2025 FAYYAZ M. KHAN SU91-MSAHW-F23-017

Determination of Needle Stick Injury Regarding Bloodborne Pathogens among Healthcare Workers at Tertiary Care Hospital Dera Ismail Khan

SUPERIOR UNIVERSITY

Thesis Submitted to

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

Master of Science in Allied Health Sciences

By

FAYAZ MUHAMMAD KHAN

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Signature:________________________

Supervisor Name: **Miss Tehmina Tariq**
Lecturer, Faculty of Allied Health Sciences

<u>Certificate of Approval</u>

This is to certify that the research work presented in this thesis, titled **“Determination of Needle Stick Injury Regarding Bloodborne Pathogens Among Healthcare Workers at Tertiary Care Hospital Dera Ismail Khan”** had conducted by **“Fayaz Muhammad Khan”** under the supervision of **“<u>Miss Tehmina Tariq</u>”**

No part of this thesis had submitted anywhere else to any other degree. This thesis is submitted to the Faculty of Allied Health Sciences, The Superior University, Lahore in partial fulfillment of the requirements for the degree of Master of Science in the field of **“Allied Health Sciences (Emergency and Intensive Care)”** in Faculty of Allied Health Sciences at The Superior University, Lahore.

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DEDICATION

This work is dedicated to my beloved parents, whose unwavering guidance, support, and assistance have been instrumental in the completion of my MS Allied Health Sciences Degree. Their constant prayers and encouragement have been the cornerstone of my success. Without their help, I would not have been able to achieve this significant milestone.

I am profoundly grateful to Allah Almighty for blessing me with such loving and caring parents. Their sacrifices, wisdom, and faith have been my guiding light throughout this journey. This accomplishment is as much theirs as it is mine, and I am forever indebted to them for their enduring love and support.

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Fayaz Muhammad Khan

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LIST OF ABBREVIATIONS

BBPs	Bloodborne pathogens
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immuno-deficiency Virus
HCWs	Health Care Workers
NSIs	Needle Stick Injuries
WHO	World Health Organization
NSSI	Needle Sickness and Sharp Injury
PPE	Personal Protective Equipment

ABSTRACT

Background: Bloodborne pathogens (BBPs) such as HBV, HCV, and HIV are the top infectious agents that can be acquired by a person through NSIs of the sharp instruments. The health care workers (HCWs) are exposed to a higher percentage of risks in NSIs with BBPs. Even though they are considered as the first line of safety in the patients, the lack of aadequate training, noncompliance with the infection control procedures, and the underreporting of the NEIs are main factors that professionals are exposed to more risks.

Objective: To determine the prevalence of needle stick injuries and assess awareness, training status, and protective practices regarding bloodborne pathogens among healthcare workers in a tertiary care hospital in Dera Ismail Khan.

Methodology: A structured questionnaire-based descriptive cross-sectional study was carried out among healthcare professionals, particularly surgical technologists, OT nurses, and other OT staff. SPSS software was used for the analysis of data concentrating on` the frequency of the NSIs in the past 12 months, BBP training status, PPE usage, and HBV vaccination coverage.

Results: A high proportion of the HCWs responded to have suffered an NSI within the previous year. A relatively small proportion of the staff received training in formal BBP procedures. PPE use was inconsistent and HBV vaccination, although increasing, was not universal. Results indicated a discrepancy between what is known and what is safe in clinical work.

Conclusion: The findings highlight the importance for improving infection control training, post-exposure protocol and complete vaccination of HCWs. Improving surveillance and reporting systems of NSIs is urgently needed to minimize occupational hazards and protect the health workers.

Keywords:

Needle Stick Injury, Bloodborne Pathogens, Healthcare Workers, Hepatitis B, Hepatitis C, HIV, Infection Control, Occupational Exposure, Tertiary Care Hospital, Dera Ismail Khan

Chapter 01

INTRODUCTION

In the case of a puncture caused by a needle (or other sharp object), blood or another bodily fluid may become accessible. The main concern is that the immune system may be exposed to infectious disease organisms in another person's blood or other bodily fluids. Health care workers (HCW), especially physicians and nurses are more exposed, compared to the general population, to the danger of the accidental needle stick injuries (NSI) occupational risks. Hepatitis B and C, HIV, and other blood-borne infections are therefore more likely to infect healthcare workers. Needlestick injuries are a dangerous occurrence for healthcare workers in their workplace when doing procedures such as taking blood, giving an intramuscular or intravenous injection, or recapping needles (1).

Sharp injuries happen when a needle or other sharp object pierces the skin. There is a chance of infection spread if the sharp object is tainted with bodily fluids like blood. Occupational needle sickness and sharp injury (NSSI) affect around 35 million healthcare workers (HCWs) worldwide each year. The Human Immunodeficiency Virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) are the three potentially fatal bloodborne pathogens (BBPs), while up to twenty BBPs can be spread by unintentional damage. Furthermore, one in three people will contract HBV due to its high contagiousness. To avoid occupational exposures and to handle potentially infectious materials like blood and bodily fluids, several measures were suggested. Universal precautions (UPs) are a set of efficient measures intended to shield medical personnel from infection by a variety of blood and bodily fluid pathogens. Everyone agrees that healthcare workers (HCWs) should avoid recapping needles with both hands, collect and dispose of needles and sharps safely using the necessary puncture and liquid-proof safety boxes in each patient care area, wear gloves when handling blood and bodily fluids, non-intact skin, and mucous membranes, clean up spills of blood and other bodily fluids quickly and carefully, and use safety systems for healthcare waste management and disposal (2).

Sharp injuries and needle stick injuries (NSIs) are frequent health risks that arise in the workplace. According to research, needle stick injury rates varied from 21% to 95%. One Healthcare worker is exposed to more than 20 distinct blood-borne pathogens as a result of these avoidable injuries, which cause 1000 illnesses annually. 86% of all occupationally associated infection transmissions were caused by needle stick injuries. HIV, HBV, and HCV are the most prevalent blood-borne viruses which are transmitted by NSIs. 3–4 World Health Organization (WHO) indicated that 2.5% of HIV cases and 40% of hepatitis B and C infection were led by occupational exposure among healthcare workers globally. Stab wounds are also more common than you'd think. Medical staff (HCWs) in Africa have an average of two to four NSIs per year. The CDC reported that safer needle devices can avertup to 86% of needle stick injuries.(3).

