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Needle Sticks Injuries in Lab Technicians: A Multi Centric Study

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Abstract

Needle stick injuries are hazardous to employees' health because they can expose them to blood-borne illnesses such as Human immunodeficiency Virus (HIV), hepatitis B, and hepatitis C. Understanding the prevalence and risk factors of injuries is crucial in order to put into practice effective preventative measures and safeguard the safety and well-being of healthcare personnel. A cross-sectional study was carried out in a lab technicians working in a National Accredited Board for Hospital (NABH) Hospital, in Chengalpattu district, Tamil Nadu, India during the period of July 2023 to September 2023. Data was collected by using a predesigned pretested questionnaire and analyzed using SPSS statistical software. Among 150 respondents 90% were males and 10% were females, Study found that about 20% of the participants had needle stick injury, with significant risk factors for needle stick injuries including <10 years of experience ($p<0.03$), infrequent needle recapping $p<0.01$, irregular glove usage ($p<0.02$), and non-attendance at training programs ($p<0.001$).Our study highlights the importance of implementing comprehensive safety measures in hospitals. Initiatives such as health education and training programs, regular evaluation of safety protocols, and safety work place to report incidents and advocate for their own safety are essential.

Keywords: Health Care Workers, Lab Technicians, Needle Sticks Injury, Safety Measures.

Introduction

Health care workers are known to be susceptible to occupational hazards, including needle sticks and sharp injuries (NSSIs) (1). Health care workers (HCW) who come into contact with blood on the job are more likely to contract blood-borne illnesses (2). The World Health Organization (WHO) estimates that out of 35 million healthcare professionals globally, over 3 million experience percutaneous exposure to blood borne infections each year, including 2 million cases of HBV (Hepatitis B virus), 0.9 million cases of HCV (Hepatitis C virus), and 170,000 cases of HIV (Human immunodeficiency virus, 2). Blood exposure at work can occur via contact with non-intact skin, muco -cutaneous injuries (splash of blood or other bodily fluids into the eyes, nose, or mouth), or per-cutaneous injuries (needle stick or other sharps damage). Therefore, hospital waste handlers, laboratory technicians, housekeeping staff, and physicians are also susceptible to blood-borne illnesses (2). Any workplace blood borne pathogen prevention program must include the prevention of non-serious infection (NSI). There should be an in every healthcare facility a functioning hospital infection control committee oversees the infection control program (3). Health care workers can be protected against occupationally related blood-borne infections by wearing personal protective equipment, following universal precautions, avoiding unnecessary injections, getting vaccinated against Hepatitis B, and managing exposures (3, 4). When it comes to healthcare providers, needle stick injuries have substantial indirect effects, especially in developing nations (5). Numerous studies have shown that nurses are the HCWs most susceptible to needle stick accidents, and serious health effects and psychological stress (5). HIV, hepatitis B, and hepatitis C are only a few of the more than twenty illnesses that can spread by NSI. Previous research shows that reporting of NSI incidence was very low hence effort should be made to identify this particular incidence in this vulnerable population (6-8). The objective of this

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study to identify the prevalence of needle stick injuries among lab technicians. To assess the relationship between needle stick injuries and specified characteristics such as age, gender, years of service, and educational qualification.

