good Practice	19-24=Excellent Practice		P value
Gender of the respondent	Male	Count	4	18	15	37	25.627
		% within gender of the respondent	10.80%	48.60%	40.50%	100.00%	
	Female	Count	4	153	22	179	
		% within gender of the respondent	2.20%	85.50%	12.30%	100.00%	
Total	Count	8	171	37	216		
	% within gender of the respondent	3.70%	79.20%	17.10%	100.00%		

Table 12: Association between gender of the respondent and prevention categories.

			Prevention Categories		Total	Chi square value
			<6= Poor Prevention	7-12= Good Prevention		P value
Gender of the respondent	Male	Count	0	37	37	0.208
		% within gender of the respondent	0.00%	100.00%	100.00%	
	Female	Count	1	178	179	0.649
		% within gender of the respondent	0.60%	99.40%	100.00%	
Total	Count	1	215	216		
	% within gender of the respondent	0.50%	99.50%	100.00%		

Table 13 shows that out of 216 respondents, 3 (1.4%) were having knowledge about Hep B transmission through NSI, out of which 2 were diploma holders and 1 had done masters, 4 (1.9%) were having knowledge about Hep C transmission, out of which 2 were diploma holders and 2 had done bachelors, 6 (2.8%) were having knowledge about HIV transmission out of which 6 were diploma holders, 203 (94%) were having knowledge about transmission of all diseases out of which 125 were diploma holders 63 had done bachelors and 15 had done masters. The p value 0.221 is more than 0.05, which shows no significant statistical difference in association between qualification of

respondents and their level of knowledge. **Table 14** shows that out of 216 respondents, 1 (0.5%) having poor attitude, out of which 1 had done bachelors, 1 (0.5%) having average attitude out of which 1 was diploma holder, 27(12.5%) having good attitude out of which 15 were diploma holders, 9 had done bachelors 3 had done masters, 187 (86.6%) having excellent attitude out of which 119 were diploma holders, 55 had done bachelors, 13 had done masters. The p value 0.698 is more than 0.05, which shows no significant statistical difference in association between qualification of respondents and their attitude level.



Table 13: Association between qualification of the respondents and their knowledge of diseases transmitted by needle stick injury.

			Which diseases are transmitted by NSI				Total	Chi square value
			Hep B	Hep C	HIV	All		P value
Qualification of the respondent	diploma	Count	2	2	6	125	135	8.244
		% within Qualification of the respondent	1.50%	1.50%	4.40%	92.60%	100.00%	
	Bachelors	Count	0	2	0	63	65	0.221
		% within Qualification of the respondent	0.00%	3.10%	0.00%	96.90%	100.00%	
	Masters	Count	1	0	0	15	16	0.221
		% within Qualification of the respondent	6.30%	0.00%	0.00%	93.80%	100.00%	
Total	Count	3	4	6	203	216		
	% within Qualification of the respondent	1.40%	1.90%	2.80%	94.00%	100.00%		

Table 14: Association between qualification of the respondent and attitude level.

			Attitude Categories				Total	Chi square value
			<5= Poor Attitude	6-10= Average Attitude	11-15=Good Attitude	16-20=Excellent Attitude		P value
Qualification of the respondent	diploma	Count	0	1	15	119	135	3.845
		% within qualification of the respondent	0.00%	0.70%	11.10%	88.10%	100.00%	
	Bachelors	Count	1	0	9	55	65	0.698
		% within qualification of the respondent	1.50%	0.00%	13.80%	84.60%	100.00%	
	Masters	Count	0	0	3	13	16	0.698
		% within qualification of the respondent	0.00%	0.00%	18.80%	81.30%	100.00%	
Total	Count	1	1	27	187	216		
	% within qualification of the respondent	0.50%	0.50%	12.50%	86.60%	100.00%		

Table 15 shows that out of 216 respondents, 8 (3.7%) were having average practice, out of which 5 were diploma holders, 1 had done bachelors and 2 had done masters, 171 (79.2%) were having good practice, out of which 113 were diploma holders, 49 had done bachelors and 9 had done masters, 37 (17.1%) were

having excellent practice, out of which 17 were diploma holders, 15 had done bachelors and 5 had done masters. The p value 0.032 is less than 0.05, which shows significant statistical difference in association between qualification of respondents and their practice level.



