Needle Stick Injuries among Healthcare Workers in a Tertiary Care Hospital of Lucknow

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Abstract:

Introduction: In healthcare settings, needle stick injuries (NSIs) pose a serious risk to occupational health. They often go unreported, which exposes a crucial weakness in workplace safety procedures. Research on needle stick injuries is crucial for enhancing the safety and well-being of healthcare workers, improving healthcare delivery, and ensuring that healthcare environments are as safe and effective as possible. **Objectives:** To determine the prevalence and associated factors of needle stick injuries among Healthcare workers in a Tertiary Care Hospital in Lucknow. **Method:** A cross-sectional study was conducted from April 2024 to June 2024 in a tertiary care hospital, Lucknow, Uttar Pradesh among 213 Health Care Workers (HCWs) i.e., physicians (consultants, specialists, and residents), nurses, other healthcare workers, and class IV employee working for a period of more than one year. A pre designed and pre tested structured questionnaire was developed for the study. Data regarding injuries by needle stick was collected. All needle stick injuries occurring between the period April 2023 and March 2024 was recorded. **Results:** The prevalence of needle stick injuries among healthcare workers was found to be 11.7% (25 out of 213) in the period of April 2023 to March 2024. Fingers (88%) were the most common site of NSI, followed by palm (8%) and hands (4%). The most common place of occurrence of NSI was wards (40%) and majority of the injuries were superficial (84%). The most common sharp causing NSI was needle (72%), followed by glass items (20%) and scalpel (4%). There was a statistically significant association between NSI and gender, years of experience, dissembling of needles by hand and working shift of health care workers (p=0.000). **Conclusion:** Prevalence of NSI was found to be higher among medical and paramedical staff who were working during day shift, working more than 7 hours a day and had an experience of less than 3 years.

Keywords: Healthcare Workers, Injuries, Needle

Introduction:

In every hospital setting, injuries from needlesticks and other sharp objects pose a major risk. Healthcare personnel may come into contact with blood through contaminated needles, scalpels, shattered glass, and other sharp objects. This poses a serious and perhaps fatal risk.[1] Among healthcare workers, NSIs are one of the most avoidable occupational dangers in the industry.[2]

The incidence of NSIs varies by healthcare setting, job role; with nurses, doctors, and laboratory technicians being among the most frequently

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affected. Factors contributing to NSIs include high workload, lack of proper training, inadequate use of protective equipment, and non-compliance with safety protocols. Furthermore, understaffing, long working hours, and emergency situations can exacerbate the likelihood of such injuries.[3]

Evidence exists for best practices that need to be adhered to in order to prevent NSIs. Nonetheless, there appears to be relatively little awareness of them and their application among medical professionals. Although India lacks government reporting mechanisms for NSIs, an investigation revealed that approximately 63% of the 3–6 billion injections administered annually are dangerous. [4]

NSIs may have a direct or indirect impact on the healthcare system. The number of available doctors and nurses is less in developing nations with low health-related human resources. The amount of workdays missed as a result of injuries and the emotional anguish that NSIs and other health-related occupational injuries cause to healthcare professionals have an impact on the health services that are offered. [5]

This research aims to determine the frequency of NSIs among HCWs working in a tertiary care hospital in Lucknow, Uttar Pradesh and to study the factors that associated with occurrence of NSIs.

Method:

A cross-sectional study was conducted from April 2024 to June 2024 in a tertiary care hospital of Lucknow, Uttar Pradesh among Health Care Workers (HCWs) i.e., doctors (consultants, specialists, and residents), nurses, other healthcare workers, and class IV employee.

Sample size: There were total 363 healthcare workers in the hospital, 256 of these have been working for a period of more than one year. Out of these 213 healthcare workers, who gave consent for participation, were selected by using convenience sampling method.

Data collection: A pre-designed and pre-tested structured questionnaire was developed for the study. Pretesting was done among 30 respondents and relevant changes were done. The questionnaire was administered in their vernacular language through interview among all the healthcare providers working in the hospital in various locations of the hospital, namely, wards, operation theatres, outpatient of various departments, intensive care units (ICUs), and sample collection center. Healthcare workers included the physicians, staff nurses, operation theater workers and other support staff.

Every six months, a one-day training program on biomedical waste management guidelines is held for all healthcare personnel. It is mandatory for each HCW to attended the training once every year. The site trainers who have recently received the training, led each training session. Lectures, workshops, discussions, site inspections, and policy and guideline reviews are all part of a training program. The following subjects are covered in the training curriculum: post-exposure follow-up, conducting a health care workplace assessment, prevention and control strategies, introduction to the hierarchy of controls, including safe medical devices, and the epidemiology of bloodborne infections. During the practical component, HCWs visit several healthcare facilities under the supervision of trainers in order to identify risks and dangers.

Data regarding injuries by needle stick injuries including sharps such as cannulas, broken vials, and splashes on cuts, and mucous membranes by potentially infectious materials such as blood and other body fluids was collected. All needle stick injuries occurring between the period April 2023 and March 2024 was recorded.

