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Evaluating the Prevalence and Prevention Strategies of Needle stick Injuries (NSI) Across Multiple Hospitals in India: A Comparative Survey

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Abstract: *Background: Needle stick injuries (NSIs) are among the most common occupational hazards for healthcare workers (HCWs), leading to the risk of transmission of blood-borne pathogens such as Hepatitis B, Hepatitis C, and HIV. Despite advancements in safety protocols and devices, NSIs remain under-reported and inadequately addressed.* ***Objectives:*** *This study aimed to assess the prevalence, contributing factors, and preventive practices related to NSIs across multiple hospitals in India, with the goal of identifying actionable strategies to improve healthcare worker safety.* ***Methods:*** *A cross-sectional descriptive study was conducted across 38 hospitals using structured questionnaires to gather data on NSI frequency, causes, timing, devices involved, preventive practices, and post-exposure protocols. The survey captured with both quantitative and qualitative insights from 44 respondents.* ***Results:*** *The majority of NSIs occurred in wards and emergency departments, with bedside nurses and housekeeping staff being most affected, major causes included needle recapping (68%), improper disposal (62%), and protocol deviations (66%). While awareness programs and post-exposure protocols were in place in many institutions, under-reporting remained a major barrier leading to 50% of staff citing lack of priority and 39% fearing of PEP treatment.* ***Conclusion:*** *The study highlights the urgent need for widespread training, stricter enforcement of safety-engineered devices using in a safe manner, improved reporting systems and institutional culture shifts to report every incident, finally creating a safe environment by minimizing incidents of NSIs and protect front-line healthcare workers.*

Key Words: *Needle Stick Injuries (NSIs, Healthcare Workers, Occupational Safety, Blood-Borne Pathogens, Injury Prevention Strategies.*

1. INTRODUCTION: Needle stick injuries (NSIs) pose a significant occupational hazard for healthcare workers (HCWs), leading to potential transmission of blood borne pathogens such as Hepatitis B, Hepatitis C, and HIV. Despite strict infection control measures, NSIs continue to occur due to various factors including human error, improper handling, accidental pricks and lack of awareness. This study aims to assess the prevalence, causes, and preventive measures related to NSIs among healthcare workers. Despite advancements in safety-engineered devices available in the market and awareness on infection control protocols, NSIs remain a persistent concern in hospitals worldwide due to resource availability of safety device being one of the concerns. This study, **"Evaluating the Prevalence and Prevention Strategies of Needle stick Injuries (NSI) Across Multiple Hospitals: A Comparative Survey,"** aims to assess the incidence of NSIs, identify common risk factors, and evaluate the effectiveness of existing preventive measures in different hospital settings. By comparing data across multiple institutions, the study seeks to highlight variations in NSI rates, compliance with safety guidelines, and the impact of training programs on reducing injuries. A comprehensive understanding of NSI trends will help in formulating targeted interventions, reinforcing adherence to standard precautions, and strengthening hospital occupational hazard prevention policies to protect healthcare workers. The findings from this survey will contribute to the development of evidence-based strategies for minimizing NSIs and ensuring a safer working environment for all healthcare professionals.

2. LITERATURE REVIEW: A study published in the **Journal of Hospital Infection (2021)** found that **up to 50% of NSIs go unreported**, primarily due to fear of consequences, lack of awareness about reporting procedures including timely follow up, and underestimation of risk. A multi-centre study conducted across hospitals in India, researchers observed that **32% of healthcare workers experienced at least one NSI in past one year**, with **nurses being the most affected group (57%)**, followed by doctors (25%) and housekeeping staff (18%) (Sharma et al., 2020). The risk factors associated with NSIs include **improper disposal of sharps, lack of adherence to standard precautions, improper handling, fatigue, understaffing, and inadequate training**. Hospitals worldwide implement several measures to reduce NSIs, including:

- **Mandatory safety training** on handling sharps and proper disposal techniques.
- **Provision of personal protective equipment (PPE)** to minimize exposure risk.
- **Use of safety-engineered devices** such as retractable needles and needleless IV systems.
- **Availability of sharps disposal containers** in easily accessible locations.
- **Post-exposure prophylaxis (PEP) programs** to manage exposure cases promptly.

Despite these efforts, gaps in implementation and adherence remain. This study will help us **evaluate the prevalence of NSIs, identify common risk factors, and assess the effectiveness of prevention strategies**. By analysing data from different healthcare settings, the research will provide evidence-based recommendations to improve NSI prevention, enhance compliance with safety protocols, and ultimately protect the health of HCWs.

3. OBJECTIVES: To assess the prevalence, contributing factors, and preventive practices related to NSIs across multiple hospitals in India, with the goal of identifying actionable strategies to improve healthcare worker safety.