Table 15: Association between qualification of respondent and their practice level.

			Practice categories			Total	Chi square value
			7-12=Average Practice	13-18=Good Practice	19-24=Excellent Practice		P value
Qualification of the respondent	diploma	Count	5	113	17	135	
		% within qualification of the respondent	3.70%	83.70%	12.60%	100.00%	
	Bachelors	Count	1	49	15	65	10.522
		% within qualification of the respondent	1.50%	75.40%	23.10%	100.00%	0.032
	Masters	Count	2	9	5	16	
		% within qualification of the respondent	12.50%	56.30%	31.30%	100.00%	
Total		Count	8	171	37	216	
		% within qualification of the respondent	3.70%	79.20%	17.10%	100.00%	

Table 16 shows that out of 216 respondents, 1 (0.5%) were having poor prevention and was bachelor holder, 215 (99.5%) had good prevention, out of which 135 were diploma holders, 64 were bachelor holders

and 16 had done masters. The p value 0.311 is more than 0.05, which shows there is significant statistical difference in association between qualification of respondents and their prevention level.

Table 16: Association between qualification of respondent and their prevention level.

			Prevention Categories		Total	Chi square value
			<6= Poor Prevention	7-12=Good Prevention		P value
Qualification of the respondent	diploma	Count	0	135	135	
		% within qualification of the respondent	0.00%	100.00%	100.00%	2.334
	Bachelors	Count	1	64	65	0.311
		% within qualification of the respondent	1.50%	98.50%	100.00%	
	Masters	Count	0	16	16	
		% within qualification of the respondent	0.00%	100.00%	100.00%	
Total		Count	1	215	216	
		% within qualification of the respondent	0.50%	99.50%	100.00%	

Table 17 shows that out of 216 respondents, 3 (1.4%) were having knowledge about Hep B transmission, out of which 2 were junior staff nurses, 1 senior staff nurse, 4 (1.9%) were having knowledge about Hep C transmission, out of which 3 were junior staff nurses, 1 senior staff nurse, 6 (2.8%) were having knowledge about HIV, all 6 were junior staff nurses, 203 (94%) were having knowledge about transmission of all

diseases, out of which 3 were student nurses, 119 junior staff nurses, 71 senior staff nurses and 10 were in-charge nurses.

The p value 0.846 is more than 0.05, which shows no significant statistical difference in association between designation of respondents and their level of knowledge.



Table 17: Association between designation of respondent and their knowledge of diseases transmitted by needle stick injury.

			Which diseases are transmitted by NSI				Total	Chi square value
			Hep B	Hep C	HIV	All		P value
Designation of the respondent	student	Count	0	0	0	3	3	
		% within designation of the respondent	0.00%	0.00%	0.00%	100.00%	100.00%	
	Junior staff nurse	Count	2	3	6	119	130	4.865
		% within designation of the respondent	1.50%	2.30%	4.60%	91.50%	100.00%	0.846
	Senior staff nurse	Count	1	1	0	71	73	
		% within designation of the respondent	1.40%	1.40%	0.00%	97.30%	100.00%	
	In-charge	Count	0	0	0	10	10	
		% within designation of the respondent	0.00%	0.00%	0.00%	100.00%	100.00%	
Total	Count	3	4	6	203	216		
	% within designation of the respondent	1.40%	1.90%	2.80%	94.00%	100.00%		

Table 18 shows that out of 216 respondents, 1 (0.5%) having poor attitude and was junior staff nurse, 1 (0.5%) having average attitude and was junior staff nurse, 27 (12.5%) were having good attitude, out of which 13 were junior staff nurse, 8 were senior staff nurse, 6 were in-charge nurses, 187 (86.6%) were

having excellent attitude, out of which 3 were students, 115 junior staff nurse, 65 senior staff nurse, 4 in-charge nurses. The p value 0.006, is less than 0.05, This shows significant statistical difference in association between designation of respondents and their attitude level.