Methodology

A cross-sectional study was carried out health workers in a National Accredited Board for Hospital (NABH) Hospital, in Chengalpattu district, Tamil Nadu, India in the period of July 2023 to September 2023.Ethical clearance was obtained (8436/IEC/2022) from the institution. Study Participants are in the age group of 18-50 years, working as lab technicians in a selected NABH Accredited Hospital in Chengalpattu. The inclusion criteria were Lab technicians in the hospital, including both male and female who are handling needles, who gave consent and who are available at the time of data collection. Lab technicians who were not willing and not available at the time of data collection were excluded. Using multi stage sampling technique, Enlisted total NABH Accredited Hospital in Chengalpattu district, among 8 NABH Accredited Hospital, 5 hospitals were chosen randomly, minimum required sample size of 30 from each selected hospital was taken for the study, total 150 lab technicians who met the inclusion criteria were interviewed. All the participants were interviewed using a semi-structured questionnaire. The questionnaire includes the following sections. The first section consists of questions regarding participants, demographic characteristics, and socioeconomic status. Second section contains question regarding needle stick injury and its management and third section contains questions regarding knowledge about needle stick injury management. Data was collected through interview method, lab technicians were contacted in person and explained about the purpose of the study and assured that their responses shall be kept anonymous. Informed consent was obtained and interviewed the participants. Data was entered in excel and analyzed using SPSS version 23. Quantitative variables were measured as means and SD, and qualitative variables were measured as a percentage. To measure the strength of association, odds ratio (OR) was calculated. Multivariate logistic regression analysis was performed to predict most significant factor. A p-value of >0.05 was considered as significant with a 95% confidence interval.

Results

Table 1: Socio Demographic Characteristics

Characteristics	Frequency n=150	Percentage
Age		
20-29 years	24	16%
30-39 years	58	38%
>40 years	68	45%
Sex		
Male	135	90%
Female	15	10%
Marital Status		
Married	108	72%
Unmarried	42	28%
Education		
DMLT	85	56.6%
BMLSC	65	43.4%

Table 2: Prevalence of NSI among Study Population

Variables	NSI Exposed (n=30)	NSI Unexposed (n=120)
Sex		
Males	25(83.3%)	110 (91.6%)
Females	5 (16.6%)	10 (8.3%)
Age		
20-29 years	5(16.6%)	19(15.3%)

30-39 years	7 (23.3%)	51(42.5%)
>40 years	18(60%)	50(41.6%)
Work experience		
≥10	12(40%)	45(37.5%)
<10	18 (60%)	75 (62.5%)
Location		
Medical ward	12 (40%)	36 (30%)
Surgical ward	7(23.3%)	38(31%)
Emergency department	11(36.6%)	46(38.3%)

Among 150 respondents 90% were males and 10% were females, majority of them are in the age group of 40 years, most of them were married (72%), nearly half of the participants completed bachelor degree (43.4%), most of the participants were having work experience above 10 years (62%). About 20% of the participants were exposed to needle stick injury, among them 18.5% were males and 33% were females, age group exposed are above 40 years, those with below 10 years of experience (38%) and those collecting samples in in medical ward (36%)(Table 1 and 2).

Table 3: Magnitude of NSI Exposure among Lab Technicians with NSI

Variables	**Frequency**	**Percentage (%)**
Frequency of injury		
Once	13	43.3 (%)
More than once	17	56.7 (%)
Types of injury		
Severe	4	13.3 (%)
Moderate	9	30 (%)
Superficial	17	56.7 (%)
Procedures related to NSI		
Recapping	12	40 (%)
Restless Patient	9	30 (%)
Putting IV line/Injection	6	20 (%)
Disposal of used needles-	3	10 (%)
Washing injury site		
Yes	30	100%
No		
Wash injury with soap & water	30	100%
Yes		
No		
Apply antiseptic		
Yes	24	80 (%)
No	6	20 (%)
Notify infection control		
Yes	9	30 (%)
No	21	70 (%)
Blood test done after NSI		
Yes	18	60 (%)
No	12	40 (%)
Vaccination Taken after NSI		
Hepatitis B vaccine (3 doses)	6	20 (%)
Tetanus Toxoid	18	60 (%)
Both	6	20 (%)
None	0	

Table 3 shows magnitude of needle stick injury among exposed participants, frequency of injury more than once (56.7%) and injury were superficial (56.7%), mainly during procedures like recapping(40%), all of them following proper washing technique after exposed to injury(100%), three fourth applying antiseptic and only (80%) are notifying to infection control, nearly half of them were doing the blood test after exposure (60%), most of them took tetanus toxoid injection (60%).

