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"A Cross Sectional Study To Assess The Knowledge And Prevalence Of Needle Stick Injury Among Healthcare Workers At A Model Hospital, Cachar"

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ABSTRACT

Needle stick injuries (NSIs) remain a major occupational risk for healthcare workers (HCWs) due to the possibility of transmitting blood-borne infections such as HBV, HCV, and HIV. Despite the existence of standard safety protocols, gaps in knowledge and persistent underreporting continue to pose challenges. This study assessed the knowledge and prevalence of NSIs among 104 HCWs—including doctors, nurses, lab technicians, housekeeping staff, BMW handlers, and nursing students—at a Model Hospital, Cachar, and examined associations with demographic variables. Data were collected through a structured questionnaire covering demographics, knowledge assessment, NSI occurrence, safety practices, and open-ended feedback. The mean knowledge score was 6.59 (SD=1.319) out of 9, with 58.7% showing good knowledge. NSI prevalence was 44.2%, with improper disposal (41.3%) and needle recapping (34.8%) being the most common causes. A significant association was observed between knowledge level and NSI experience ($\chi^2 = 36.073$, $p < 0.05$). Participants reported barriers such as inadequate reporting systems, resource shortages, and time constraints. Although overall knowledge was satisfactory, gaps remained regarding post-exposure prophylaxis and hepatitis C vaccination. Less experienced and non-clinical staff showed increased vulnerability, highlighting the need for focused training, improved reporting mechanisms, and strengthened resource availability to enhance NSI prevention and promote a safer working environment.

Keywords: Needle Stick Injuries, Healthcare Workers, Occupational Hazard, Knowledge Assessment, NSI Prevalence, Blood-Borne Infections, Safety Practices, Post-Exposure Prophylaxis, Reporting System.

1. INTRODUCTION

Needle stick injuries (NSIs) are one of the most prevalent occupational hazards encountered by healthcare workers (HCWs) across the globe. These injuries typically occur when a needle or other sharp object unintentionally puncture the skin, which leads the individual to potentially blood infection or other bodily fluids. NSIs are particularly dangerous due to their potential to transmit life-threatening blood-borne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV), among others (WHO,2022).

Globally, the World Health Organization estimates that approximately 3 million healthcare workers experience NSIs annually, with nearly 90,000 infections attributable to HIV, HCV, and HBV resulting from such injuries (WHO,2022). In India, the burden is significant, particularly in tertiary hospitals and resource-constrained health settings, where inadequate compliance with standard precautions, limited training, and poor surveillance contribute to frequent exposures (Verma et al.,2021). Furthermore, evidence suggests that a significant number of NSIs go unreported, particularly among nurses and junior staff, due to institutional barriers and lack of awareness (Gupta et al,2019).

According to the Centers for Disease Control and Prevention (CDC), over 600,000–800,000 NSIs occur annually in the United States alone, and studies indicate that more than half of these incidents are preventable through proper training, use of safety engineered devices, and improved protocols (CDC,2021). However, developing countries face far more consequences due to limited access to personal protective equipment (PPE), poor disposal practices, and lack of formal PEP protocols (Paul et al.,2022).

In India, research conducted in tertiary care centers such as those in Delhi, Punjab, and Tamil Nadu has shown NSI prevalence ranging between 30% and 60%, with recapping needles and improper disposal identified as leading causes. The risk is especially high among early-career HCWs, those lacking formal training, and those working in high-turnover or emergency units. Moreover, fear of professional consequences, lack of institutional response, and unavailability of post-exposure prophylaxis (PEP) further discourage timely reporting (Thomas et al.,2015).

NSIs are not only a clinical risk but also represent a significant economic and psychological burden. The financial impact includes the cost of laboratory tests, post-exposure prophylaxis (PEP), treatment of infections, and compensation in severe cases. Psychologically, HCWs who experience NSIs often report anxiety, fear of sero conversion, stigma, and emotional distress, especially when they have limited access to confirmatory testing or PEP. These effects are exacerbated in settings where institutional support systems are lacking or poorly implemented. HCWs exposed to NSIs had higher levels of workplace stress and reduced job satisfaction (Tadesse et al.,2021).

Another concern is the unsafe practice of needle recapping, improper waste disposal, and accidental puncture while handling patients. Many of these risks stem from lack of adequate training or systemic reinforcement of infection prevention protocols. Even when training is provided, it may not be updated, reinforced, or monitored adequately. example, a recent cross-sectional study conducted in Multan, Pakistan, found that 49.7% of nurses had experienced at least one NSI in the past year, with underreporting being a major concern (Ateeq et al.,2023).