Needlestick injuries (NSIs) are low incidences, but they are among the most significant hazards experienced worldwide by healthcare workers. They arise mostly during certain procedures, such as injection, blood withdrawal, suturing, and disposal of used sharps. All these put the healthcare worker at risk of exposure to blood-borne pathogens (BBPs) such as the hepatitis B virus (HBV) and hepatitis C virus (HCV), and the human immunodeficiency virus (HIV), leading to both psychological trauma and morbidity long after the event. (3). It's neither good for the HCWs, nor is it good for the economy as it costs money for testing, treatment, or compensation. Some estimates say three million HCWs receive some type of per-cutaneous exposure to BBPs every year and end up acquiring 66,000 HBV, 16,000 HCV, and 1,000 HIV infections. These statistics emphasize the importance that must always be given to the need for occupational health and safety in health care establishments by eliminating the much-crippling NSIs. 4).

It is a silent epidemic in healthcare facilities, especially in low- and middle-income countries (LMICs) with weak surveillance networks (5). Prevalence rates for NSIs are 30% to 75%, study population and healthcare facility allowing, and are common in Pakistani healthcare workers (6). Still, various institutions vary in the way they apply protective measures, for instance needleless technologies, personal protection equipments (PPE), and proper system of disposal (7). Besides the lack of training and awareness programs, there are no many promotional activities in the district hospitals offered, and this explains why staff are not knowledgeable and how to prevent cases in particular the process of referring it to public hospitals (8).

Due to the demanding and edging procedures taking place at the sites, surgical theaters, emergency departments, and intensive care unit are some of the setups with the highest NSIs perils (9). Bearing in mind that factors that increase a person's sensitivity to infection include frequent contact with sharp instruments and exposure to high volumes of blood and bodily fluids, whose contactors are the general authorities, anesthetists, anesthesia technicians, and operating room technicians (5). Fatigue, stress, and work load are other reasons that increase the likelihood of accidental injuries in these strenuous environments (11).

Apart from physical injuries, NSIs may generate psychological distress. Anxiety and worry about exposure to infection are reported in HCWs who sustain an NSI and it can have a detrimental impact on their psychological health and productivity at the workplace (12). The time between serological testing and follow-ups can be emotionally draining, even if the test is negative, Saunders said. Eventually, such persistent fear and anxiety can result in high staff turnover, burnout, or even absenteeism (13).

Underreporting is another major barrier. Many healthcare workers do not report NSIs because they believe the injury was insignificant or because they fear reprisal or lack of confidentiality (14). This behaviour impedes surveillance and disrupts a timely institutional response, leading to inconsistencies in infection control protocols and policy enforcement (15).As a result, healthcare organizations do not make evidence-based decisions and are ignorant of the actual scope of the issue (16).

Thus, health organizations are not basing their decisions on evidence and are blinded as to the real magnitude of the problem (16). The Centers for Disease Control and Prevention (CDC) recommends a range of interventions to reduce NSIs, including engineering, administrative, and education/training interventions (17) However, in healthcare systems with limited resources, such as those in many regions of Pakistan, these recommendations are frequently not well followed. The discrepancy between policy and practice is caused in part by inadequate monitoring systems, budgetary constraints, and a lack of leadership commitment (18). To comprehend the factors that contribute to NSIs and create customized interventions, localized data is vital (19).

Vaccination is a tried-and-true preventive method, particularly against HBV, coverage among healthcare workers is still below ideal in many developing nations (20). Despite their occupational risk, research indicates that a sizable portion of healthcare workers are either unvaccinated or only partially vaccinated (21). Lack of knowledge, false beliefs about vaccine safety, and institutional failure to provide or enforce vaccination policies are some of the factors causing low vaccine uptake (22). Another crucial tactic for controlling NSI-related exposures, particularly those involving HIV, is post-exposure prophylaxis, or PEP (23). The risk of seroconversion is considerably decreased by early PEP initiation. Nonetheless, research from Pakistan and comparable contexts shows that HCWs have low awareness of and poor adherence to PEP protocols (24). In many health institutions, post-exposure prophylaxis (PEP) medication is either unavailable or very hard to obtain, creating an extremely high risk of infection after exposure to HIV (25).

Timely information about NSIs is crucial to effective prevention and control measures and is the lynchpin for an effective surveillance system. These have become, however, an inconvenient truth: numerous tertiary care hospitals in Pakistan are still lacking a proper NSI surveillance system (26). Without data, the path for advocacy of policies, interventions, and risk assessments is hampered. Institutional leaders are often left in the dark as to the numbers of NSIs and their common causes owing to the lack of real-time data (27).

Particularly in verge areas like Dera Ismail Khan, tertiary hospitals are facing specific problems such as a lesser number of staff compared to the heavy load of patients, lack of resources for protection, and lack of training (28).HCWs in these hospitals are especially susceptible to NSIs because of these factors taken together. Furthermore, hospital hierarchical structures and cultural barriers frequently keep junior employees from speaking out against unsafe practices or incidents (29). This necessitates immediate study and locally appropriate action.

Thus, the aim of this study is to evaluate the prevalence, risk factors, and preventive measures associated with NSIs among healthcare workers at a Dera Ismail Khan tertiary care hospital. This study will enhance safety procedures, improve policy, and increase hospitals' ability to safeguard their frontline staff by determining the causes and prevalence of NSIs (30). Additionally, the results will serve as a foundation for upcoming research and national and regional initiatives.

1.1 Problem Statement

The risk of occupational exposure to blood-borne pathogens (BBPs), including Hepatitis B (HBV), Hepatitis C (HCV), and HIV, is increased for healthcare workers (HCWs), particularly those working in Trauma & Emergency Department. Despite the critical role of HCWs in ensuring public health, insufficient surveillance, inconsistent safety protocols, and limited infection control measures place these professionals at significant risk of morbidity and mortality.

1.2 Research Objective

To determine the epidemics of needle stick injury regarding bloodborne pathogens among health care workers.

1.3 Operational Definitions of Key Variables

- **Bloodborne Pathogens**

  Infectious microorganisms present in blood that can cause disease in humans, particularly Hepatitis B, Hepatitis C, and HIV, transmitted through exposure to infected blood or body fluids.

- **Surveillance**

  A systematic process of monitoring, screening, and recording bloodborne infections among healthcare workers to identify risks and improve preventive measures.

- **Emergency Department Staff**

  Healthcare professionals working in the emergency department, including doctors, nurses, paramedics, technicians, and support staff involved in patient care.

- **Needle-stick and Sharps Injury**

  Accidental puncture or cut caused by needles or sharp instruments contaminated with blood or body fluids.