4. RESEARCH METHOD: The study utilized a **cross-sectional descriptive research design** to explore the prevalence, contributing factors, and preventive practices associated with needle stick injuries (NSIs) among healthcare workers. Conducted across 38 hospitals in India, the study collected data at a single point in time using structured questionnaires administered to 44 respondents, including bedside nurses, housekeeping staff, and other frontline healthcare personnel. This design allowed for the collection of both quantitative data, offering a comprehensive understanding of NSI frequency, causes, devices involved, situational factors, and existing prevention and post-exposure protocols. The descriptive approach was instrumental in identifying common patterns and systemic gaps in safety practices, thereby informing targeted strategies to improve occupational safety and reduce the risk of blood-borne pathogen transmission in healthcare settings. A structured survey questionnaires were used to collect self-reported data on Needle Stick Injuries (NSIs) among healthcare workers in 38 hospitals. The survey captured comprehensive information on:

- Frequency (incidents quarter wise) and NSI incidents for various reasons
- Associated risk factors including body fluid exposure
- Existing safety practices
- Types of devices responsible for NSI
- Open & closed methods of sample collection
- Reporting behaviour

The survey link was distributed electronically to multiple hospitals to encourage broad participation and ensure diverse data representation.

5. FINDINGS: A detailed explanation of all the survey question responses is provided here.

5.1 Survey Question 01: Frequency of NSI in the 1st quarter & 2nd quarter

In the first quarter (**Graph** 01) 73% of hospitals (32 out of 38) reported fewer than two needle stick injuries (NSIs), while 20% (9 hospitals) recorded between 2 to 5 NSIs, and 5% (2 hospitals) reported between 5 to 10 NSIs. In the second quarter, (**Graph** 02) there was a slight decline in the number of hospitals with minimal NSIs, as 66% (29 hospitals) reported fewer than two incidents. Meanwhile, 27% (12 hospitals) recorded between 2 to 5 NSIs, showing an increase from the previous quarter, whereas the percentage of hospitals reporting 5 to 10 NSIs remained constant at 5% (2 hospitals). **69.32% of NSIs occurred more than twice.**

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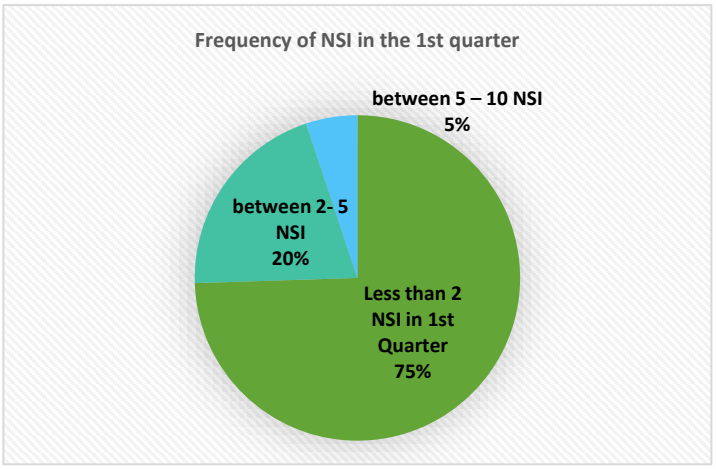
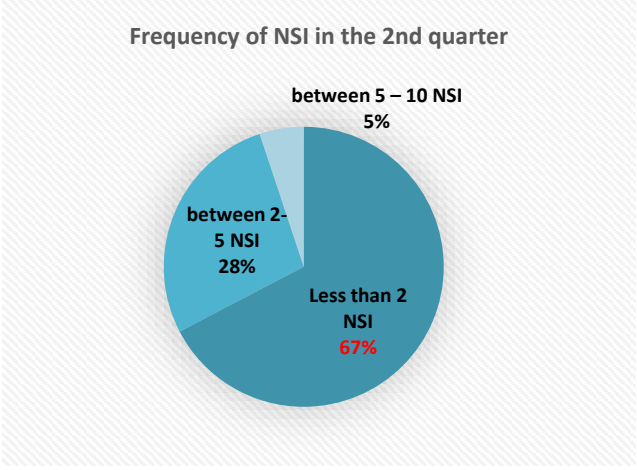
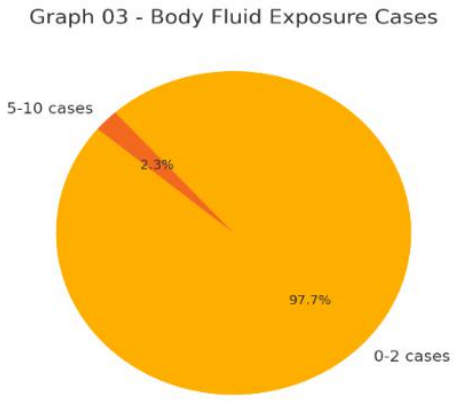


Graph 01 Frequency of NSI in the 1st quarter

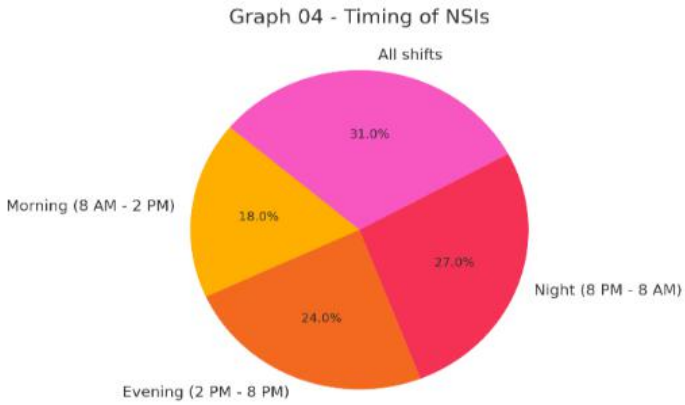


Graph 02 Frequency of NSI in the 2nd quarter

5.2 Survey Question 02: Incidence of Body Fluid exposures and Timings when NSI mostly happens



Graph 03 Incidence of Body Fluid exposures



Graph 04 Timings NSI mostly happens

Graph 03 depicted that 98% of exposures involved 0–2 cases, while only 2% of exposures accounted for 5–10 cases, which may be due to common causes like inadequate use of PPE, mishandling of body fluids or may be lack of training. There may be a contributing factor like inadequate staffing or equipment design or malfunction.