While there are national guidelines such as the Biomedical Waste Management Rules, 2016, and protocols recommended by NABH and MoHFW, their implementation at hospital level varies significantly and knowledge gap among healthcare workers persist. several studies have shown a gap between awareness and actual practice even when HCW's are trained, reinforcement, monitoring, and behavior change communication are often lacking (Kaur & Dey,2024). Therefore, systematic research that simultaneously examines knowledge level, prevalence of NSIs and practical challenges faced by HCWs is critical for designing more effective intervention.

Objectives:

1. To assess the level of knowledge regarding needle stick injuries among healthcare workers in selected hospital.
2. To determine the prevalence of NSIs among healthcare workers in selected model hospital.

2. LITERATURE REVIEW

Umar et al. (2025) investigated the occupational risk of needle stick and sharp injuries (NSSIs) among healthcare workers in a tertiary care hospital in Manipur. Using a cross-sectional survey of 357 HCWs selected through stratified sampling, the study found that 23.8% had sustained at least one NSSI in the past year, most commonly from needles on disposable syringes, with needle recapping identified as the leading cause. Notably, 61.2% of injured HCWs did not report the incident. The study also showed that full hepatitis B vaccination was associated with a reduced risk of NSSIs, while injuries involving contaminated sharps were more likely to be reported. Overall, the findings highlight that NSSIs remain frequent yet underreported, emphasizing the need for regular training and better reporting systems to improve safety in healthcare settings.

Raj et al. (2025) examined the prevalence and determinants of needle stick injuries (NSIs) among healthcare workers in a tertiary care hospital in Kerala. Using a cross-sectional design, 210 HCWs from multiple departments were interviewed with a semi-structured questionnaire covering demographics, NSI incidents in the past year, devices involved, and post-exposure prophylaxis (PEP) practices. Analysis using chi-square tests and logistic regression showed a 31% NSI prevalence, with an average of 1.34 injuries per worker annually. IV cannulas were the most frequent source, and many injuries occurred during injection procedures. Most affected HCWs reported the incident and received PEP. The study also found that workers aged over 31 faced a significantly higher risk of NSIs. The authors emphasize the need for continuous safety training, strict adherence to standard precautions, timely PEP, stronger institutional protocols, and accessible reporting systems to reduce NSIs and protect healthcare professionals.

Aziz et al. (2023) carried out a descriptive cross-sectional study among 200 nurses at SKIMS, a tertiary care hospital in Kashmir, to determine the prevalence of needle stick injuries (NSIs) and related risk factors. The study found that 61% of nurses had experienced an NSI during their career, with 43.5% reporting an incident within the previous year. NSIs were significantly more common among nurses working over 40 hours per week, those with five or fewer years of experience, and staff posted in emergency departments. Needle recapping emerged as the leading cause of injuries. Post-exposure responses were inadequate, as only 21.5% followed proper protocols such as washing the site and applying antiseptics, and 75% of incidents went unreported. The findings highlight a high NSI burden and emphasize the need for increased awareness, stricter compliance with safety practices, and stronger reporting and management systems to reduce occupational risks.

Datar et al.(2022) conducted a study "Needle stick and sharps' injury in healthcare students: Prevalence, knowledge, attitude and practice," conducted a cross-sectional survey of 942 medical, dental, and nursing students in Maharashtra, India. The study found a 25.2% prevalence of needle stick and sharps injuries, with the highest rates among nursing students. While students demonstrated adequate knowledge about blood-borne virus transmission and general prevention, there were significant gaps in their understanding of post-exposure prophylaxis and in translating knowledge into safe practices. The authors recommend curricular reforms, regular educational programs, strict reinforcement of safety guidelines, and the establishment of accessible reporting centers and standard operating procedures to address these gaps and improve student safety

Khalid et al.(2025) conducted a study to assess the incidence, knowledge, attitudes, and practices related to needle stick injuries (NSIs) among nursing students in Saudi Arabia. Among the 281 participating students, the prevalence of NSIs was found to be 14.1%, with most students experiencing at least one incident in the past year. The majority of injuries occurred during needle recapping and injections. While students demonstrated good knowledge and positive attitudes toward NSI prevention, their practical application of

safety measures was found to be lacking. Notably, most students did not formally report their injuries, often due to fear or anxiety. The study also found that female and senior students performed better across all domains compared to their male and junior counterparts. The authors recommend increased awareness, ongoing education on safe handling of sharps, and training on proper incident reporting to help bridge the gap between knowledge and practice among nursing students.