- **Personal Protective Equipment (PPE)**

  Protective clothing and equipment such as gloves, masks, and gowns used to reduce exposure to infectious materials.

- **Blood Sample Screening**

  Laboratory testing blood samples for the presence of HBV, HCV, and HIV to determine infection status.

- **Occupational Exposure**

  Contact with blood or potentially infectious body fluids during professional healthcare activities.

1.4 Rationale of the Study

Healthcare workers in emergency departments are at a particularly high risk of exposure to bloodborne pathogens due to frequent contact with trauma cases, uncontrolled bleeding, emergency procedures, and time-critical interventions. In developing regions like Dera Ismail Khan, limited surveillance systems, underreporting of occupational exposures, and inconsistent screening practices further increase this risk. Despite the critical nature of the emergency department, there is a lack of local data regarding the prevalence of bloodborne pathogens among emergency healthcare staff. This study is therefore designed to generate evidence-based data on bloodborne pathogen exposure and infection status, assess current surveillance practices, and identify gaps in preventive strategies. The findings will support informed decision-making for improving occupational health safety in emergency care settings.

1.5 Significance of the Study

This study holds significant importance for healthcare workers, hospital administration, and public health authorities. By identifying the prevalence of bloodborne pathogens among emergency department staff, the study will help highlight occupational risks and the need for regular screening and effective surveillance systems. The findings will assist hospital management in strengthening infection control policies, improving training programs, and ensuring the availability and proper use of PPE. Additionally, the study will contribute valuable local data to the existing literature, serving as a reference for future research and policy formulation aimed at protecting healthcare workers and enhancing patient safety.

Chapter 2

LITERATURE REVIEW

Health care workers (HCW), especially doctors and nurses, are more likely to suffer accidental needlestick injuries (NSI) due to their working conditions, according to a Bangalore study by Christy Vijay. Healthcare personnel are therefore at a higher risk of catching blood-borne infections such as HIV, hepatitis B and C, and other diseases. The purpose of this study was to evaluate interns' and postgraduate students' understanding of NSI and their practices around the disposal of needles and sharps. 110 interns and postgraduate medical students who worked in different departments of a tertiary healthcare facility in Bangalore participated in this cross-sectional study. Data on HCWs' knowledge, practices, and preventive actions at work were gathered using a self-administered questionnaire. Of the 110, 55 (50%) were interns, 55 (50%) were postgraduate students, 47 (42.7%) were male, and 63 (57.3%) were female. It was discovered that 36.3% of people have NSI. Postgraduate students and women participants knew more. The practice of female participants and interns was superior. Thus, it is concluded that medical students' (interns' and postgraduates') knowledge was insufficient, highlighting the necessity of awareness campaigns to lessen the burden of NSI among healthcare workers (1).

In December 2014, a cross-sectional survey with an institutional focus was carried out among medical staff in four hospitals in the Bale zone in southeast Ethiopia. 362 medical personnel in all were chosen at random from each hospital department. Data was gathered by a self-administered survey. Epi-Info version 3.5 was used to enter the gathered data, and SPSS version 20.0 was used for analysis. The study employed multivariable logistic regression analysis to determine each independent variable's independent impact on the outcome variable. Participants gave their written informed permission. 37.1% of people have experienced a needle stick or sharp injury in their lifetime, with a 95% confidence interval of 32.0% to 42.5%. 19.1% of people reported having been injured in the previous 12 months, with a 95% confidence interval of 14.9% to 23.3%. The department with the highest rate of needlestick and sharp injury (31.7%)

was the emergency ward. Syringe needles were the primary cause of harm (69.8%). Compared to their counterparts, participants who engaged in needle recapping had increased odds of experiencing a needle stick or sharp injury during the previous 12 months (AOR = 3.23, 95% CI: 1.78, 5.84). It concludes that almost one in five respondents suffered at least one needle poke or sharp injury in the previous 12 months. Healthcare professionals in the research area were at risk for needlestick and sharp injury due to certain procedures and behaviors. The main modifiable risk behavior was needle recapping. Hospital managers and health policymakers should develop plans to enhance healthcare personnel' working conditions and encourage greater adherence to universal precautions (2).

Healthcare personnel are susceptible to occupational health risks such as needle stick and sharp injury. Through tainted needles and other sharps injuries, they are exposed to lethal infections daily. Assessing the frequency and contributing factors of needle stick and sharp injury among healthcare personnel at FelegeHiwot Referral Hospital was the goal of this study. From July 1–5, 2012, a facility-based cross-sectional survey was carried out utilizing a questionnaire. Every healthcare professional who was contacted during the study period was included. Data analysis was done with SPSS version 16.0. To determine the variables linked to needlestick and sharp injury, binary logistic regression was employed. 216 (65.1%) of the 332 healthcare personnel who were enrolled were female. Almost two-thirds had a diploma and were nurses by occupation. In the past 12 months, 103 (31.0%) people experienced at least one needle stick or sharp injury. Needlestick injuries accounted for three-fourths of the injuries. The odds of getting hurt were 4.1, 2.8, and 4.1 times higher for those who worked in waste handling units, had a monthly income of >1000.00Eth Birr, and were satisfied with their jobs, respectively (Adjusted Odds ratio (AOR) =4.1, 95% Confidence Interval (CI) 1.27-13.14, AOR=2.78, 95% CI 1.01-7.63, and AOR=4.1, 95% CI 1.27-13.14). Maternity unit employees had an 80% lower risk of injury than emergency department employees (AOR= 0.20, 95% CI 0.05-0.78). Almost one-third of participants experienced at least one needlestick or sharp injury in the past 12 months. It was determined which behaviors and suboptimal practices put individuals at risk for harm. In addition to frequent support supervision, authorities should provide on-the-job training. The frequency of the injury and the kind of sickness they might get require more investigation (3).

Nearly 64 percent of healthcare workers had at least one needle stick injury (NSI) during their careers, according to a study by Sharma et al. (2019) in a tertiary hospital in India. Nurses, followed by paramedics, were found to be at special risk because of their frequent handling of needles in patient care. This study found a lack of training and inadequate protective equipment among other study-related causes for the increase in NSIs among individuals. It was also learned that PEP is mostly delayed due to administrative bottlenecks and therefore induces anxiety among workers and related health risks. Another serious concern was the low rates of incident reporting, caused by supervisors punishing and threatening reprimand. According to these findings, instituting mandatory training on NSIs, routine HBV vaccinations, and organized surveillance systems in clinical settings will reduce exposure risks and hence promote safer working environments. (31).