Graph 04 showed that a total of 31% of needle stick injuries (NSI) occurred across all shifts. Among these, 27% took place during the night shift (8 PM – 8 AM), 24% occurred during the evening shift (2 PM – 8 PM), and 18% happened during the morning shift (8 AM – 2 PM). Lack of supervision at night may be the major contributing factor for higher no of incidents at night.

5.3 Survey Question 03: Type of Device mostly responsible for NSI and Types of Needles and syringes mostly used

Graph 05 highlighted the distribution of needle stick injuries (NSI) based on the type of device involved. The highest percentage (48%) of NSI occurred due to suture needles, followed by 46% from hypodermic needles, 39% from IV cannulas, 21% from lancets, and 19% from vacutainer needles. Additionally, 14% of NSI took place while mixing drugs, and 5% were caused by scalp vein needles.

Graph 06 highlighted the use of different types of needles and syringes in clinical practice in the organization. It was observed that 87% of healthcare professionals used single-use insulin syringes, 73% use single-use lancets. Additionally, 57% adopted the use of safety IV cannulas, and 53% incorporated needleless connectors into their practice. However,

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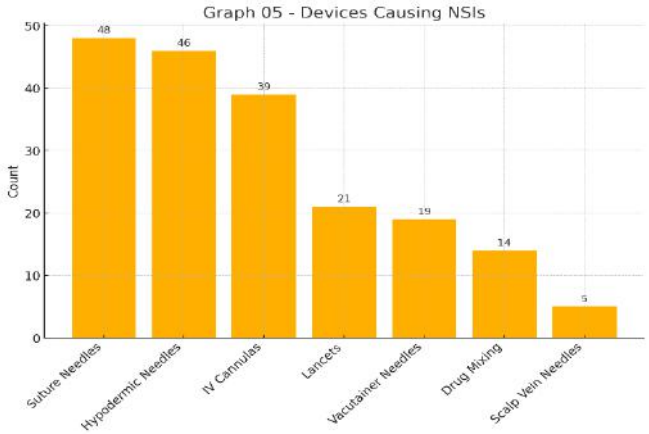
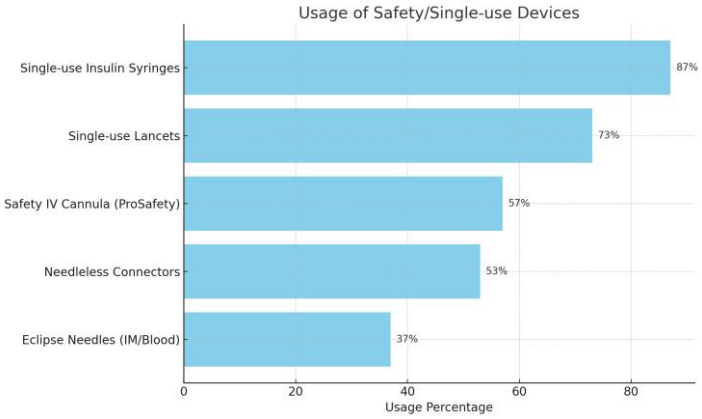
only 37% use Eclipse needles for intramuscular injections and blood collection. Despite having the availability of safety engineered devices in the market, there was a lacuna in use of appropriate device in few hospitals.