Table 18: Association of designation of respondents and their attitude level.

			Attitude Categories				Total	Chi square value
			<5= Poor Attitude	6-10= Average Attitude	11-15=Good Attitude	16-20=Excellent Attitude		P value
Designation of the respondent	student	Count	0	0	0	3	3	
		% within designation of the respondent	0.00%	0.00%	0.00%	100.00%	100.00%	23.21
	Junior staff nurse	Count	1	1	13	115	130	0.006
		% within designation of the respondent	0.80%	0.80%	10.00%	88.50%	100.00%	
	Senior staff nurse	Count	0	0	8	65	73	
		% within designation of the respondent	0.00%	0.00%	11.00%	89.00%	100.00%	
	In-charge	Count	0	0	6	4	10	
		% within designation of the respondent	0.00%	0.00%	60.00%	40.00%	100.00%	
Total	Count	1	1	27	187	216		
	% within designation of the respondent	0.50%	0.50%	12.50%	86.60%	100.00%		



In **Table 19**, we see that of the total respondents, 8 (3.7%) had average practice of NSI, of which junior staff nurses were 6 and 2 were senior staff nurses. 171 (79.2%) of the respondents had good practice of NSI, of which 3 were students, 103 were junior staff nurses, 57 were senior staff nurses and 8 were in-charge. 37

(17.1%) of the respondents had excellent practice regarding NSI, of which 21 were junior staff nurses, 14 were senior staff nurses and 2 were in-charge. The P value 0.925, which is more than 0.05, shows that there is no significant statistical difference between designation of the respondents and their practice level.

Table 19: Association between designation of respondent and their practice level.

			Practice categories			Total	Chi square value
			7-12=Average Practice	13-18=Good Practice	19-24=Excellent Practice		P value
Designation of the respondent	student	Count	0	3	0	3	
		% within designation of the respondent	0.00%	100.00%	0.00%	100.00%	
	Junior staff nurse	Count	6	103	21	130	1.946
		% within designation of the respondent	4.60%	79.20%	16.20%	100.00%	0.925
	Senior staff nurse	Count	2	57	14	73	
		% within designation of the respondent	2.70%	78.10%	19.20%	100.00%	
	In-charge	Count	0	8	2	10	
		% within designation of the respondent	0.00%	80.00%	20.00%	100.00%	
Total	Count	8	171	37	216		
	% within designation of the respondent	3.70%	79.20%	17.10%	100.00%		

In **Table 20**, we see that of the total respondents, 1 (0.5%) had poor prevention of NSI and was in-charge. 215(99.5%) of the respondents had good prevention of NSI, of which 3 were students, 103 were junior staff nurses, 73 were senior staff nurses and 9 were in-

charge. The P value 0.000, which is less than 0.05, shows that there is significant statistical difference between designation of the respondents and their prevention level.

Table 20: Association between designation of respondent and their prevention level.

			Prevention Categories		Total	Chi square value
			<6=Poor Prevention	7-12=Good Prevention		P value
Designation of the respondent	Student	Count	0	3	3	
		% within designation of the respondent	0.00%	100.00%	100.00%	20.696
	Junior staff nurse	Count	0	130	130	0
		% within designation of the respondent	0.00%	100.00%	100.00%	



	Senior staff nurse	Count	0	73	73	
		% within designation of the respondent	0.00%	100.00%	100.00%	
	In-charge	Count	1	9	10	
		% within designation of the respondent	10.00%	90.00%	100.00%	
Total		Count	1	215	216	
		% within designation of the respondent	0.50%	99.50%	100.00%	

Table 21 shows that out of 216 respondents, 3 (1.45%) were having knowledge about Hep B transmission, out of which 3 were of surgical department, 4 (1.9%) having knowledge about Hep C transmission, out of which 2 were of medical and 2 were of surgical department, 6 (2.8%) were having knowledge about HIV transmission, out of which 5 were

of medical department and 1 surgical department, 203 (94%) having knowledge about transmission of all diseases, out of which 131 of medical and 72 were of surgical department. The p value 0.083 is more than 0.05 which shows no significant statistical difference in association between working department and level of knowledge.