From a cross-sectional survey conducted by Alhazmi et al. (2020), it seems that among those responding to the survey's general awareness of BBP transmission risks, only 41% of the actual observed non-sharp injuries (NSIs) affected were reported to infection control units in Saudi Arabia. Analyzing the answers of medical staff in intensive care units and emergency rooms, such as workload pressure, time issues or the presumption that the injury was immaterial, included among the reasons that resulted in under-reporting. In course of time, this study was able to demonstrate that by holding departmental workshops and continuing medical education, NSI prevalence would be seriously reduced. Meanwhile, the same Alhazmi et al. also suggested that occupational safety and transparency may be achieved by creating a system of anonymous reporting and establishing a non-punitive culture. Their initiatives established the relevance of leadership positions as far as safety compliance and the mental health of affected employees were concerned (32).

Based on a multi-center study carried out in Pakistan by Malik and colleagues (2020), multi-center study carried out in Pakistan by Malik and colleagues (2020), roughly 58% of healthcare workers had NSIs. According to their research, only 45% of participants had finished the entire HBV vaccination course, even though the vaccine is offered in the majority of medical facilities. Most injuries occurred during intravenous injections, suturing, and needle recapping. Moreover, the study found that many medical professionals were unclear about the procedures involved in post-exposure management. To ensure prompt recognition, the researchers suggested adding NSI management modules to the undergraduate healthcare curriculum and underlined the importance of organized infection prevention and control programs. They also recommended strengthening hospital administration rules to guarantee compliance with WHO safety guidelines (33).

Cho et al. (2018) conducted a prospective study in South Korea and discovered that the same healthcare workers who experienced repeated NSIs had higher levels of psychological distress, including PTSD symptoms. In addition to being a biological threat, the study, which followed 352 medical staff members throughout surgical wards, found that NSIs were a major cause of emotional and mental health issues. The study found that following such incidents, hospitals hardly ever provided psychological counseling. Cho and his colleagues promoted mental health screening for employees who have been exposed repeatedly as well as institutional psychological support systems. The study also came to the conclusion that, in addition to biomedical interventions, comprehensive strategies that include psychological rehabilitation are crucial for managing the aftermath of NSIs (34).

Ekwere and Okafor (2018) evaluated the contribution of institutional safety culture to the decrease of NSI incidents in Nigerian government hospitals. According to the study, hospitals with regular training, feedback sessions, and established safety committees reported substantially fewer injuries than those without formal safety oversight. Additionally, healthcare professionals in these facilities expressed greater job satisfaction and a sense of organizational support. Even low-cost interventions like signage, visual cues, and peer-led safety rounds resulted in a quantifiable decrease in NSIs, highlighting the importance of administrative commitment in fostering a safety culture. In order to make such interventions a legal requirement for all healthcare facilities, the authors argued for national policy enforcement (35).

According to a study conducted in Iran by Dehghan et al. (2021), 71% of dentists had suffered a needlestick injury while working in clinical settings. The highest risk was observed during the administration of anesthesia, needle disposal, and surgical extractions. Curiously, the study discovered that NSIs were significantly influenced by ergonomic flaws in clinical setups, such as inadequate lighting, a small work area, and malfunctioning sharps containers. To lessen these injuries, the study suggested updating healthcare facilities' architectural layouts and offering ergonomics instruction. In order to guarantee structural and environmental sufficiency for safe clinical practice, the study also highlighted the necessity of occupational safety officers conducting workplace audits (36).

According to an observational study conducted in Lahore, Pakistan, by Ayub et al. (2019), medical students were extremely susceptible to NSIs during their clinical rotations because they were not adequately supervised or trained. Of the 600 students examined in the study, 23% acknowledged having experienced at least one NSI. A sizable fraction of these incidents were not reported because of fear of embarrassment or academic sanctions. The results highlighted the need for mentorship programs where senior healthcare professionals can teach students safe practices and the inclusion of NSI safety education in the clinical training curriculum. In order to prevent NSIs, Ayub et al. determined that closing the educational gap was just as important as providing protective gear (37).

A distinct investigation conducted in China by Ouyang et al. (2019) found that long work hours and large patient volumes were the main causes of NSIs among medical staff in urban tertiary hospitals. According to their findings, burnout and understaffing considerably hampered judgment and coordination, raising the possibility of unintentional injuries. The researchers suggested that team-based care models, sufficient rest periods, and interventions that address workload redistribution could all help reduce these risks. In addition, Ouyang and colleagues emphasized that NSIs brought on by fatigue were equally as dangerous as those brought on by carelessness or poor technique, and they urged healthcare administrators to think about systemic changes for long-term occupational safety (38).

A study by Hassan et al. (2020) in Egypt evaluated how well personal protective equipment (PPE) lowers the risk of NSI. According to the study, a 48% decrease in reported NSIs was linked to adherence to appropriate PPE usage, especially during surgical and emergency procedures. However, because of discomfort, unavailability, and insufficient monitoring, the study found inconsistent PPE use. Stricter enforcement measures and local production of cozy, climate-appropriate PPE were suggested as ways to improve compliance. According to the study's findings, PPE should be a component of a larger risk reduction framework that also includes accountability, accessibility, and training because it is insufficient on its own (39).

Finally, a study by Demir et al. (2021) in Turkey assessed how simulation-based training helped lower NSI incidents among medical personnel. In-depth practical simulation scenarios for handling sharp objects, controlling exposure, and handling emergencies were given to the participants (40). When compared to the control group, the group's NSI case count decreased by 35% over a six-month follow-up period. The study demonstrated that frequent exposure to real-world exercises enhanced reflexive decision-making in high-stress scenarios and assisted in internalizing safety procedures. In order to enhance clinical skills and safety practices, the authors argued for the nationwide implementation of simulation centers in healthcare facilities (41).

Chapter 3

MATERIALS AND METHODS

3.1 Research Design

This study was based using descriptive-cross-sectional study design.

3.2 Clinical Setting

The research was conducted in District Head Quarter Hospital (DHQ) and Mufti Mehmood Memorial Teaching Hospital (MMMTH) ,Dera Ismail Khan.

3.3 Sample size

The study population consists of all staff members working at District Head Quarter (DHQ) Hospital, Dera Ismail Khan. A non-probability convenience sampling technique was used to select participants. The total numbers of staff working in both hospitals are estimated to be 1000.