The Questionnaire used in the study consisted of two parts:- Part I included the socio-demographic details of the study subject viz. age, gender, marital status, religion, education level and monthly income.

Part II included individuals' work related information like their appointment, place of working, years of experience etc. It also included the details of NSI sustained by the individual including number of times NSI occurred, where the injury occurred (place and site), type of item which caused NSI, reporting protocol and guidelines for working environment in hospital.

Operational Definitions:

Needle stick injury: defined by the United States National Institute of Occupational Safety and Health are injuries caused by needles such as hypodermic needles, blood collection needles, intravenous (IV) stylets, and needles used to connect parts of IV delivery systems.[1]

Superficial injury: Scratches with a minute or no blood oozing following the NSI.[6]

Deep injury: injuries penetrating through the skin or leading to bleeding wound.[6]

Data Analysis: Data was entered into MS Excel and analyzed using SPSS software. Frequencies, percentages, and measures of central tendency to describe the prevalence and distribution of needlestick injuries were calculated. Chi square test was applied to test the association between variables and Odds Ratio to test the strength of association. P value less than 0.05 was considered significant.

Ethical Approval: Institutional Ethical Committee approval was taken before the start of the study. (TSMMC&H/IEC/2024/113(05))

Results:

The study was conducted among 213 healthcare workers. Age of the participants ranged from 20 to 59 years with mean (SD) of 32.34 (9.18)

Table 1 shows the age and gender wise distribution of study participants. The most common age group of healthcare workers was less than 30 years (55.87%) with total females being more than males.

Table 1: Age and Gender wise Distribution of Study Participants (N=213)

Age group (in years)	Male n (%)	Female n (%)	Total
<30	44 (56.41 %)	75 (55.56%)	119 (55.87%)
31-40	16 (20.51%)	46 (34.07%)	62 (29.11%)
41-50	5 (6.41%)	14 (10.37%)	19 (8.91%)
>51	13 (16.67%)	0 (0%)	13 (6.11%)
Total	78 (36.62 %)	135 (63.38 %)	213
Mean	34.24	31.24	32.34
S.D.	11.72	7.15	9.18

Table 2: Job characteristics of the Study Participants (N=213)

Variable	n (%)
Number of working hours per day	
Upto 7 hours	61 (28.6%)
More than 7 hours	152 (71.4%)
Shift as on day of interview	
Day	189 (88.8%)
Evening	12 (5.6%)
Night	12 (5.6%)

Around 50% of participants were married, 47.5% unmarried, 0.9% widowed and 0.9% divorced. Majority of the participants i.e, 90.6% were Hindu by religion. Most of the participants were either graduate (45.6%) or post-graduate (45.1%). Majority of the participants i.e, 97 (45.5%) were Resident doctors, 54 (25.4%) were consultants and the rest were paramedical and hospital support staff.

Table 2 shows the job characteristics of study participants. Majority of the study participants were working for more than 7 hours a day (71.4%) and in day shift (88.8%).

The prevalence of needle stick injuries among healthcare workers was found to be 11.7% (25 out of 213). Fingers (22 out of 25, i.e 88%) were the most common site of NSI, followed by palm (8%) and hands (4%). Seventy two percent of healthcare workers with NSI had one episode of needle stick injury. The most common place of occurrence of NSI was wards (40%) followed by operation theatres (20%) and laboratory (12%) and majority of the

Table 3: Association of various factors with Needle Stick Injury (N=213)

Factors		NSI present (n=25) n (%)	NSI absent (n=188) n (%)	Chi square, (P value)	OR (C.I)
Gender	Female	11 (44%)	124(65.96%)	4.584, (0.032)	0.406 (0.177-0.929)
	Male	14 (56%)	64 (34.04%)		
Years of Experience	<3 years	12 (48%)	134 (71.28%)	5.545, (0.019)	0.372 (0.162- 0.853)
	>3 years	13 (52%)	54 (28.72%)		
Designation	Medical staff	15 (60%)	136 (72.34%)	1.628, (0.21)	0.574 (0.246-1.333)
	Paramedical staff	10 (40%)	52 (27.66%)		
Dissembling of Needles	By Hand	20 (80%)	70 (37.23%)	16.54, (<0.0001)	6.743 (2.423-18.767)
	By Needle Cutter	5 (20 %)	118 (62.77%)		
Working Shift	Day	15 (60%)	174 (92.55%)	23.388, (<0.0001)	0.121 (0.047- 0.312)
	Evening / Night	10 (40%)	14 (7.45%)		

injuries were superficial (84%). The most common sharp causing NSI was needle (72%), followed by glass items (20%) and scalpel (4%). The reporting of NSI was done by 68% of healthcare workers. Post exposure prophylaxis was given to 68% of healthcare workers. Since only those HCWs who have been working for a period of more than 1 year have been included in the study, all the HCWs included in the study had received training regarding needle stick injuries (under Bio medical Waste Management Guidelines) at the tertiary hospital.

