

Original Research Article

Prevalence of needle stick injury and its associated factors among nursing staff working at a tertiary care hospital of North India

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ABSTRACT

Background: Needle stick injury is a serious concern for healthcare workers as it poses a major risk for HIV, Hepatitis and other diseases transmission. The study aimed to determine the prevalence of NSI and its associated factors among nursing staff working at SKIMS, a tertiary care hospital of Kashmir, India.

Methods: A descriptive cross-sectional study was conducted among 200 nurses working in different departments of SKIMS. Data regarding socio-demographic, various organizational and behavioral factors that may contribute to NSI, was collected using self-structured questionnaire and analysed using IBM statistical package for social sciences (SPSS), version 23.

Results: The overall prevalence of NSI among nurses of SKIMS was 61% and it was 43.5% in the last 1 year. The nurses working for >40 hrs per week were found more at risk of NSI and it was more prevalent in young nurses with ≤5 years of experience. The nurses working in emergency unit were found more prone to NSI than the other units and recapping was found as the most common practice responsible for NSI. Post exposure to NSI, only 21.5% were found to wash the injury site with soap, water and applied antiseptics and most of them (75%) had not reported NSI to the concerned body.

Conclusions: The magnitude of needlestick injury among nurses was high. Awareness generation regarding occupational health hazards of NSI, protective measures, the importance of reporting of incident and sharp management is the need of hour.

Key words: Needle stick injury, Prevalence, Associated factors, Nursing staff

INTRODUCTION

Needle stick injuries (NSIs) remain a significant occupational hazard for healthcare professionals, particularly among nursing staff, placing them at an increased risk of exposure to blood-borne pathogens.¹⁻⁴ These inadvertent incidents have long been recognized as a pressing issue, demanding comprehensive research and intervention strategies to ensure the safety and well-being of healthcare workers. In the context of the SKIMS (Sher-I-Kashmir institute of medical sciences) Tertiary Care

Hospital of Kashmir, where a dedicated workforce of nursing staff provides essential patient care services, understanding the prevalence and factors associated with NSIs is crucial to implementing effective prevention measures. The nursing staff, serving as the backbone of any healthcare system, plays a pivotal role in patient care, administering injections, drawing blood samples, and handling various medical devices and sharp instruments daily. Unfortunately, this invaluable service comes at the cost of potential occupational hazards, with NSIs being a recurring concern.^{5,6}

The consequences of needle stick injuries can range from immediate pain and discomfort to the transmission of dangerous infections, including HIV, hepatitis B and C, and other blood-borne pathogens, making it an alarming issue that requires immediate attention.⁷⁻⁹ Against this backdrop, our research aims to conduct a cross-sectional study to comprehensively assess the prevalence of needle stick injuries among nursing staff at the SKIMS Tertiary Care Hospital of Kashmir. By determining the frequency of NSIs and examining the associated factors, we intend to identify the most susceptible groups within the nursing staff, understand the contributing factors behind these incidents, and propose evidence-based interventions to prevent and mitigate the risks of needle stick injuries effectively.

METHODS

The present cross-sectional study was conducted between Aug-2022 and Oct-2022 among staff nurses working at SKIMS tertiary care hospital, Soura, J&K, in Northern India. The pre-tested, self-structured questionnaire was used for collection of information regarding socio-demographic, various organizational and behavioral factors that may have contributed to NSI. The content validity of the questionnaire was checked by submitting the tool evaluation criteria to 10 research experts and clinicians specialized in the concerned field. The experts were given criteria checklist and were asked to put a tick mark against the response: 'relevant', 'non-relevant' and 'needs modification' against each item.

Suggestions and recommendations from experts were incorporated in the final questionnaire used in this study. The sample size of 200 nursing staff working at SKIMS, Soura Hospital, was considered for the present study after consultation with the statistician. The sampling technique used for the present study was convenient non probability sampling technique. The study subjects were briefed beforehand about the purpose of the research and the informed consent was obtained and the questionnaire was distributed to the nursing staff and on the same day questionnaire was collected back. The study subjects were selected as per the accessibility of nursing staff, from different departments of the hospital, who were actively involved in the patient care.