3. RESEARCH METHODOLOGY

The study was conducted among healthcare workers (HCWs) of a Model Hospital, Cachar, who were directly involved in patient care or the handling of sharps, including doctors, nurses, laboratory technicians, paramedical staff, biomedical waste handlers, and housekeeping personnel, while administrative, security, and other non-clinical staff were excluded. A descriptive cross-sectional design was used to assess knowledge and the prevalence of needle stick injuries (NSIs), integrating quantitative data with qualitative insights obtained from open-ended responses to provide a comprehensive understanding of NSI-related risks and challenges. The sample size was determined using the Finite Population Correction (FPC) method, resulting in a final sample of 110 participants, recruited through convenience sampling from the eligible HCW population. Data were collected using a standard semi-structured questionnaire consisting of both closed-ended questions and open-ended items, covering demographics, NSI knowledge, history of exposure, and existing safety practices and policies within the hospital.

3.1 STATISTICAL METHODS EMPLOYED

The Data were entered into Excel and analyzed using IBM SPSS Version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize the findings. To explore relationships between knowledge levels and demographic factors or NSI experiences, chi-square tests were performed, with a p-value of less than 0.05 considered statistically significant. The mean knowledge score and its standard deviation were also computed. In addition, qualitative insights were incorporated to complement the quantitative analysis, providing a more comprehensive understanding of the factors, prevention and reporting challenges, providing deeper insight into participant's experiences and perspectives.

4. FINDINGS

This chapter presents the results of the study. It is organized into two main sections: the first provides a demographic analysis, offering an overview of key participant characteristics, while the second presents a descriptive analysis of the data, enriched with qualitative insights. The findings are illustrated using tables and graphs for clarity and ease of interpretation.

4.1 SECTION I: Demographic Characteristics of The Respondents

Table 1: Demographic characteristics of the respondents

Demographic variable	Frequency (n)	Percentage (%)
Age group		
<25years	30	28.8%
25-34years	25	24.0%
35-44 years	29	27.9%
45>above	20	19.2%
Gender		
Male	38	36.5%
Female	66	63.5%
Profession		
Doctor	15	14.4%
Nurse	21	20.7%
Lab. Technician	9	8.2%
House keeping	10	9.6%
BMW handlers	14	13.4%
Nursing students	30	28.8%
Ward boy/girl	5	4.8%
Experience		
<1 year	36	34.6%
1-5 years	20	19.2%
6-10 years	29	27.9%
>10 years	19	18.3%
Formal training		
Yes	13	2.5%
No	91	87.5%