To calculate the sample size using **Cochran's formula**, the formula is:

$$n0 = \frac{Z^2 . p . (1 - p)}{e^2}$$

Where as;

1. Z = 1.96 (Z-score for a 95% confidence level)
2. p = 0.5 (expected prevalence)
3. e = 0.05 (margin of error)

Substituting the values into the formula:

$$n0 = \frac{1.96^2 . 0.5 . (1 - 0.5)}{0.05^2}$$

$$n0 = 384$$

To adjust the sample size for a population of N=100,000 we use the finite population correction formula:

$$n = \frac{n0}{1 + \frac{n0-1}{N}}$$

Substituting the values:

$$n = \frac{384}{1 + \frac{383}{1000}}$$

$$n = \frac{384}{1.383}$$

$$n = 277$$

The adjusted sample size for a population of almost 1000 staff members is approximately 280 participants.

3.4 Duration of study

The duration of the study was 4 month after the approval of synopsis.

3.5 Selection Criteria

3.5.1 Inclusion Criteria

- Healthcare workers (doctors, nurses, technologists, paramedics, and support staff) working in a tertiary care hospital in Dera Ismail Khan.
- Staff members who have occupational exposure to blood and other body fluids.
- Individuals are willing to participate in the study and provide informed consent.
- Participants are available during the data collection period and conveniently accessible.

3.5.2 Exclusion Criteria

- Healthcare workers who are not directly involved in patient care or do not have occupational exposure to bloodborne pathogens.
- Staff members unwilling to participate or who refuse to provide informed consent.
- Individuals on extended leave or unavailable during the data collection period.
- Those with incomplete or unreliable responses in the survey.

3.6 Data Collection

Data was collected through a structured questionnaire (Appendix IV) covering:

- Demographic Information (age, gender, designation, years of experience).
- Knowledge, practices, and attitudes regarding needle stick injuries and bloodborne pathogen transmission.
- History of occupational exposure, including previous NSIs and post-exposure management.
- Screening for BBPs (HBV, HCV, HIV) through blood sample collection from all participants.

3.7 Data analysis

SPSS version 23 was used to code and analyze the data collected. Microsoft Excel V. 2013 was utilized for tables, graphs, and charts and descriptive statistics such as means, frequencies, and percentages. The results, which are displayed in text, tables, and figures, and validated for significance using statistical tests such the Chi-Square Test and t-Test.

Chapter 4

RESULTS

The study was carried out at the District Head Quarter (DHQ) Hospital and the Mufti Mehmood Memorial Teaching Hospital (MMMTH), two significant public hospitals in Dera Ismail Khan. The results are presented in this chapter. The study included 280 healthcare workers (HCWs) from the surgical and related departments. The findings are categorized based on demographic traits, bloodborne pathogen (BBP) knowledge and practices, needle stick injury (NSI) incidence and response, and involvement in screening and surveillance initiatives. Frequencies, percentages, and, where appropriate, graphs or figures are used to describe the findings.

4.1 Demographic Characteristics of Participants

In all, 280 healthcare workers (HCWs) from the District Head Quarter Hospital (DHQ) and Mufti Mehmood Memorial Teaching Hospital (MMMTH), two significant tertiary care hospitals in Dera Ismail Khan, participated in this study. The following describes and interprets the participants' demographics, which include gender, age, designation, and years of work experience.

4.1.1 Gender Distribution

Figure 4.1 demonstrated that among the total participants (n = 280), the majority were male healthcare workers (n = 234, 83.6%), while female participants accounted for a significantly smaller portion (n = 46, 16.4%).

Table 1. Gender distribution among health care workers (HCWs)

Gender	Frequency
Male	234
Female	46

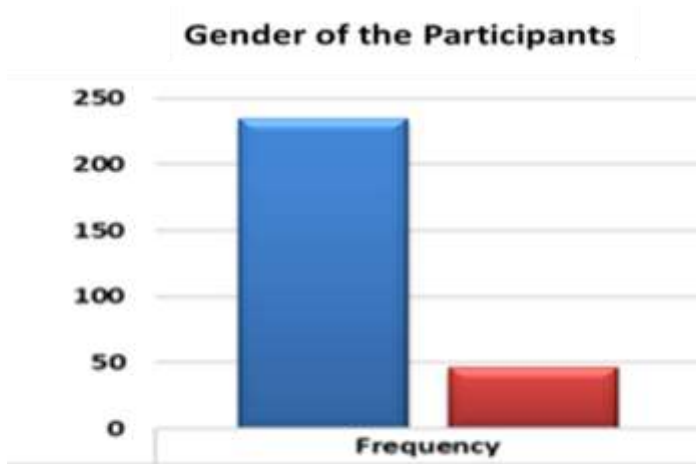

Figure 1. Gender Distribution among Health Care Workers

This gender distribution reflects the commonly observed male predominance in surgical and paramedical roles in tertiary care settings within the region. Such a distribution is critical in understanding occupational exposure risks and tailoring infection control interventions across gender-specific roles.

4.1.2 Age Distribution

The respondents' ages were grouped into three primary brackets to evaluate exposure risk across different career stages. The 18–30 years group comprised the largest portion of participants (n = 144, 51.4%), followed by those aged 31–45 years (n = 117, 41.8%). Only a minority (n = 19, 6.8%) were in the 46–60 years bracket. The relatively young workforce suggests a predominance of early-career professionals who may have variable awareness and adherence to infection control practices, highlighting the importance of targeted education and surveillance strategies.

Table 2. Age Distribution among Health Care Workers (HCWs)

Age Groups	Frequency
18-30	144
31-45	177
46-60	19

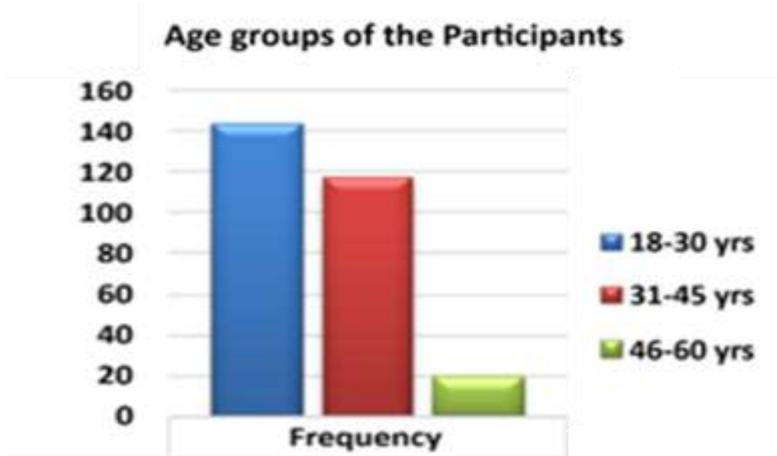

Figure 2. Age Distribution among Health Care Workers

4.1.3 Professional Designation

The study sample comprised a diverse group of healthcare professionals and support staff actively engaged in clinical services within hospital settings, particularly in surgical suits, operating theatres, and trauma care units. The paramedical staff represented the largest segment of respondents (n = 162, 57.9%), reflecting their integral role in the provision of perioperative and procedural care. Nurses constituted (n = 59, 21.1%) of the participants, including circulating nurses and those responsible for pre- and post-operative care. Doctors, including medical officers and surgical residents, accounted for (n = 27, 9.6%).