Sample size

Sample size was estimated on the basis of anticipated prevalence of 39.3% reported in a similar study by Kebede B², using the formula:

$$n = Z^2 P(1-P) / d^2$$

Where, P=anticipated prevalence, Z=1.96 and d=relative precision. Taking the relative precision 18%, a sample size of 183 was obtained. Considering a non-response rate of 10%, a sample size of 200 was taken for the study.

Inclusion criteria

The study includes the staff nurses who were actively involved in patient care, willing to participate in the study, available at the time of data collection and having more than one year of experience.

Exclusion criteria

The study excludes nursing staff who were not actively involved in patient care and having less than one year of experience.

Statistical analysis

The data collected was entered in the Microsoft excel spreadsheet and later analysed using SPSS software, version 23, IBM Statistics, Chicago, USA. Frequency and percentages were used to describe the variables. Chi-square test was applied for determination of any significant association between the variables. Odds ratios with 95% confidence intervals was also calculated for association with the factors related to NSI. Binary logistic regression analysis was applied to determine independent predictors of NSI in the study population, p values <0.05 were deemed to be statistically significant.

RESULTS

The data presented in (Table 1) depicts that there was almost similar distribution of staff nurses according to age and experience, whereas majority of them were females (85.5%), married (71.0%) and didn't attend any seminar or training program regarding prevention of NSI (84.5%). As per (Table 2), 43.5% of nurses had exposure to NSI in last 1 year and the life time prevalence of NSI among the nurses was 61.0%. Most of the nurses reported >40 hours of work per week (84.5%), three tier shift duty (70.0%). 96.5% of nurses reported NSI in hands, 66.7% received superficial NSI and 52.87% reported NSI during recapping of needle. Further 75.0% staff nurses didn't report any NSI and 5% did not receive any vaccine dose against hepatitis B. The (Table 3) shows that age, marital status, qualification, experience, place of posting, duty hours, and shift duty showed statistically significant association with NSI among the staff nurses. Logistic regression analysis, as shown in (Table 4), showed independent association of working experience and place of posting with NSI. The adjusted odds of NSI decreased with increasing experience as staff nurses with least experience (1-5 years) showed highest adjusted odds ratio of 32.510 compared to those with experience of > 15 years. Also, staff nurses who were posted in emergency had highest adjusted odds of having NSI (AOR; 6.366) followed by posting in OT (AOR; 5.574) compared to those posted in wards.

Table 1: Distribution of demographic variables.

Parameters		N	%
Age (years)	25-29	59	29.5
	30-34	38	19.0
	35-39	47	23.5
	40-44	26	13.0
	≥45	30	15.0
Gender	Male	29	14.5
	Female	171	85.5
Marital status	Unmarried	58	29.0
	Married	142	71.0
Type of family	Nuclear	120	60.0
	Joint	80	40.0
Qualification	GNM	59	29.5
	BSc Nursing	100	50.0
	MSc Nursing	41	20.5
Experience (years)	1-5	59	29.5
	6-10	46	23.0
	11-15	45	22.5
	>15	50	25.0
Place of posting	Emergency	31	15.5
	ICU	36	18.0
	OT	36	18.0
	Obs./Gynae	11	5.5
	Ward	86	43.0
Attended any seminar or training program regarding prevention of NSI	Yes	31	15.5
	No	169	84.5