4.2 SECTION II: Level of knowledge of participants regarding needle stick injury

4.2.1 Level of knowledge of the participants

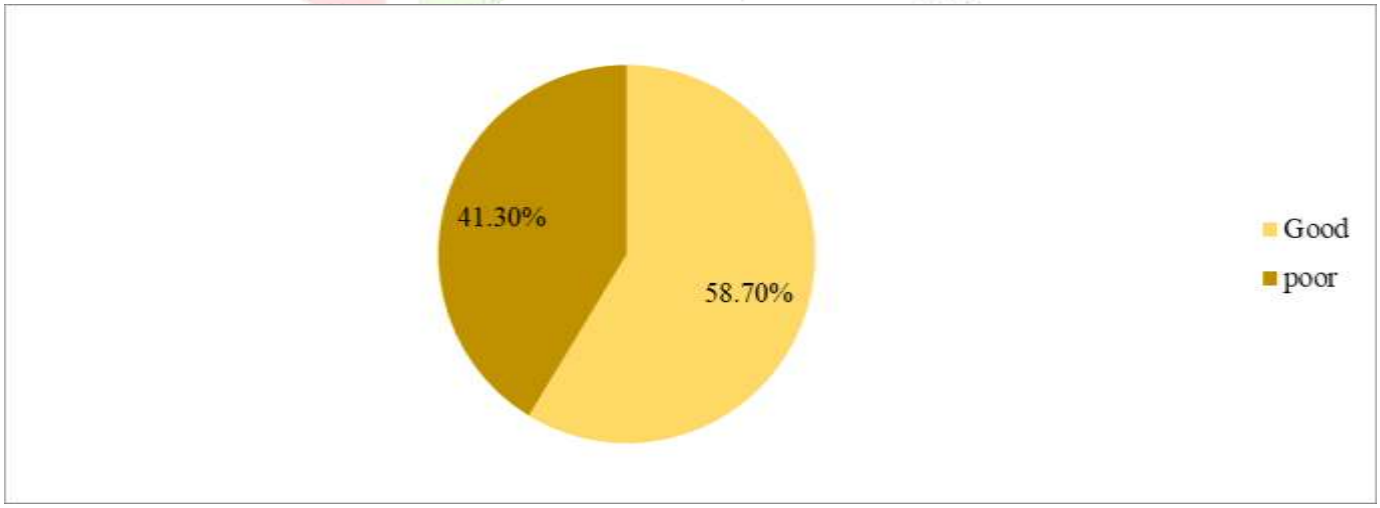

Figure 1: Pie chart showing distribution of level of knowledge of participants

Data presented in the figure1 shows that Among the 104 healthcare workers who participated in this study, 58.7% demonstrated good knowledge about needle stick injuries, while 41.3% were found to have poor knowledge. This distribution indicates that, although a majority of healthcare workers possess a satisfactory

understanding of the risks and preventive measures associated with needle stick injuries, a substantial proportion still lacks adequate knowledge. Such findings highlight the ongoing need for targeted educational interventions and regular training programs to bridge the knowledge gap among healthcare workers. Ensuring that all staff have access to up-to-date information and best practices is crucial for minimizing the incidence of needle stick injuries and promoting a safer working environment in healthcare settings. These results are consistent with previous studies, which have also reported significant variability in knowledge levels among healthcare professionals, underscoring the importance of continuous education and reinforcement of safe practices

4.2.2Accuracy of Responses to Knowledge Assessment Items:

Table 2: Accuracy of Responses to Knowledge Assessment Items

Item No.	Knowledge Area Assessed	Correct (%)	Incorrect (%)
Q1	Recognition of a needle stick injury as an accidental puncture by a needle or sharp instrument	100%	0%
Q2	Understanding that NSIs are a major route of transmission for blood-borne pathogens	100%	0%
Q3	Identification of the primary clinical risk associated with NSI	73.1%	26.9%
Q4	Evidence based prevention practices	80.8%	19.2%
Q5	Reporting and protocol Awareness	100%	0%
Q6	Immediate Post Exposure Actions	57.7%	42.3%
Q7	Timing of post exposure prophylaxis (PEP)	30.8%	69.2%
Q8	Tetanus Vaccination Awareness	100%	0%
Q9	Awareness of HCV vaccination availability	16.3%	83.7%

4.3 SECTION III: Prevalence of needle stick injury

Table 3: Prevalence of needle stick injury

Variables	Frequency(n)	Percentage (%)
Ever experienced an NSI (N=104)		
Yes	46	44.2%
No	58	55.8%
Frequency of NSI (n=46)		
Once	27	58.7%
2-3 times	17	37.0%
>3 times	2	4.3%
Reported Causes of NSI		
Recapping needle	16	34.8%
Improper disposal	19	41.3%
Accidental puncture	11	23.9%
Reporting NSI to Hospital Supervisor		
Yes	46	100%
No	0	0%

Chi square value showing the association between knowledge and selected demographic variables

Table 4: Association of knowledge with selected demographic variable

Selected Demographic Variable	Good	Poor	X^2 value	df	Table value
Age group					
Below 25	14	16			
35-44	14	11	7.72	3	7.81
35-44	16	13			
45 and above	17	3			
Gender					
Male	20	18	0.89	1	3.84
Female	41	25			

Profession					
Doctor	15	0			
Nurse	16	5	*27.73	3	7.81
Laboratory technician	8	1			
Others	22	37			
Experience in years					
Less than 1 year	16	20			
1-5 years	12	8	*10.59	3	7.81
6-10 years	16	13			
More than 10 years	17	2			
Formal NSI Training					
Yes					
No	61	43	*10.47	1	3.84

P value <0.05

Chi square showing Association between knowledge and NSI experience

Table 5: Association between knowledge and NSI experience

Selected variable	**Good (n=61)**	**Poor (n=43)**	**X^2 value**	**df**	**Table value**
NSI Experience					
Yes	15	31			
No	46	12	*36.07	1	3.84

P value <0.05 *Significance

4.4 SECTION IV:

4.4.1 Awareness of Institutional NSI Reporting protocol

Table 6: Awareness of Institutional NSI Reporting protocol

Response	**Frequency**	**Percentage**
Yes	65	62.5%
No	23	22.1%
Not sure	16	15..4%

4.4.2 Challenges in Preventing and Reporting Needle stick injuries:

Participants were asked:

"What challenges do you face in preventing and reporting needle stick injuries?"