Table 21: Association between working department of respondent and their knowledge of disease transmitted by needle stick injury.

			Which diseases are transmitted by NSI				Total	Chi square value
			Hep B	Hep C	HIV	All		P value
Working department	Medicine	Count	0	2	5	131	138	
		% within working department	0.00%	1.40%	3.60%	94.90%	100.00%	6.662
	Surgery	Count	3	2	1	72	78	0.083
		% within working department	3.80%	2.60%	1.30%	92.30%	100.00%	
Total		Count	3	4	6	203	216	
		% within working department	1.40%	1.90%	2.80%	94.00%	100.00%	

Table 22 shows that out of 216 respondents, 1 (0.5%) having poor attitude and was from medical department, 1 (0.5%) having average attitude and was from surgical department, 27 (12.5%) having good attitude, out of which 17 were from medical department and 10 were from surgical department, 187 (86.6%)

having excellent attitude, out of which 120 from medical department and 67 from surgical department. The p value 0.503 is more than 0.05, which shows there is no significant statistical difference in association between working department and attitude levels.



Table 22: Association between working department of respondent and their attitude level.

			Attitude Categories				Total	Chi square value
			<5= Poor Attitude	6-10= Average Attitude	11-15= Good Attitude	16-20= Excellent Attitude		P value
Working department	Medicine	Count	1	0	17	120	138	2.531
		% within working department	0.70%	0.00%	12.30%	87.00%	100.00%	
	Surgery	Count	0	1	10	67	78	0.503
		% within working department	0.00%	1.30%	12.80%	85.90%	100.00%	
Total		Count	1	1	27	187	216	
		% within working department	0.50%	0.50%	12.50%	86.60%	100.00%	

Table 23 shows that out of 216 respondents, 8 (3.7%) were having average practice, out of which 5 were from medical department and 3 were from surgical department, 171 (79.2%) were having good practice, out of which 107 from medical and 64 from surgical department, 37 (17.1%) were having excellent

practice, out of which 26 from medical and 11 from surgical department. The p value 0.674 is more than 0.05, which shows there is no significant statistical difference in association between working department and level of practice.

Table 23: Association between working department of respondent and their practice level.

			Practice categories			Total	Chi square value
			7-12=Average Practice	13-18= Good Practice	19-24=Excellent Practice		P value
Working department	Medicine	Count	5	107	26	138	0.788
		% with in working department	3.60%	77.50%	18.80%	100.00%	
	Surgery	Count	3	64	11	78	0.674
		% with in working department	3.80%	82.10%	14.10%	100.00%	
Total		Count	8	171	37	216	
		% with in working department	3.70%	79.20%	17.10%	100.00%	

Table 24 shows that out of 216 respondents, 1 (0.5%) having poor prevention and was from medicine department, 215 (99.5%) were having good prevention, out of which 137 were from medicine department and

78 were from surgical department. The p value 0.45 is more than 0.05, which shows there is no significant statistical difference in association between working department and prevention levels.



Table 24: Association between working department of respondent and their prevention level.