Table 4: Multivariate Logistic Regression Analysis

Characteristics	NSI exposed (%)	NSI non exposed (%)	OR(95%CI, P value)	AOR (95%CI, P value)
Age				
20-29 years	5(16.6%)	19(15.3%)	0.73(0.23-2.25), <0.13	0.21,(0.11-1.96),<0.6
30-39 years	7(23.3%)	51(42.5%)	0.38(0.14-0.99), <0.04	0.13,(0.7-0.64),<0.9
>40 years	18(60%)	50(41.6%)	1	1
Sex				
Male	25(83.3%)	110(91.6%)	0.45(0.14-	0.21,(0.05-
Female	5(16.6%)	10(18.3%)	1.44),<0.1	0.87),<0.18
Marital Status				
Married	18(60%)	90(75%)		0.12,(0.06-
			0.5(0.21-	0.98),<0.7
Unmarried	12(40%)	30(25%)	1.15),<0.10	
Education				
DMLT	19(63.3%)	74(61.6%)	1.07(0.46-	0.34,(0.02-
BMLSC	11(36.6%)	46(38.3%)	2.45),<0.86	1.67),<0.5
Work experience				
<10 years	25(83.3%)	32(26.6%)	13.7(4.85-	1.63(1.03-
>10 years	5(16.6%)	88(73.3%)	38.9),<0.001	5.71), <0.03
Recapping the needles				
Always	12(40%)	43(35.8%)	2.6(1.18-	1.74(1.13-
Never/sometimes	18(60%)	77(64.1%)	6.10),<0.01	2.89), <0.01
Attended Training on NSI				
Ye	12(40%)	87(72.5%)	3.9,(1.71-	2.41,(3.42-
			9.09),0.001	9.71),<0.001
No	18(60%)	33(27.5%)		
Use of Gloves				
Always	10(33.3%)	68(56.6%)	2.61(1.12-	2.13,(1.03-
sometimes	20(66.6%)	52(43.3%)	6.06),<0.02	3.36),<0.02
Location				
Medical ward	12(40%)	36(30%)	1	1
Surgical ward	7(23.3%)	38(31%)	0.5(0.195-	0.23(0.05-
			1.55),<0.26	1.36),<0.42
Emergency care	11(36.6%)	46(38.3%)	0.7(0.28-	0.47(0.09-
			1.81),<0.48	1.23),<0.61

Table 4 shows that those with less than 10 years of experience are at 13.7 times more risk of getting needle stick injury (OR- 4.85-38.9, p<0.01, AOR-1.03-5.71, p<0.03) and those who never or sometimes recap the needle are 2.6 times higher risk of getting injured (OR- 1.18-6.10,p<0.01, AOR-1.74(1.13-2.89<0.01), and those who are not regularly use gloves during procedures are 2.61 times more risk of getting injured (OR- 1.12-6.06,p<0.02,AOR-1.03-3.36,

P<0.02) and also among those who are not attending are at 3.9 times higher risk of getting injured (OR- 1.71-9.09 p<0.001,AOR-3.42-9.71,P<0.001) and it shows significant. In Table 5 we could observe that awareness of preventive measure among majority of the lab technicians were reported high and only few felt that training on safety measure is needed (58%).

Table 5: Awareness of Preventive Measures Among Lab Technicians

Variables	Frequency(n=150)	Percentage
Aware of universal precaution	135	90%
Always recap the needles	145	97%
Proper disposal of needle in marked container	147	98%
Wear glove during the procedure	123	82%
Full dose of the hepatitis vaccine should be taken	109	73%
Training on safety measure is needed	87	58%