Table 3. Designation of health care workers among the participants

Designation	Frequency
Doctor	27
Nurse	59
Paramedics	162
Other	32

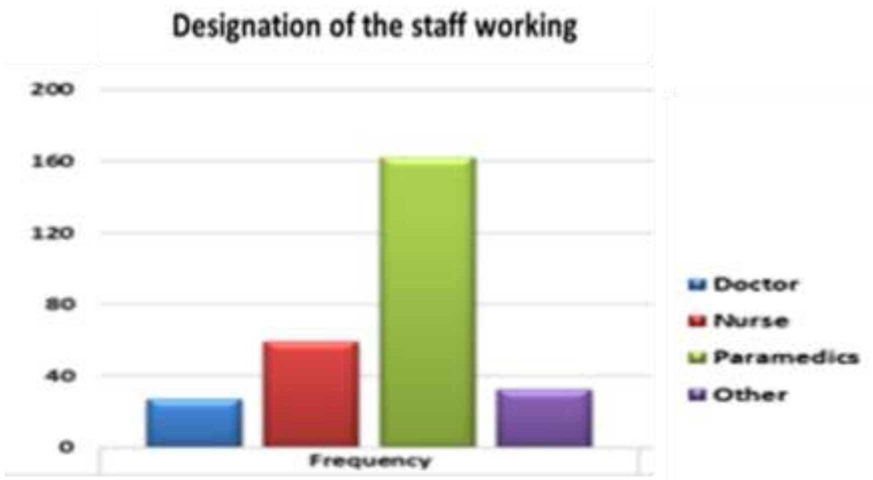

Figure 3. Designation of Health Care Workers among the participants

The "Other" category (n = 32, 11.4%) included individuals such as OT interns, technicians in training, and supporting staff responsible for the transportation and handling of surgical instruments and supplies in the Operating Theatre (OT) and trauma centers. While these individuals may not be directly performing invasive procedures, they maintain close and routine contact with patients and contaminated materials, making them equally relevant to the objectives of this study particularly in the context of infection control and bloodborne pathogen surveillance. This diverse representation allows for a comprehensive assessment of infection prevention knowledge, practices, and exposure risks across various cadres of hospital personnel.

4.1.4 Professional Experience

In terms of professional experience, a substantial proportion of respondents reported more than 6 years of service (n = 130, 46.4%), reflecting a mature and senior healthcare personnel likely familiar with hospital protocols. Those with 4–6 years of experience accounted for (n = 75, 26.8%), followed by staff with 1–3 years (n = 64, 22.9%). A small proportion (n = 11, 3.9%) had less than 1 year of experience, suggesting the presence of newly inducted personnel such as interns and recently recruited healthcare workers. The distribution demonstrates an opportunity to reinforce infection control training across all experience levels, especially among less experienced individuals.

Table 4. Experience of Health Care worker working in hospital

Experience	Frequency
Less than 1 Year	11
1-3 Year	64
4-6 Year	75
More than 6 Years	130

Figure 4. Experience of Health Care worker working in hospitals

4.2 Bloodborne Pathogens Knowledge and Awareness

4.2.1. Training on Bloodborne Pathogens

Among the total participants (n = 280), a significant majority (n = 198, 70.7%) reported that they had received formal training on bloodborne pathogens, reflecting institutional efforts to equip healthcare workers with essential infection control knowledge. However, a notable proportion (n = 82, 29.3%) stated they had not received any training. This group predominantly comprises newly recruited staff, internees, or auxiliary personnel who may have joined clinical duties prior to receiving formal orientation or training modules.

Table 5. Training on Blood Borne Pathogen among Health Care Workers

Training	Frequency
YES	198
NO	82

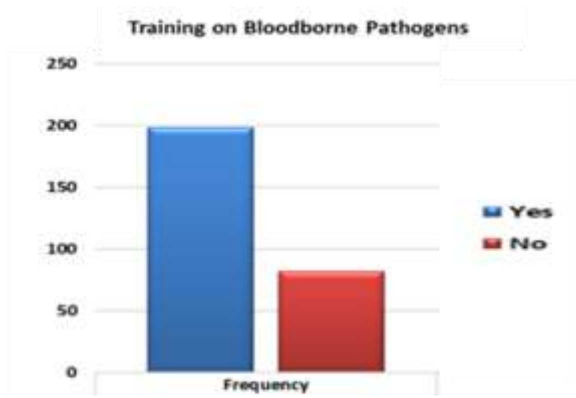

Figure 5. Training on blood borne Pathogen among HCWs

4.2.2 Awareness of Bloodborne Pathogens

When assessing general awareness regarding bloodborne pathogens, the findings revealed that 75.7% (n = 212) of the participants were aware of the term and its clinical significance. However, 24.3% (n = 68) lacked this basic awareness. Upon reviewing the respondent demographics, it was noted that this segment largely included individuals with minimal clinical experience such as internees, support staff, or newly employed personnel who had not yet undergone formal infection control training or exposure to practical hospital protocols. This gap underscores the necessity of mandatory orientation sessions for all incoming staff, regardless of rank.