			Prevention Categories		Total	Chi square value
			<6=Poor Prevention	7-12=Good Prevention		P value
Working department	Medicine	Count	1	137	138	0.568
		% with in working department	0.70%	99.30%	100.00%	
	Surgery	Count	0	78	78	0.451
		% with in working department	0.00%	100.00%	100.00%	
Total	Count	1	215	216		
	%with in working department	0.50%	99.50%	100.00%		

Table 25 shows that out of 216 respondents, 3 (1.4%) had knowledge of Hep B transmission, all 3 had attended infection control training program, 4 (1.9%) had knowledge about Hep C transmission, out of which 2 had attended training while 2 had not, 6 (2.8%) had knowledge about HIV transmission out, of which 1 had attended training while 5 had not, 203 (94%) had

knowledge about all diseases' transmission, out of which 172 had attended training and 31 had not. The p value 0.000 is less than 0.05, which shows there is significant statistical difference in association between nurses attended the training and their level of knowledge.

Table 25: Association between whether respondent have attended infection control training program and their knowledge of diseases transmitted by needle stick injury.

			Which diseases are transmitted by NSI				Total	Chi square value
			Hep B	Hep C	HIV	All		P value
Had attended infection control training program	Attended	Count	3	2	1	172	178	22.179
		% within had attended infection control training program	1.70%	1.10%	0.60%	96.60%	100.00%	
	Never	Count	0	2	5	31	38	0
		% within had attended infection control training program	0.00%	5.30%	13.20%	81.60%	100.00%	
Total	Count	3	4	6	203	216		
	%within had attended infection control training program	1.40%	1.90%	2.80%	94.00%	100.00%		

Table 26 shows that out of 216 respondents, 1 (0.5%) having poor attitude and had attended the infection control training program, 1 (0.5%) having average attitude and had attended the training, 27 (12.5%) having good attitude, out of which 22 had attended the training while 5 had not, 187 (86.6%)

having excellent attitude, out of which 154 had attended the training while 33 had not. The p value 0.931, is more than 0.05, which shows there is no significant statistical difference in association between nurses attended the training and their level of attitude.



Table 26: Association between whether respondent have attended infection control training program and their attitude level.

			Attitude Categories				Total	Chi square value
			<5= Poor Attitude	6-10=Average Attitude	11-15=Good Attitude	16-20=Excellent Attitude		P value
Had attended infection control training program	Attended	Count	1	1	22	154	178	
		% within had attended infection control training program	0.60%	0.60%	12.40%	86.50%	100.00%	
	Never	Count	0	0	5	33	38	0.443
		% within had attended infection control training program	0.00%	0.00%	13.20%	86.80%	100.00%	0.931
Total		Count	1	1	27	187	216	
		% within had attended infection control training program	0.50%	0.50%	12.50%	86.60%	100.00%	

Table 27 shows that out of 216 respondents, 8 (3.7%) having average practice, out of which 6 had attended the infection control training program and 2 had not, 171 (79.2%) having good practice, out of which 141 had attended the training and 30 had not, 37

(17.1%) having excellent practice, out of which 31 had attended the training and 6 had not. The p value 0.839 is more than 0.05, which shows there is no significant statistical difference in association between nurses who attended the training and their level of practice.

Table 27: Association between whether respondent have attended infection control training program and their practice level.

			Practice Categories			Total	Chi square value
			7-12 =Average Practice	13-18 = Good Practice	19-24 =Excellent Practice		P value
Had attended infection control training program	Attended	Count	6	141	31	178	
		% within Had attended infection control training program	3.40%	79.20%	17.40%	100.00%	
	Never	Count	2	30	6	38	0.351
		% within Had attended infection control training program	5.30%	78.90%	15.80%	100.00%	0.839
Total		Count	8	171	37	216	
		% within Had attended infection control training program	3.70%	79.20%	17.10%	100.00%	



Table 28 shows that out of 216 respondents, 1 (0.5%) having poor prevention and have never attended the infection control training program and 2 had not, 215 (99.5%) had good prevention, out of which 177 had

attended the training and 38 had not. The p value 0.643 is more than 0.05, which shows there is no significant statistical difference in association between nurses who attended the training and their level of prevention.

Table 28: Association between whether respondent have attended infection control training program and their prevention level.