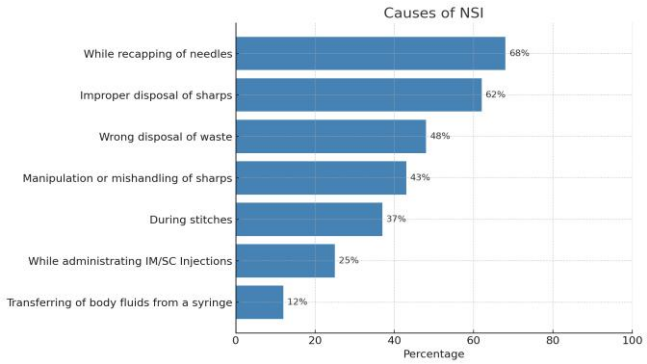


Graph 05 Type of Device mostly responsible for NSI



Graph 06 Types of Needles and syringes mostly used

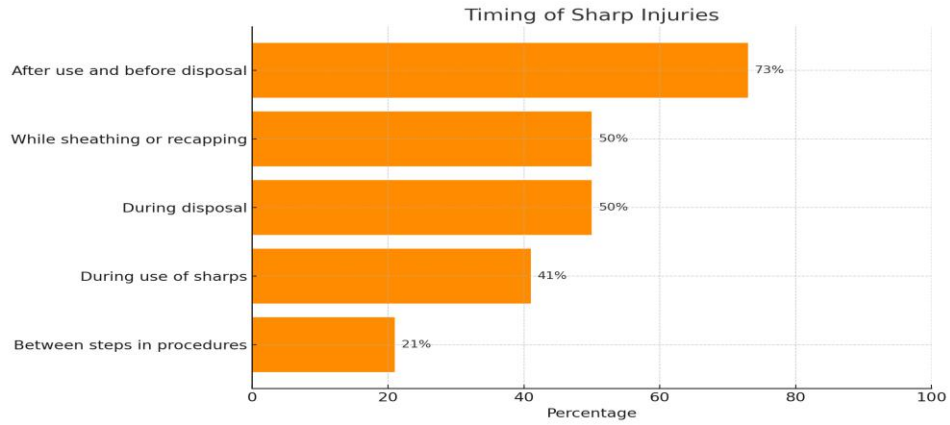
5.4 Survey Question 04: Results on type of Work practice inducing NSI and Situations where NSI happen mostly



Graph 0 7 Results on type of Work practice inducing NSI

Graph 07 analysed the common causes of needle stick injuries (NSI) in clinical settings. It was observed that 68% of incidents occurred while recapping needles, highlighting a major risk factor. Additionally, 62% of NSI resulted from the improper disposal of sharps, while 48% were due to the incorrect segregation of medical waste. Mishandling or manipulation of sharps accounted for 43% of cases, and 37% of injuries occurred during suturing procedures (where suture needles being the type of devices responsible for higher no of incidents of NSI). Furthermore, 25% of NSI happened while administering intramuscular (IM) or subcutaneous (SC) injections, and 12% were reported during the transfer of body fluids using a syringe. This shows the gap in core practices as for as NSI is concerned amongst the hospitals considered in the study.

Graph 08 examined the timing of needle stick injuries (NSI) in healthcare settings situation wise. The data revealed that 73% of NSI occurred after use of needles but before disposal, making it the most critical risk period. Additionally, 50% of injuries took place while sheathing or recapping needles, and another 50% happened due to improper method of following disposal process. Furthermore, 41% of incidents occurred while directly using sharps, and 21% happened due to needle collection or disposal at source while doing bedside procedures.



Graph 0 8 situation where injuries happen mostly.

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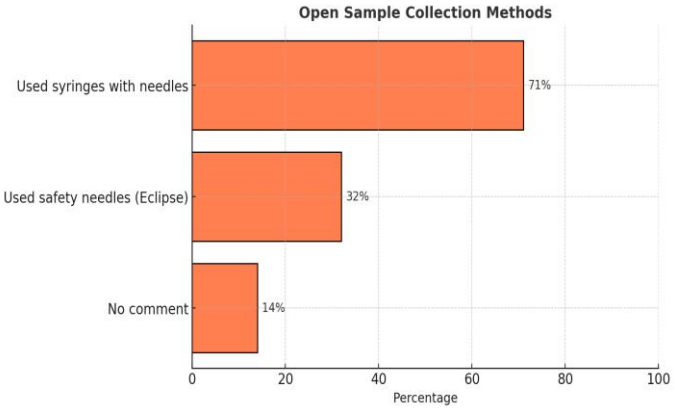
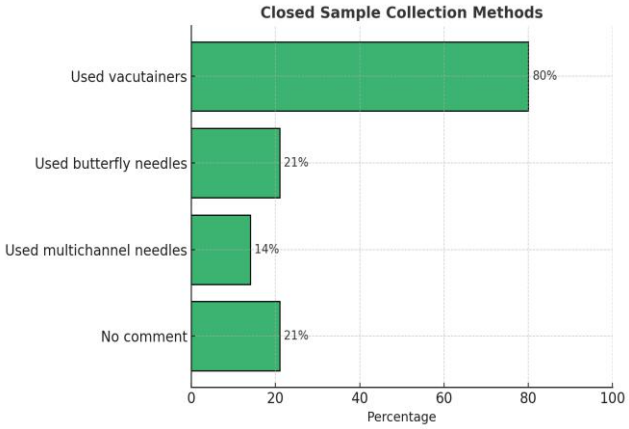
5.5 Survey Question 05: Sample Collection Method - Closed Method Vs Open Method