Table 6. Awareness on Blood borne Pathogen among HCWs

Awareness	Frequency
Yes	212
No	68

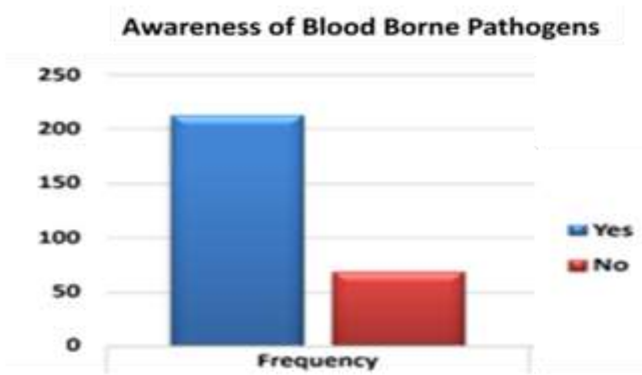

Figure 6. Awareness on Blood borne Pathogen among HCWs

4.2.3 Awareness of Routes of Transmission

With respect to understanding the routes of transmission for bloodborne pathogens such as needlestick injuries, blood splashes, contaminated instruments, or mucocutaneous exposure 72.9% (n = 204) of participants demonstrated adequate awareness. In contrast, 27.1% (n = 76) responded negatively, indicating a lack of knowledge. Like the trends observed in training and general awareness, this group too consisted largely of newly appointed or non-clinical staff (e.g., internees, circulating support personnel) who had not received a structured orientation on occupational exposure risks. These findings reinforce the importance of pre-service education and regular refresher training, especially for those in surgical and high-contact settings.

Table 7. Awareness on Route of Transmission among Health Care Workers

Awareness on Routes of Transmission	Frequency
YES	204
NO	76

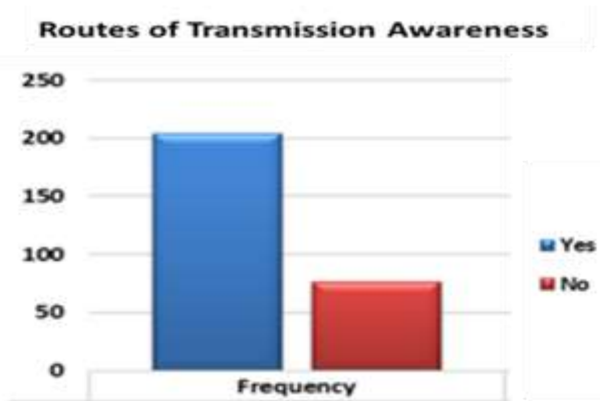

Figure 7. Awareness on Route of Transmission among HCWs

4.3 Practices Related to Bloodborne Pathogen Exposure and Infection Control

4.3.1 Use of Personal Protective Equipment (PPE)

The consistent and correct use of Personal Protective Equipment (PPE) is a cornerstone of infection prevention in surgical and clinical environments. In this study, the majority of participants reported routine adherence to PPE guidelines, with (n = 224, 80.0%) stating they always used PPE during clinical procedures. A smaller subset indicated inconsistent practices, with (n = 29, 10.4%) using PPE sometimes, (n = 19, 6.8%) rarely, and (n = 8, 2.9%) never using protective equipment. While the high rate of compliance is encouraging, the presence of occasional and rare users underscores the need for continual reinforcement through institutional monitoring and targeted training.

Table 8. Use of personal Protective Equipment among Health Care Workers

Use of PPE	Frequency
Always	224
Sometimes	29
Rarely	19
Never	8

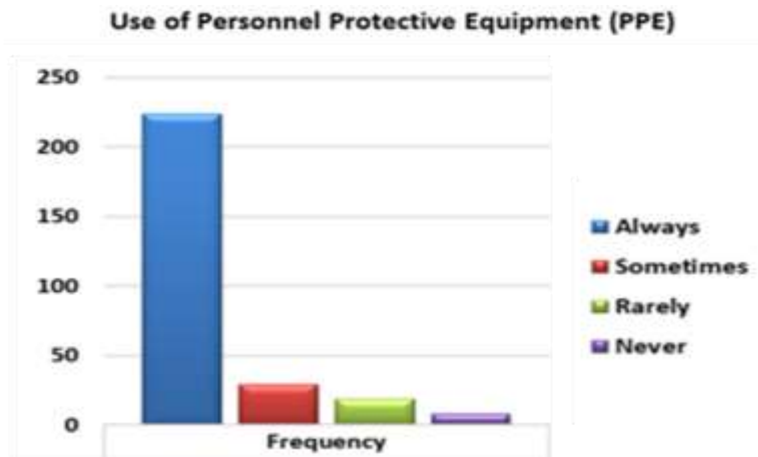

Figure 8. Use of personal Protective Equipment among HCWs

4.3.2 Incidence of Needle-Stick/Sharps Injuries

Among the 280 respondents, (n = 96, 34.3%) reported experiencing at least one needle-stick or sharps injury in the last 12 months, whereas (n = 184, 65.7%) had not encountered such an incident. This prevalence highlights the ongoing occupational risks faced by frontline staff, especially those involved in invasive procedures, and underscores the need for sustained awareness and preventive interventions such as safety-engineered devices and sharps disposal protocols.

Table 9. Incidence of Needle-Stick/Sharps Injuries among HCWs

Incidence	Frequency
Yes	96
No	184

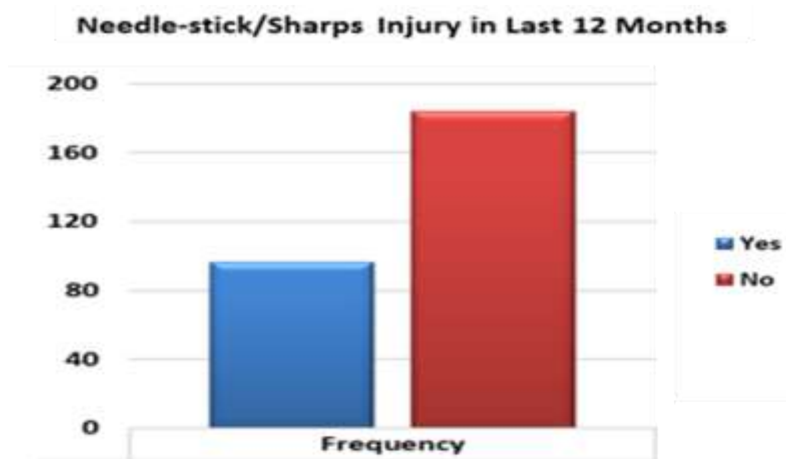

Figure 9. Incidence of Needle-Stick/Sharps Injuries among HCWs

4.3.3 Actions Taken After Injury (n = 96)

Among those who had experienced a needle-stick or sharps injury (**n = 96** total exposures), the post-injury response varied:

Table 10. Action Taken After Needle-Stick/Sharps Injuries among HCWs

Actions taken After Injury	Frequency
Washed the wound	54
Post exposure prophylaxis	23
No action taken	18