			Prevention Categories		Total	Chi square value
			<6=Poor Prevention	7-12=Good Prevention		P value
Had attended infection control training program	Attended	Count	1	177	178	0.214
		% within had attended infection control training program	0.60%	99.40%	100.00%	
	Never	Count	0	38	38	0.643
		% within had attended infection control training program	0.00%	100.00%	100.00%	
Total		Count	1	215	216	
		% within had attended infection control training Program	0.50%	99.50%	100.00%	

Discussion

In this article the discussion is about the needle stick injuries causes many problems and this issue need to be addressed for preventing various kind of blood borne diseases amongst the nurses or health care workers by providing them services in healthcare institution in Pakistan. The healthcare providers who have an occupational exposure are more at risk for acquiring blood borne infections. The risk depends of the level of number of patients with that infection in the health care facilities and the precautions the health care workers observe while dealing these patients [28]. NIs are a potentially serious threat to health care workers. Its high prevalence exposes them to risk of acquiring life threatening blood borne pathogens. In this study 73.61% of nurses experienced needle stick injury in their professional life. In comparison to a study conducted in Aga Khan University Hospital, 45% of the participants had received NSI of which 29% were nurses [29].

Knowledge

We assessed knowledge of the respondents on the basis, if they were aware about the diseases transmitted by NSI, 93.98% of nurses are aware of the transmission

of HBV, HCV and HIV. The risk of getting hepatitis B, C and HIV from NSIs was well known amongst both doctors and nurses (>88%) [29]. 2.78% of nurses believed that only HIV is transmitted by NSI, 1.39% were aware that HBV is transmitted by NSI and 1.85% said that only HCV is transmitted by NSI. The knowledge of nurses regarding diseases' transmission by NSI was better than a study conducted in Islamabad which was 77% [30]. Similarly, a study conducted in Rawalpindi showed that only 13.3% and 10% of HCW were unaware of the fact that HBV and HCV respectively [31,32].

Attitude

In our study, majority of the respondents 86.57%, of nurses had excellent attitude regarding NSI. 74.54% of nurses responded positively, when they were asked if needles should be bent/recapped/discarded after use. A study done in Central India, where 53.3% of respondents think that recapping of needles is dangerous [33]. 90.28 % of nurse's believed that if they ever encounter NSI, their immediate action will be to wash hands with soap and water. Regarding post exposure actions, 92% health care workers washed the wound with running water and drew blood from the pricked site, 23% also applied anti septic solution [30].



Almost similar responses were observed in the University of Toronto where 87% medical students washed wound with water and anti-septic solution [34]. 83.80% of nurses believe that NSI should be reported as compared to an Indian, 86.2 % of participants were of the idea that reporting each and every case of needle stick injury is essential [33].

Only 10.8% of the NSIs were reported according to a study of Peshawar [31]. 35.19 % were concerned about NSI from a known case of HBV/HCV/HIV. From a study of Aga Khan University Hospital, 81% of HCWs who had a NSI were aware of the clinical diagnosis of the patient in the handling of whom the exposure occurred [29]. 56.94% of the participants said that post exposure prophylaxis is really necessary. While in another study, only 10% knew about post exposure prophylaxis. Similarly in another study, two third of the participants exactly knew the post exposure prophylaxis protocol [29].

Practice

According to our study findings, 79.17 % of nurses had good practice and 17.13% had excellent practice of NSI. 67.59% of nurses always practice of using tray for keeping syringes. Similar findings from a study showed that 61.1% of the workers used tray to keep syringes [31]. 42.59% of nurses always used gloves during procedures. 90% nurses wear gloves and masks routinely, only 4% health care workers used gloves for phlebotomy procedures, while a study from Rawalpindi reported 49% people who used gloves for phlebotomy procedures [30,33,35]. 62.50% of nurses had never practiced bending / breaking needles by hand. 61.57% of the participants had never practiced moving around with uncapped needles. 62.50% of the respondents always use sharp disposal container. Another study showed that use of safety containers for disposal of contaminated medical waste was reported by 30% of respondents [7]. 56.94% had received sharps related training. According to a study conducted in Peshawar, 33% of the participants had received sharp related training [31].