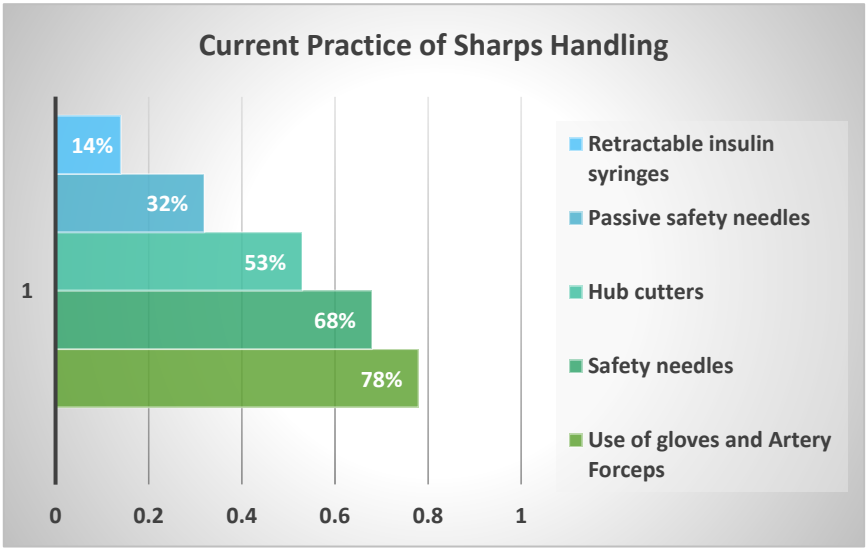
Graph 09 Open sample collection method



Graph 10 Closed Sample Collection method

Graph 09 analyzed the methods used for sample collection and their associated risks. The data showed that 71% of healthcare professionals used syringes with needles to collect samples as open method of collection, which increased the use of needles directly and the risk of needle stick injuries, whereas use of vacutainer holder had been the safest method of closed system collection. In contrast, only 32% utilized safety needles, such as Eclipse needles, which are designed to enhance safety by reducing exposure to sharp injuries. Additionally, 14% of respondents did not provide any comments on their sample collection practices.

Graph 10 analysed the methods used for sample collection, highlighting the utilization of different safety devices. The data revealed that 80% of healthcare professionals used vacutainer holders for sample collection, making it the most commonly preferred method due to its safety and efficiency. Additionally, 21% reported using butterfly needles for children & difficult vein access, while 14% utilized multichannel needles for sample collection. Notably, 20% of respondents did not provide any comments regarding their sample collection practices. This gives a standard guideline to practice closed method of sample collection over open method.



Graph 11. Current practice of Sharps Handling

5.6 Survey Question 06: Current Practice of Sharps Handling and Practices related to Sharp Disposal

Graph 11: The analysis of current practices related to sharp handling and disposal highlights a strong adherence to safety protocols among healthcare settings. In terms of **sharps handling**, a majority (78%) reported using gloves & forceps while using sharps during procedures or surgeries, indicating a widespread commitment to basic protective measures. Additionally, **68% used safety needles** and **53% used hub cutters**, showing moderate adoption of engineering controls to prevent injuries. However, more

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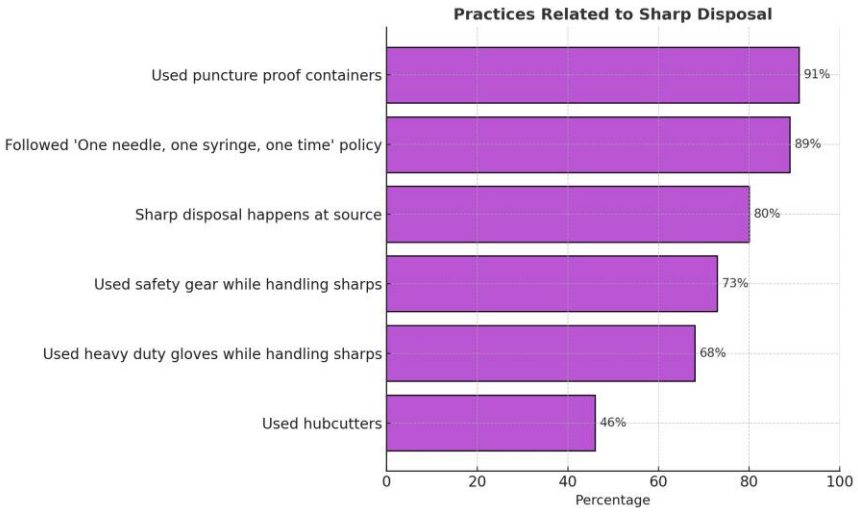
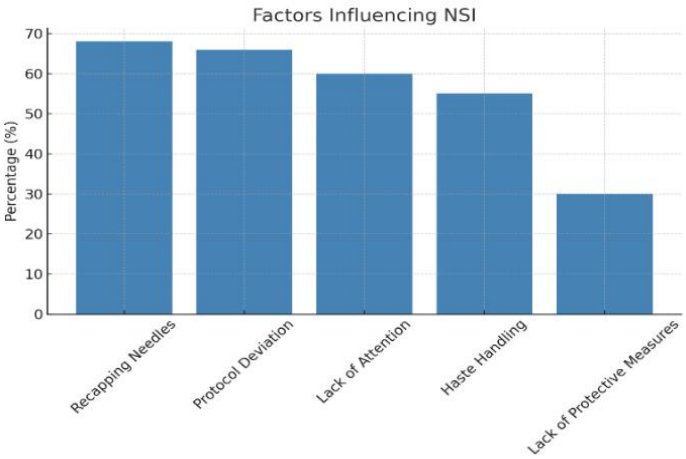
advanced safety devices like **passive safety needles (32%)** and **retractable insulin syringes (14%)** were less commonly used, suggesting room for improvement in adopting newer and safer technologies.