DISCUSSION

Prevalence of needle stick injury in staff nurses

In this study, the period prevalence of NSI among staff nurses in the last 12 month was found to be 43.5%. This is comparable with the studies done in South west Ethiopia by Beker (44.12%) and Kebede (39.3%), North East Ethiopia by Bazie (40.1%), Maharashtra (India) by Rajput (37.7%), Rezaei similarly reported an overall 1year period prevalence of 44% from Iran.^{2,10-13} In the present study the overall prevalence found was 61%. This is in line with the studies done in South west Ethiopia by Beker (61.76%), North East Ethiopia by Bazie (60.2%), South West Ethiopia by Belachew (58.8%), Haryana (India) by Gupta (63%), Pakistan by Afridi (64%), Maharashtra (India) by Rajput (65.6%).^{10,12,14-16} North India by Bharti (66.7%) and Ashat (68.2%).^{17,18} But the overall prevalence in this study is lower than the figure from an earlier study in Iran by Jahangiri (76%).^{19,20} Whereas, slightly lower prevalence was reported from Tehran (Iran) by Galougahi (56.96%), Assam (India) by Gupta (53.7%).⁸ These differences might be related to the fact that the above studies were conducted in nursing staff from hospitals, health centers and clinics, with different socio-demographic/economic status, and cultural characteristics of study participants, sampling

method and sample size. The other possible reason might be related to work load and the availability of resources as well as the work environment and related to different time of recall periods.

Demographic variables and other risk factors associated with needle stick injury among staff nurses in last one year

In our study, age was found a determining factor for NSI among staff nurses. The staff nurses who received maximum number of NSI belonged to younger age group and were found mostly unmarried. This is in line with Gholami who identified age as an important risk factor in NSI incidents.²¹ In addition, Smith reported a 4.5 times higher risk of NSI incidents among nurses aged lower than 27 years.⁷ Belachew reported that unmarried respondents were about two times more likely to have occupational hazards than the married ones.¹⁴ Bharti in contrast reported that the chances of getting NSI were higher among married staff nurses in comparison to the unmarried nursing staff.¹⁷ Regarding sex, our study showed no significant association between gender and needle stick injury. Similar results have also been reported by Ahmed.²² Ghanei on the other hand reported more prevalence of NSI in women than in men.²³ Dilie in contrast reported 10 times more prevalence of NSI in males than females.²⁴

The present study found majority of injuries were superficial (66.7%). This was lower than study conducted in Egypt, zigzag university by Ahmed who reported that needle stick injuries during the last year among nurses were superficial (74.24%) and the most common causes of NSI were recapping (52.87%) followed by manipulation of needle during procedure (17.24%).²² Similar, findings were reported by Abebe who found nurses that practice recapping of needle were 4 times more likely to experience needle stick and sharp object injury when compared with nurses who didn't practice needle recap.²⁵ It is also in line with the studies conducted by Gholami, Berhan and Abalkhail.^{21,26,27} The systematic review by Mengistu also revealed that the risk for NSI significantly increased among those who usually or always did needle recapping in comparison to those who did not practice needle recapping.²⁸ Our study revealed that most of the nursing personnel (35.5%) had NSI because of the fatigue and overburden, and in 28.7% of cases due to the rush. This is in line with the study conducted by Sharma who reported majority of the respondents (50.4%) ascribed their injury to fatigue.²⁹ Laishram found the majority of the nursing personnel (44%) reported rush of patients was the number one circumstance leading to NSI.¹

The number of Duty hours were also found as a determining factor for NSI among the staff nurses. This is in line with Weldesamuel who reported that respondents who work for greater than 40 h per week were 16 times more likely to experience NSI than those who were working less than or equal to 40 h per week.³⁰

Table 2: Distribution of selected organizational and behavioural factors related to needlestick injury.