Strategies for prevention

We asked our respondents about what strategies should be adopted to prevent NSI, almost all (99.54%) of nurses were well aware of the preventive strategies. From a study conducted in Iran, 71.7 % of the participants attained a moderate-to-high score for the NSIs preventive behaviors.

94.91% of nurses think that training of HCW can be helpful in prevention of NSI. 88.89% of nurses believed that avoiding needle recap can prevent NSI. To avoid further NSIs due to recapping, policy of no recapping of

used syringes should be strictly implemented unless as a for means of recapping is available as recommended by the UK department of health [29]. 93.06% of the respondents said that use of tray to carry syringes can prevent NSI. 89.35% of participants were aware that use of sharps disposal container scan helps prevent NSI. A study conducted in Nigeria revealed that 76.1% of the participants had correct information that used syringes and needles should be discarded in a sharp waste box.

87.04% of the respondents believe that avoiding needle breaking/bending by hand can prevent NSI. 85.65% of nurses responded that avoiding leaving open syringes can help prevent NSI. According to a study, there are different strategies to prevent infections due to sharps injuries, including training HCWs and reduction of invasive Procedures. In our study, only 13.2 % of NSI could have been prevented by organization all measures [15].

Limitations

Limitations of our study include our study type which is a cross-sectional study, the weakest observational study which captures information based on data gathered for a specific point in time. The timing of the snapshot is not guaranteed to be representative. The data for our variables is gathered from a pool of participants with varied characteristics such as age, gender, designation and years of experience in nursing. There may be variables we failed to reflect on, which also affects our results. We also used convenience sampling as our sampling technique and relied on the data from the population conveniently available to participate in our study. The sample may not be representative of the entire population because of this sampling bias.

Conclusions

This study was conducted to assess the knowledge, attitude, practices and prevention strategies regarding needle Stick Injuries (NSIs) among nurses in tertiary care hospitals of Peshawar. The findings highlight that the majority of nurses were aware that NSIs transmit HBV, HCV and HIV, although a small proportion believed only one of these diseases could be transmitted. This shows that while knowledge was generally high, there are still gaps that require attention.

NSIs remain one of the most important occupational health hazards for nurses, with alarmingly high rates that expose them to blood-borne infections. Most respondents demonstrated excellent attitudes and good preventive practices, but some nurses showed poor practices and careless attitudes, which increase the risk of exposure.

Greater awareness of preventive strategies was



observed, with nearly all respondents recognizing methods such as avoiding recapping, using sharps containers and adhering to safety measures. However, challenges persist due to gaps in training, limited resources and workforce-related issues. Strengthening policies, providing safety-engineered devices and regular training are essential to further reduce the risk of NSIs.

Acknowledgments

The authors would like to acknowledge the support and cooperation of their respective institutions and their fellow colleagues. We are grateful to the healthcare staff and nurses of the participating hospitals for their valuable assistance during data collection. The authors also extend their thanks to colleagues, mentors, and technical staff who provided guidance and administrative support. No external funding or grants were received for this study.

Declarations

Human ethics and consent to participate

Ethical approval for this study was obtained from the Ethics Committee of Northwest School of Medicine, Peshawar, Pakistan (Ref. No. NWSM/Res/let/46, dated 23-08-2021). Administrative permissions for data collection were granted by the participating hospitals, including Khyber Teaching Hospital, Northwest General Hospital and Northwest Teaching Hospital. Written informed consent was obtained from all participants prior to their inclusion in the study.

Consent to publish

All authors have read and approved the final version of the manuscript and consent to its publication.

Funding

The authors received no financial support for the research, authorship or publication of this article.

Conflicts of interest

The authors declare no conflicts of interest related to this work.

Clinical trial number

Not applicable.

Trial registration

Not applicable.

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