From all the responses from the respondents four core responses were emerged, summarized in the table below:

Table 7: Challenges Faced by Healthcare Workers in Preventing and Reporting NSI

Responses	frequency	percentage
Resources unavailability	52	50.0%
Insufficient reporting system	28	27.0%
Time constraints and workload	24	22.7&
Poor enforcement of safety policies	3	3.0%

4.4.3 Recommendations to Prevent Needle Stick Injuries

Participants were asked: "What recommendations do you have for improving needle stick injury prevention and reporting in your hospital?" Responses of the participants were grouped into 5 categories as illustrated in the table below:

Table 8: Recommendations to Prevent Needle Stick Injuries

Recommendation	Frequency	Percentage
Awareness and Training programs	54	51.9%
Improved availability of safety equipment	33	31.9%
Reporting and Surveillance	6	5.7%
Safe Handling of Sharps	6	5.7%
Policy & Regulations	5	4.8%

5. DISCUSSION

The study findings show that the healthcare workforce in the Model Hospital, Cachar is predominantly young, with most respondents below 25 years, mirroring national trends of increasing recruitment of early-career professionals (Sharma et al., 2021; Reddy et al., 2022). Female predominance (63.5%) aligns with national and global patterns in nursing and allied health professions (Gupta et al., 2023; WHO, 2020). Nurses and nursing students formed the largest professional groups, consistent with workforce distributions reported in earlier studies (Kumar et al., 2022; Banerjee et al., 2021). A large proportion of respondents had less than one year of experience, reflecting a growing influx of new graduates into the healthcare sector, as noted previously (Mehta et al., 2020). Despite this, only 12.5% had received formal NSI-related training—far lower than figures reported in similar studies (Verma et al., 2023)—highlighting a significant gap in institutional training practices. Although 58.7% demonstrated good overall knowledge, substantial gaps remained regarding immediate post-exposure actions, PEP timing, and hepatitis C prevention, consistent with earlier findings showing limited awareness of post-exposure management among less experienced staff (Mehta et al., 2022). The prevalence of NSIs in this study (44.2%) aligns with regional and international estimates (Ateeq et al., 2023; Bibi et al., 2022; Thomas et al., 2015), and repeated injuries further indicate systemic issues such as workload and inadequate reinforcement of safety protocols, in line with previous research (Lal & Joshi, 2023; Musroor & Salim, 2022). Improper sharps disposal and needle recapping emerged as major contributors to NSIs, echoing WHO guidelines and other regional studies (George et al., 2022). Although all participants reported incidents to supervisors, qualitative insights suggested uncertainty about reporting systems, reflecting underreporting challenges noted in other studies (Tadesse et al., 2021). Significant associations between knowledge levels, profession, years of experience, and NSI occurrence reiterate evidence that inadequate knowledge increases injury risk, as reported by Patel et al. (2022) and Sharma et al. (2024). Key barriers identified—limited resources, weak reporting systems, and heavy workloads—correspond with patterns observed in other Indian studies (Kumar et al., 2023; Patel et al., 2022), while recommended solutions such as enhanced training and improved safety equipment availability align with national and WHO guidelines (ICMR, 2023; WHO, 2022). Together, these findings highlight the

critical need for strengthened institutional support, regular training, and improved occupational safety systems to reduce NSI risk among healthcare workers.

CONCLUSION

This study highlights critical insights into the knowledge, prevalence, and reporting practices related to needle stick injuries (NSIs) among healthcare workers in the hospital setting. Although 58.7% of participants demonstrated good overall knowledge, notable gaps remain in key areas such as post-exposure prophylaxis timing and awareness of hepatitis C vaccination. The prevalence of NSIs (44.2%) indicates a persistent occupational risk. While all participants reported incidents to supervisors, the possibility of reporting bias suggests the need for verification through objective audits. Knowledge levels were significantly influenced by professional role, experience, and formal training, with less experienced and non-clinical staff showing greater vulnerability. Identified barriers—limited resources, inadequate reporting systems, heavy workloads, and inconsistent policy enforcement—underscore the need for strengthened training, improved safety infrastructure, and a more supportive reporting environment to enhance occupational safety.

ETHICAL CONSIDERATIONS

This study ensured ethical conduct by obtaining informed consent and clearly explaining the purpose, procedures, risks, and rights of participants. Privacy and confidentiality were strictly maintained, and participants' autonomy was respected throughout the process. Measures were taken to minimize harm, ensure beneficence, and promote fairness in participant selection and data interpretation. Transparency was upheld through clear communication of methods and findings, with accountability for the integrity of the assessment. Ethical approval was obtained from the appropriate committee, and all procedures adhered to relevant guidelines. Cultural sensitivities were respected by adopting culturally appropriate, inclusive communication and assessment practices.

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