Dissembling of needles by hand was being done by 90 (42.3%) of the healthcare workers and the rest used needle cutters. Personal protective equipment was being used by 198 (93%) of the healthcare workers.

Table 3 shows the association of various factors with NSI. It was found that there is a statistically significant association between NSI and gender, years of experience, dissembling of needles by hand and working shift of health care workers ($p<0.0001$). The working shifts i.e., evening and night shifts were combined in the table to test association.

Discussion:

NSI is not uncommon problem with healthcare workers, especially those who are working in laboratories, who are undergoing training for laboratory work or surgical procedures and those who are working in operation theatres. Rates of NSI in hospitals differ by country, use of safety devices and methodologies (including potential under-reporting) used.

The prevalence of NSI in the present study was 11.7% among the healthcare workers. An incidence of 8.9% was found in a comparable study conducted by Goel V. et al[6] in a tertiary care hospital in North India. The prevalence of needlestick injuries (NSIs), defined as the incidence of at least one NSI within the past 12 months, was evaluated in 87 research across 31 countries in a recent systematic review and meta-analysis by Bouya S. et al.[7] The random effects technique revealed that, among the 50,916 HCWs analyzed, the global prevalence of NSIs was 44.5% (95% confidence interval: 35.7-53.2).[8] Shah R. et al[9], conducted a cross- sectional study in a tertiary care hospital in Ahmedabad, Gujarat and showed that since NSIs are often under-reported, healthcare institutions should not interpret low reporting rate as low injury rate.

In the present study, among HCWs, doctors constituted the largest group that suffered NSI (60%), followed by paramedical staff (40%). In a similar research from Maharashtra, India conducted by Yadav S. et al[10], has shown that the prevalence of

NSI among doctors ranged from 39 and 73.7%.[10] This may be because resident physicians in teaching hospitals are frequently involved in clinical procedures and the collection of blood samples, just like in the current study.

A study done by Mbaisi EM et al[11], in a provincial hospital, Kenya showed that, the probability of ever having a NSI has been reported to be inversely related to the years of experience.[11] A study conducted in Ahmedabad by Shah et al[8] found that 61 per cent HCWs had an experience of less than five years of work. The increased prevalence of NSI among comparatively younger healthcare workers may be brought on by insufficient experience, more workload of patients, under pressure situations, and a lack of awareness as a result of insufficient preventive training.[9] In the current study, male HCWs reported NSI at a higher rate (56%) than did their female counterparts (44%). Notably, some researchers conducted by Goel V. et al[6] in North India and Muralidhar S et al[12], in New Delhi showed that, NSI was more common in male HCWs while an another study done by Mbaisi EM et al[11], in a provincial hospital, Kenya showed that, NSIs were more common in female HCWs, suggesting that there is no clear pattern.

According to the current study, needle stick injuries most frequently occurred to the fingers. Research from Rajesh J. et al,[13] Chennai, and Singru SA et al,[14] Mumbai revealed that the most common location for needle stick injuries was the index finger. According to a survey conducted by Rais N et al,[15] in Karachi, Pakistan, the most prevalent place for injuries is the finger. Maximum NSIs were observed in employees with three years or less of work experience. Similar findings were observed in a study conducted by Saxena S. et al,[16] in Bareilly, India, where the rate of NSIs declined as years of work experience increased.

Needles were the most frequently reported kind of device for needlestick injuries (NSIs) in our study. This conclusion is consistent with prior studies done by Saxena S. et al,[16] in Bareilly, India and Radha R. et al,[17] in Karnataka, India found that suturing needles caused the most injuries, followed by hollow bore needles., The current study found that the working environment is a significant risk factor for needle stick injuries (NSIs), with the wards being the most common place of NSIs. According to research conducted in Central India by Bagdey P et al., operation theatre is the most common location for needle stick injuries,[10] whereas research conducted in North India by Goel V. et al,[6] found that emergency and intensive care unit (ICU) wards were the most common places for NSIs.

These findings imply that the workplace has a significant impact on the incidence of needle stick injuries. Therefore, before being assigned to different wards, staff members should get sufficient and ongoing training about needle safety procedures. When staff members were asked if they were knowledgeable about universal safety precautions, 99.5% of them responded in the affirmative.

Conclusion:

Prevalence of NSI was fairly high among health care workers. Needle stick injuries among the health care workers had a significant association of NSI with gender, years of experience, dissembling of needles by hand and working shift of health care workers.

It is recommended that for prevention of NSI, using devices with safety features, and promoting education and safe work practices for handling needles and related systems should be undertaken. Continuous education regarding safe injection techniques and the use of protective equipment is necessary for the hospital staff. Every workplace should have materials for education, information and communication displayed prominently. All hospital staff members should be encouraged to self-report NSI.

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