Parameters		N	%
Exposure to NSI in last 1 year	Yes	87	43.5
	No	113	56.5
Frequency of occurrence of NSI in last 1 year	1-2	74	85.1
	3-4	12	13.8
	5 and above	1	1.1
Needle stick injury before 1 year	Yes	97	48.5
	No	103	51.5
Life time prevalence	Yes	122	61
	No	78	39
Working hours per week	≤40	31	15.5
	>40	169	84.5
Shift duty	General	60	30.0
	Three tier	140	70
Shift felt more prone to NSI	Morning	3	1.5
	Evening	45	22.5
	Night	75	37.5
	Same for all	77	38.5
Body part exposed to NSI	Hand	84	96.5
	Arm	1	1.2
	Lower limb	2	2.3
Type to NSI received	Superficial	58	66.7
	Deep	9	10.3
	Moderate	20	23
Procedure followed to dispose off the used needle	Recapping	12	6
	Bending of needle	13	6.5
	Destroying by using needle cutter	159	79.5
	Simply throwing in bin	16	8.0
Most recent cause of NSI incident that happened in last 12 month	Recapping needle	46	52.87
	Transferring of blood samples from syringe	1	1.15
	Improper disposal of needles	3	3.45
	Setting up drugs	13	14.9
	During stitches	9	10.3
	while manipulation of needle during procedure	15	17.24
Circumstances in which you received the Needle stick injury (NSI)	During rush	25	28.7
	Un co-operative patient	12	13.8
	Lack of assistance	8	9.5
	Fatigue/Over-burdened	31	35.5
	Recapping needle	11	12.5
Use of PPE during duty hours	Yes	92	46
	No	108	54
Measures taken after NSI	Washed with water only	7	8
	Washed with soap and water	16	18.4
	Washed with soap-water & applied antiseptic	43	49.5
	Washed with soap-water, applied antiseptic, and PEP	9	10.5
	Pressing injury site	8	9
	Ignore and continued work	4	4.6
Whether reported after NSI	Yes	22	25
	No	65	75
Vaccination received after NSI	Hepatitis B vaccine	6	6.89
	Tetanus toxoid	39	44.8
	Both hepatitis B vaccine and tetanus toxoid	15	17

Continued.

Parameters		N	%
Any guidelines or protocols regarding needle stick injury in your hospital	None	27	31
	Yes	103	51.5
	No	97	48.5
Whether received prophylactic vaccination regime against hepatitis B	Complete doses	142	71
	Incomplete doses	48	24
	Unvaccinated	10	5

Table 3: Chi-square test for determination of association between needlestick injury and selected factors.

Parameters	Chi-square value	P value
Age	39.419	<0.001*
Gender	0.933	0.334
Marital status	27.787	<0.001**
Type of family	1.495	0.221
Qualification	10.764	<0.05*
Experience	41.888	<0.001**
Place of posting	20.567	0.001**
Seminar or training program attended regarding NSI prevention	0.343	0.558
Duty hours	4.673	<0.05*
Shift duty	9.882	<0.05*
PPE Used	1.324	0.250
Guidelines or protocols present	1.179	0.278

*Significance at $p \leq 0.05$, **Significance at $p \leq 0.001$

Table 4: Logistic Regression model to determine the independent predictors of NSI.

Parameters		AOR	95% CI	P value
Age (years)	25-29	0.683	(0.039-11.806)	0.793
	30-34	2.706	(0.229-31.913)	0.429
	35-39	0.481	(0.046-5.076)	0.542
	40-44	0.559	(0.075-4.140)	0.569
	≥ 45	1		
Marital status	Unmarried	1.891	(0.577-6.198)	0.293
	Married	1		
Qualification	GNM	1.559	(0.434-5.597)	0.496
	BSc Nursing	1.482	(0.483-4.554)	0.492
	MSc Nursing	1		
Experience (years)	1-5	32.510	(2.791-378.615)	0.005*
	6-10	11.645	(1.562-86.792)	0.017*
	11-15	8.723	(1.169-65.090)	0.035*
	>15	1		
Place of posting	Emergency	6.366	(1.948-20.807)	0.002*
	ICU	0.685	(0.250-1.880)	0.463
	OT	5.574	(1.131-27.470)	0.035*
	Obs/Gynae	3.568	(0.693-18.372)	0.128
	Ward	1		
Duty hours	≤ 40	0.378	(0.095-1.496)	0.166
	>40	1		
Shift	General	1.185	(0.259-5.428)	0.827
	Three Tier	1		

*Significance at $p < 0.05$, **Significance at $p < 0.01$.

This could be explained by work load makes health professionals to be stressed, loss their ability to concentrate and fatigue, which are more likely to increase the chance of human error and contribute to a tendency towards risky behaviors and poor compliance with the

precautions in general. It also suggests the problem of under-staffing in developing countries.