Graph 12. Practice Related to Sharp Disposal

Graph 12: Regarding **sharp disposal practices**, the data reflects a commendable level of compliance. A significant **91% used puncture-proof containers**, and **89% followed the "One needle, one syringe, one time" policy**, both of which are critical in reducing needle-stick injuries and cross-contamination. Furthermore, **80% ensured disposal of sharps at the point of use**, reinforcing immediate containment strategies. The use of personal protective equipment also featured prominently, with **73% using safety gear** and **68% using heavy-duty gloves** while final disposal of sharps. Still, practices like using hub cutters (46%)—though beneficial—were not universally adopted, indicating opportunities for further standardization and training.

5.6 Survey Question 07 Factors influencing NSI and Reasons for not reporting NSI



Graph 13 Factor Including NSI

Graph 14 Reasons for Not Reporting NSI

Graph 13 analysed the contributing factors to needle stick injuries (NSI) in healthcare settings. The data revealed that 68% of NSI incidents occurred due to recapping needles, highlighting a critical safety lapse. Additionally, 66% of cases were linked to deviations from established protocols, emphasizing the need for improved awareness and strict adherence to safety protocols. Furthermore, 60% of NSI incidents were attributed to a lack of attention leading to accidental pricks, while 55% resulted from handling needles in a hurried or careless manner. Notably, 30% of cases were associated with the availability or lack of protective measures, indicating a gap in utilizing the access to essential safety equipment.

Graph 14 examined the barriers to reporting needle stick injuries (NSI) among healthcare professionals. The data revealed that 50% of individuals did not prioritize the importance of reporting NSI incidents, which can lead to missed opportunities for intervention and prevention. Additionally, 39% of respondents expressed fear of taking post-exposure prophylaxis (PEP), potentially increasing their risk of infection. Furthermore, 25% of healthcare workers lacked knowledge about the proper reporting system, indicating the need for better awareness and training. Additionally, 9%

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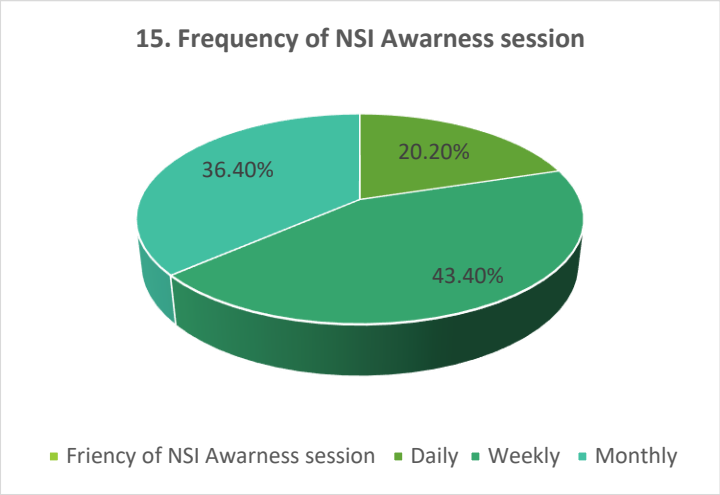
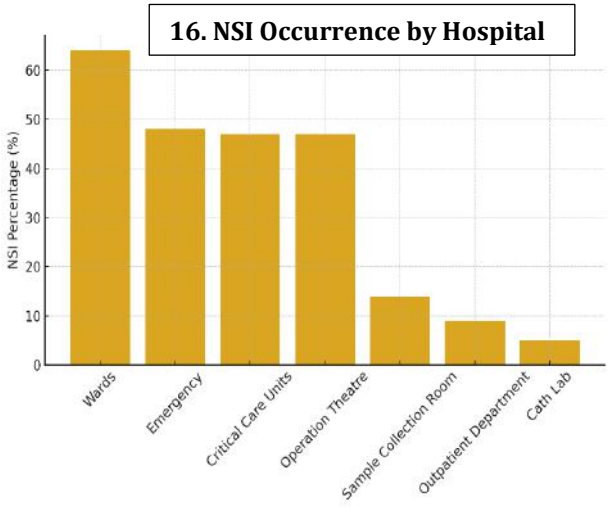
of individuals refrained from reporting due to fear of punitive action, which highlights the need for a non-punitive reporting culture.

5.7 Survey Question 07: Frequency of NSI awareness sessions and Work area where NSI occurs the most



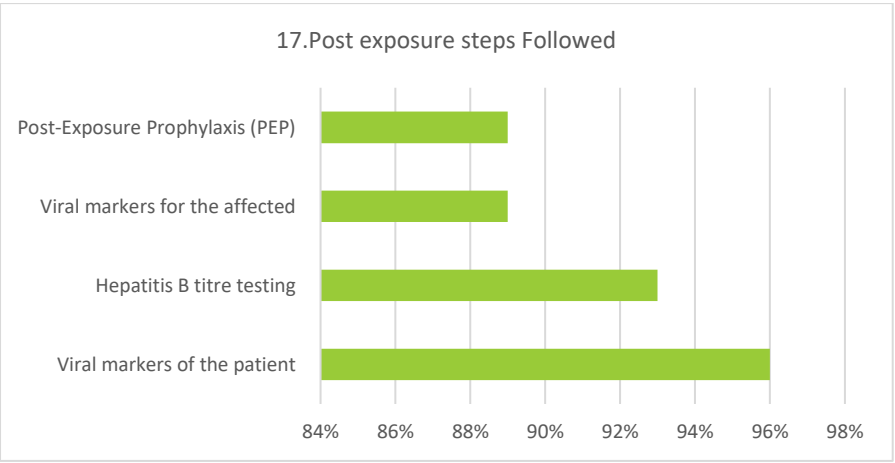


Graph 15 analysed the frequency of needle stick injury (NSI) awareness sessions conducted in healthcare facilities. The findings indicated that 20% provided daily training while reflecting a strong commitment to continuous education. 43% of institutions conducted NSI awareness sessions on a weekly basis, ensuring regular reinforcement of safe practices. Additionally, 36% held these sessions monthly