Discussion

NSIs are among the most frequent work-related injuries among lab technologists and pose a significant risk to healthcare workers. In this research, we discovered that 43.3 % of the technicians experienced at least one needle stick injury in the previous year, which is consistent with a study conducted in an Australian hospital (9). The prevalence of needle stick injuries among healthcare workers varies from "high to epidemic" based on the work environment and resource availability (10). The crude needle stick injury rate in our study was found to be 20%, which was quite high when compared to a rate of 1.31% among Korean lab technicians and 4.9 % among Egyptian lab technicians (11). The majority 36% of needle stick injury incidents in this study occurred on the medical wards, which is consistent with global data (12). In our study, 40% of needle stick injuries occurred during the recapping of needles. These findings align with a previous study conducted at PGIMER, which also reported a 40% rate of such injuries, as noted by Aiken *et al*. (13), highlighting that many needle stick injuries happen during the process of needle recapping. Improved knowledge and training can significantly reduce the occurrence of needle stick injuries (NSIs). However, only 30% of healthcare personnel report all NSIs, which aligns with findings from a study by Shiao *et al*., where 81.8% of NSIs went unreported among Taiwanese healthcare providers (14). Among all HCWs, injuries during disposing of the sharps 18.31% were reported in the study conducted in the Jordan while in our study disposing of the used needles reported were 10% (15). Another study reported that HCWs were not trained about infection prevention was about (70.5%) but in our study 90% of the participants were awareness about universal precautions of needle stick injury management (16). Previous research study shows that wearing disposable gloves was 62.7% among the participants, while our study we observed around 82% of the participants were wearing disposable gloves this shows awareness about the precautionary methods among the participants was satisfactory (17). A study by H.N. Harsh Kumar *et al.,* observed that 57.1% completed primary series of 3 doses of Hepatitis vaccine (18), but in our study it was found that only 20% had vaccinated against hepatitis, which shows the need for health education. In the current study, 90% of healthcare workers reported being aware of universal precautions. This is comparable to Shen *et al.,* and Alfarhan *et al.,* findings where medical students also exhibited a high level of awareness about universal precautions, recognizing them as critical for preventing needle stick injuries (19, 20). The current study shows that 97% of healthcare workers still practice recapping needles. In contrast, Saadeh *et al.,* pointed out that recapping needles is a hazardous practice that is discouraged by many safety protocols (21). 90% of healthcare workers in the present study are aware of universal precautions Eryani *et al.,* in their study conducted in Yemen, awareness was also high, but there were regional variations in how effectively

these precautions were implemented (22). The current study found that 97% of healthcare workers continue to recap needles, a practice that is generally discouraged Albeladi *et al.,* in their study in Saudi Arabia, a significant number of healthcare workers also reported recapping needles, which was identified as a risk factor for injuries (23). Proper disposal in marked containers was reported by 98% of healthcare workers McCormick and Maki in their similar study, the proper disposal of needles was a significant focus, though adherence was lower in earlier decades (24). 82% of healthcare workers reported wearing gloves during procedures. Alsabaani *et al.,* found that while many healthcare workers wore gloves, there were still gaps, particularly in emergency settings where compliance was lower (25). Only 73% of healthcare workers had received the full dose of the hepatitis vaccine. In Italy, Brusini *et al.,* found similar challenges, with varying rates of vaccination coverage among nurses, indicating that even in well-developed healthcare systems, vaccine uptake can be inconsistent (26). Despite the fact that all exposed lab personnel in this research got either full or partial post-exposure prophylaxis, very few blood tests were performed after exposure. Many safety equipment and innovative techniques have been developed in an effort to lower the number of NSIs 58% of the lab personnel in this study required safety precautions training. Some lab workers still lack certain skills, which puts them at danger even with ongoing education. The frequency and contributing factors of needle stick injuries (NSIs) among lab technicians may vary depending on regional differences in patient demographics, healthcare infrastructure, and occupational safety policies. In order to capture the whole range of factors impacting NSIs and improve the generalizability of findings, future research could take a multi centric approach, including various geographic regions and healthcare settings. A multimodal strategy that includes instruction, training, regulatory changes, and the provision of suitable equipment is needed to address the problem of NSIs among lab staff. To inform healthcare professionals about the dangers of NSIs and stress the value of following basic measures, extensive training programs should be put in place. To reduce the chance of NSIs during standard operations, healthcare facilities also need to invest in safety-engineered technology such needleless systems and retractable needles. In order to foster a culture of safety in healthcare settings, strict adherence to safe work practices such as appropriate sharps disposal and frequent safety audits is necessary. Limitations of the study includes one of the study's main weaknesses was its small sample size, which means that the findings might not accurately represent all of the lab technicians working in this hospital. But since the survey was anonymous, participants might have replied honestly, increasing the likelihood that their answers would be accurate and enabling suggestions to be made in light of the data gathered. Furthermore, bias may be introduced into data on NSIs if lab workers are relied upon to self-report; this is because under or over reporting of occurrences can skew prevalence rates and associated characteristics. Additionally, the cross-sectional design used in this study makes it more difficult to determine causality or temporal trends for NSIs among lab workers. Lab workers may have trouble correctly recalling previous NSI episodes, especially if they were minor or happened a long time ago. This raises the possibility of recall bias. Furthermore, the research was limited to tertiary care facilities in Chengalpattu, Tamil Nadu, which may have limited the findings' applicability to other areas of the country or healthcare environments. By addressing these shortcomings with wider sample techniques and methodological improvements, the validity and reliability could be improved. Recommendation for this study includes that an ongoing education curriculum on safe working practices, which should include safe handling and disposal of sharp objects, be designed, and that such a program be evaluated on a regular basis. It is imperative that an administrative regulation that makes it illegal to recap needles be put into place. The evaluation and selection of an appropriate needleless safety device, training in its appropriate use, and ongoing training in its appropriate use, as well as ongoing evaluation of the usability and acceptability of such a device, should all entail the participation of lab technicians. Staffs members ought to be involved in the planning of systems to enhance the reporting of needle stick injuries in order for appropriate preventative actions to be implemented, and this is why they should be involved in the planning. It is