Unlike the study conducted by Abebe in Dessie referral hospital, Ethiopia where subjects who had training on

needle stick and sharp object injury were found 4 times less likely to experience needle stick and sharp object injury than with no training.²⁵ Nsubuga also reported similar findings.⁹ Our study in contrast found that subjects who had attended seminars or training programs regarding prevention of NSI were not any better than the ones who had not attended. The reason for this may be due to fact that in our institution not many of these seminars/ training programs were organized and most attended these sessions at individual level. These activities need to be done regularly at the institutional level so that it may have an impact on the prevention from NSI.

Regarding immediate response taken by nurses working at SKIMS after they were exposed to NSI only quarter of it were reported to the concerned body and 49.2% gave heavy workload as a reason while, 24.6% were not familiar of the reporting process and 18.4% had low risk perception regarding NSI. In the similar study, Ayranci revealed 69.1% of nurses had not reported their NSI to their superiors.³¹ Most (32.3%) of these were unaware of the need to report to the seniors, 18.7% had stated that they had no opportunity to do so, 16.7% had said that they were afraid of being considered to have poor clinical skills, and 10.4% and 8.3% had said that the NSIs that they were exposed to did not concern anybody, and that reporting was meaningless, respectively and another 13% had reported no reason. During our research, 5% of nurses were found unvaccinated and 24% not fully vaccinated against HBV. In a similar study, Ayranci reported that, 32.4% of nurses had not been vaccinated against HBV.³¹

The Qualification was also found as a determining factor for NSI among the staff nurses. Kebede reported highest percentage (41%) of NSI in diploma nurses.² This can be explained on the basis that more knowledge creates more awareness and more awareness results in more precautions which in turn leads to less exposure to NSI. Our study found shift duty as a determining factor for NSI among staff nurses. This is in line with Smith who reported that working mixed shifts (rotating day and night, as opposed to day shifts alone) was associated with a 1.7-fold increased risk of sustaining any NSI and a 2.7 times greater risk of sustaining NSI from a contaminated device.³² Balouchi reported highest percentage of NSI during night shift.³³ Berhan reported that workers who feel sleepy at work were 2.24 times more likely to be injured by needles and other sharps than those whose sleep was not disturbed.²⁶

The Binary logistic regression analysis carried out in our research revealed that besides place of posting, years of experience was an independent determinant of needle stick injury among nursing staff. Nurses who work in emergency unit and OT were found more prone to NSI. This is in line with Fadil, who reported that in the hospital, 19.8% of NSI were in the emergency department followed by the 15.3% in the surgical side.³⁴ Afridi in a similar study reported that working in operating rooms is the main factor increasing prevalence of needle stick injuries.¹⁶ Sriram

reported that the area of the hospital where most of the NSIs took place were the ward and bedside of the different medical and surgical departments, followed by the emergency department.³⁵ Ahmed also reported that frequency of exposure were high among nurses working in emergency followed by surgery departments (78.04% and 71.05% respectively).²² The needle stick injuries were most prevalent in staff nurses with less than 5 years of experience. Bazie also reported that nurses with less work experience were more likely to experience needle stick and sharp injuries as compared to those who had more work experience.¹¹

Implications

An administrative policy prohibiting the recapping of needles must be instituted and self-reporting of NSI must be encouraged. Further epidemiological research could be encouraged at the government and private sectors in this regard, as the outcome can be helpful to know the magnitude and risk factors involved in different clinical settings.

Limitations

Limitations were; since this study was conducted in a tertiary level hospital setting, hence the findings cannot be generalized to health care facilities of all private and public health sector to the whole of Jammu & Kashmir state. The accuracy of the past experience of the respondents with regard to the occurrence of the NSI might have been affected by recall bias.

CONCLUSION

The findings of our study revealed that the prevalence of needle stick injury among nurses was high and particularly risk was higher in nurses who recapped needle after use. It is important to plan and implement strategies for spreading awareness regarding risks associated, and proper handling techniques. The establishment of a comprehensive NSI prevention program should help in reducing the occurrences of NSIs. The easy reporting mechanism to the concerned authorities about the needle stick injury shall help in taking immediate remedial action in the form of prophylaxis and treatment.

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