Graph 16 analysed the distribution of needle stick injuries (NSI) across different hospital areas. The data revealed that the highest incidence of NSI occurred in **wards (64%)**, followed by **emergency departments (48%)**. Additionally, **47% of NSI cases** were reported in both **critical care units and operation theatres (OTs)**, highlighting the risks in areas where the level of supervision was compromised.

Further analysis showed that **14% of NSI incidents** took place in **sample collection rooms**, while **9% occurred in outpatient departments (OPD)**. The **lowest incidence (5%)** was recorded in **Cath labs**, likely due to specialized training and controlled environment.

5.8 Survey Question O8: The post exposure steps followed and Category of staff effected



Graph 17 : Post Exposure Steps

Graph 17 analysed the post-exposure management practices following a needle stick injury (NSI). The data revealed that **96% of healthcare facilities** conduct **viral marker testing for patients** involved in NSI incidents, ensuring timely identification of potential infections. Additionally, **93% of institutions** perform **Hepatitis B titre testing for affected**

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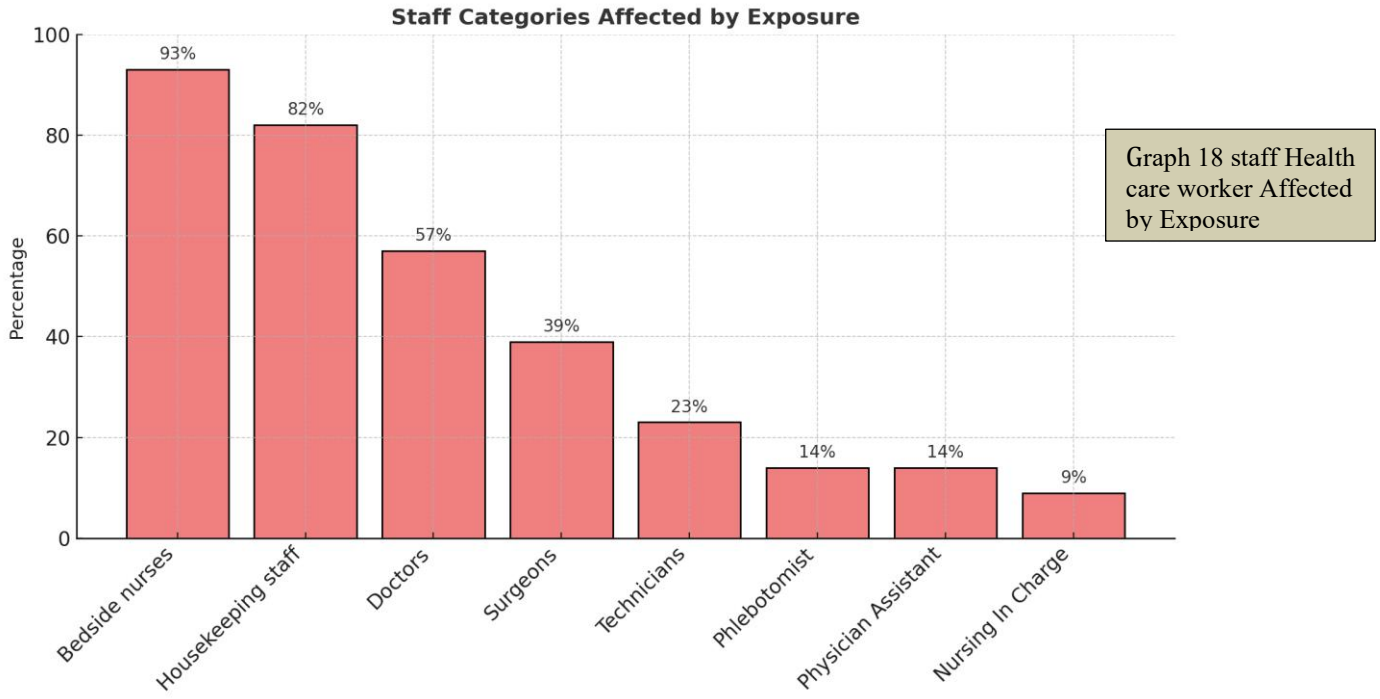
staff, helping assess immunity levels and the need for further intervention. Also, **89% of healthcare settings** conduct **viral marker testing for affected staff**, ensuring early detection and appropriate follow-up care. The same percentage (**89%**) administers **post-exposure prophylaxis (PEP) as per policy**, reinforcing adherence to established safety protocols.