imperative that precautions be taken to ensure that individuals receive the full series of hepatitis B vaccinations as prescribed.

Conclusion

From this study we concluded that needle stick injuries are comparatively lower than other studies. The study's alarming findings about the frequency of NSIs among lab technicians exposed weaknesses in occupational safety policies and procedures. Inadequate training, ignorance, and a lack of access to safety-engineered devices are some of the factors that make this population more vulnerable to NSIs. Furthermore, the significance of taking preventative action to avoid such accidents is underscored by the short- and long-term effects of needlestick injuries (NSIs) on the impacted individuals and the healthcare system. A large number of the needle stick injuries happened on the ward, with syringe needles being the most commonly implicated causative instrument, and the majority of the incidents taking place during the recapping of used needles. Multimodal approaches are necessary to address the problem of NSIs among lab personnel. To raise public awareness of the dangers of needle stick injuries (NSIs) and encourage adherence to recommended precautions, extensive education and training initiatives should be put in place. Prioritizing the availability of safety-engineered equipment and enforcing stringent guidelines for its use during standard operations are vital for healthcare facilities. To further effectively lower the frequency of NSIs, healthcare facilities must promote a culture of safety that is defined by open communication, incident reporting, and routine review of occupational safety policies. Healthcare facilities can reduce the incidence of unintended needle stick injuries among lab technicians and protect the health and well-being of these vital frontline workers by implementing evidence-based treatments and promoting a safety culture. Our study highlights the importance of implementing comprehensive safety measures in hospitals. Lab technicians should participate in training programs, regular evaluation of safety protocols and ensure safety workplace to report incidents and advocate for their own safety.

Abbreviations

NSIs: Needle sticks injuries, NSSIs: Needle sticks and sharp injuries, HCW: Health care workers, NABH: National Accredited Board for Hospital, HIV: Human immunodeficiency Virus, HBV: Hepatitis B virus, HCV: Hepatitis C virus, WHO: World Health Organization.

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Author Contributions

Dr. Ashmitha Rajan, Dr. Pradeep and Dr. Bincy: Data collection and drafting of the article; Dr. Bincy, Dr. Ashmitha Rajan, Dr. Kaveri: Interpretation of data; Dr. Logaraj, Dr Pradeep: Concept and design and final approval of the version to be published.

Conflict of Interest

The Authors declare that there is no conflict of interest among them.

Ethics Approval

The study has been approved by the Intuitional Ethical Committee.

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