Graph 18 staff Health care worker Affected by Exposure

Graph 18 analysed the distribution of needle stick injuries (NSI) among different category of healthcare professionals. The findings showed that **bedside nurses (93%)** were the most affected group, highlighting their frequent exposure to sharp instruments and needles during direct patient care responsibilities. **Housekeeping staff (82%)** also experienced a significant number of NSI incidents, likely due to improper disposal of sharps and needles. Among healthcare professionals, **57% of NSI cases** involved **doctors**, out of which **39% affected surgeons**, who frequently handle sharp instruments in high-risk settings. **Technicians (23%)**, **phlebotomists (14%)**, and **physician assistants (14%)** also reported NSI incidents, though at lower trends. **Nursing in-charge (9%)** had the lowest reported NSI cases comparatively, reflecting their more supervisory role with less direct handling and exposures.

6. DISCUSSION : This study reinforces the persistent challenge of needle stick injuries (NSIs) in Indian healthcare settings, despite increased awareness and safety resources. Notably, nurses and housekeeping staff remain at high risk due to their direct and frequent handling of sharps & needles, particularly in wards and emergency rooms, staffing may be another challenge in this case.

A key insight is the overwhelming role of unsafe practices—especially needle recapping and improper disposal—in causing injuries. These findings align with global literature but also reveal localized gaps in implementation and behaviour change even when not supervised. The partial adoption of safety devices such as passive safety syringes, needleless connectors, and hub cutters suggests operational or financial constraints that need to be addressed through policy and procurement reform.

One of the most critical findings is the underreporting of NSIs. Cultural and psychological barriers, such as fear of post-exposure prophylaxis or punitive consequences, significantly hamper incident tracking and timely intervention. Establishing a non-punitive, anonymous reporting system is essential to generate accurate data and guide prevention efforts.

While many hospitals conduct regular NSI awareness sessions and follow WHO-recommended PEP protocols, this is not yet universal. The disparity in training frequency and safety compliance indicates a need for national-level standardization and monitoring mechanisms.

The analysis of needle sticks injuries (NSI) across healthcare settings highlights key risk factors, affected groups, and safety measures. **Bedside nurses (93%) and housekeeping staff (82%)** face the highest risk, with **wards (64%) and emergency rooms (48%)** being the most common locations for NSI incidents. The leading causes include **recapping needles (68%)**, **improper disposal of sharps (62%)**, and **handling needles in a haste manner (55%)**. Encouragingly, **96% of facilities conduct viral marker testing for patients**, and **89% administer PEP as per policy**, ensuring effective post-exposure management. However, **50% of healthcare workers do not prioritize reporting NSI**, and **39% fear taking PEP**, highlighting gaps in awareness and compliance. To enhance safety, **regular NSI awareness sessions (43% weekly, 36% monthly)** should be reinforced, along with **strict adherence to policies like "One needle, one syringe, one time" (89%)**.

The use of **safety-engineered devices, proper disposal methods, and enhanced training for high-risk groups** will further reduce NSI incidents and improve overall workplace safety in healthcare settings.

7. SUMMARY: Needle stick injuries (NSIs) remain a substantial and preventable occupational hazard for healthcare workers. This multi-centre survey underscores the pressing need for institutional commitment to safety through structured training, consistent use of safety-engineered devices, and proactive incident reporting systems. Reducing NSI risk requires a holistic strategy—combining policy reform, behaviour change, and infrastructure support. By addressing both human and systemic factors, healthcare institutions can create safer working environment, protect their frontline workers, and enhance the overall quality of patient care and prevent occupational hazards.

A recent study titled **"Prevalence, Response, and Associated Factors of Needle stick Injury Among Healthcare Workers,"** published in **BMC Health Services Research in July 2024,** found that over one-third of healthcare workers experienced NSIs, indicating a high occurrence rate. The study also revealed that midwives had the highest prevalence compared to other health professionals, emphasizing the need for targeted interventions in this group to enhance safety measures and reduce occupational risks.

8. LIMITATIONS: Reliance on questionnaire-based responses may introduce recall bias and social desirability bias, affecting the accuracy of the data. Data was collected at a single point in time, limiting the ability to assess trends or causality over time. The study did not include direct observation or qualitative interviews, which could have provided deeper insights into behavioral and systemic issues.

9. RECOMMENDATIONS:

- **Enhance Training and Awareness:** Conduct regular workshops on NSI prevention, safe handling, and disposal of sharps.
- **Strengthen Safety Practices:** Mandate the use of safety-engineered devices like needleless connectors and retractable needles.
- **Improve Sharp Disposal Systems:** Ensure proper segregation and immediate disposal of sharps at the point of use.
- **Encourage Reporting:** Create a non-punitive environment to encourage reporting of NSIs for better data collection and preventive action.
- **Monitor and Evaluate Compliance:** Regular audits should be conducted to assess adherence to safety protocols.
- **Follow:** A method of closed system of sample collection, using maximum possible safety engineered devices at most of the settings and while doing procedures, accurate method of needles & sharps disposal at source and use of hub cutters, use of forceps for sharps disposals, use of appropriate PPE for body fluid exposures, to avoid recapping, use of heavy duty gloves by Housekeeping staffs for final disposal.
- **Behavioural Changes:** Every healthcare personnel to ensure **"ZERO"** NSI as a culture shift in practice.

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