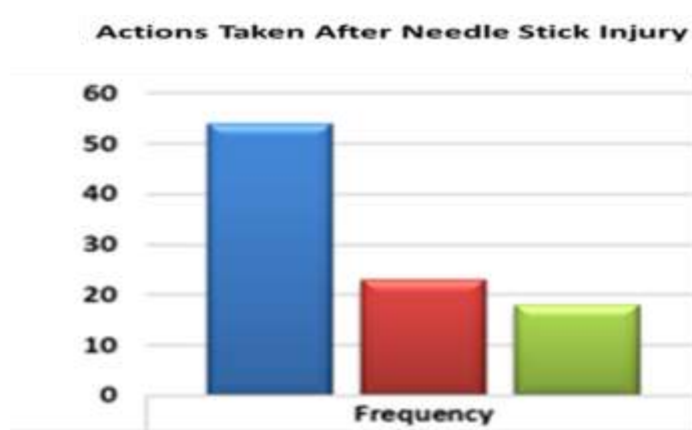

Figure 10. Action Taken After Needle-Stick/Sharps Injuries among HCWs

Wound cleansing was the most reported immediate response. This action aligns with WHO and CDC recommendations, which advise prompt washing of the exposed site with soap and water as an initial response. However, only 24.0% of exposed individuals reported initiating post-exposure prophylaxis (PEP), a crucial step in mitigating the risk of seroconversion to bloodborne viruses. The finding that nearly one-fifth (19.2%) took no action at all is alarming and indicative of either a lack of awareness, gaps in training, or institutional deficiencies in reporting and response mechanisms.

4.3.4 Frequency of Disinfection Protocols

Routine disinfection practices were also evaluated. A significant majority of respondents (n = 219, 78.2%) reported always adhering to disinfection protocols. Others admitted to sometimes (n = 28, 10.0%), rarely (n = 19, 6.8%), or never (n = 14, 5.0%) following proper disinfection procedures. These inconsistencies could directly contribute to increased occupational risk and patient cross-contamination, particularly in high-exposure zones such as operating theaters and trauma centers.

Table 11. Frequency of Disinfection Protocol among Health Care Workers (HCWs)

Disinfection Protocol	Frequency
Always	219
Sometimes	28
Rarely	19
Never	14

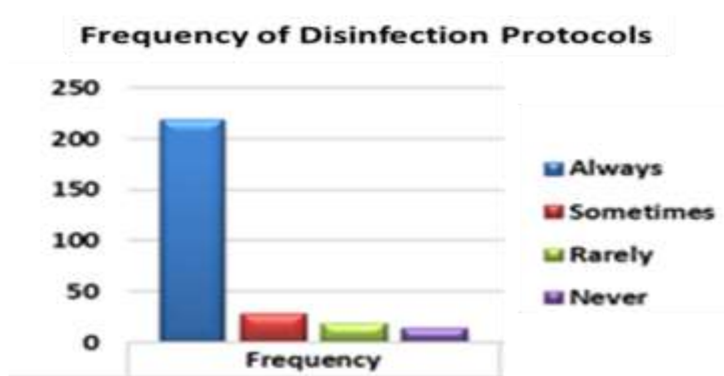

Figure 11. Frequency of Disinfection Protocol among HCWs

4.4 Blood-borne Pathogens Surveillance

The data collected from the Operation Theater staff (n = 280) regarding institutional practices and individual-level compliance toward bloodborne pathogens (BBPs) surveillance revealed several key findings.

4.4.1 Availability of a Formal Surveillance Program

Among the total respondents (n = 280), a majority (n = 190; 67.9%) confirmed the presence of a formal bloodborne pathogen surveillance system within their healthcare settings. However, a notable proportion of participants either reported the absence of such a program (n = 40; 14.3%) or expressed unawareness regarding its existence (n = 50; 17.9%). This unawareness can be attributed to the inclusion of newly recruited healthcare personnel and interns who may not have received comprehensive institutional orientation or training related to occupational health and safety protocols. Furthermore, it may reflect gaps in the communication or enforcement of institutional policies regarding routine surveillance systems.

Table 12. Availability of a Formal Surveillance Program for HCWs

Surveillance Program	Frequency
YES	190
NO	40
Don’t Know	50

Figure 12. Availability of a Formal Surveillance Program for HCws

4.4.2 Frequency of Screening for Bloodborne Pathogens

The data revealed that 62.1% of respondents (n = 174) reported being screened for bloodborne pathogens (HBV, HCV, HIV) every six months, which is consistent with internationally recommended guidelines for healthcare workers operating in high-risk environments. Additionally, 24.6% (n = 69) mentioned that screening occurs only after known exposure, while 11.8% (n = 33) reported never being screened. A very small number (n = 4, 1.4%) indicated annual screening. The relatively high percentage of post-exposure and "never screened" responses likely reflect the inclusion of staff from peripheral departments, newly appointed employees, or those under probationary or internship status. These individuals may not yet be fully incorporated into institutional screening programs or may lack awareness due to insufficient onboarding procedures.

Table 13. Frequency of Screening of Blood Borne Pathogen in HCWs

Screening	Frequency
Annually	4
Every 6 month	174
After Exposure	69
Never	33

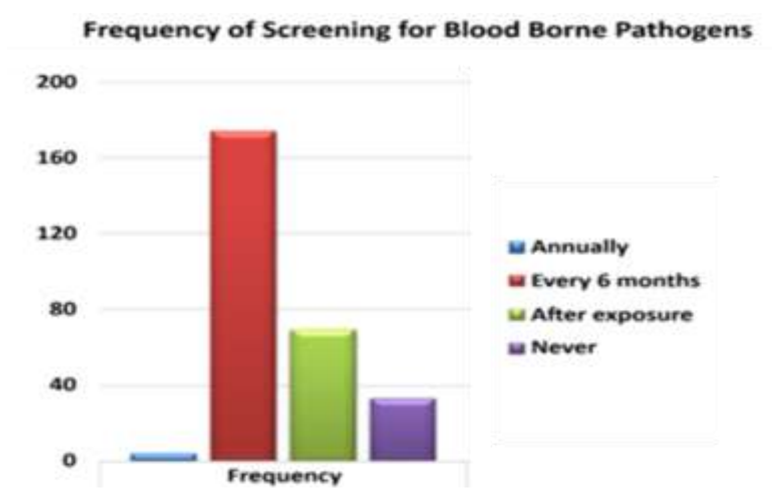

Figure 13. Frequency of Screening of Blood Borne Pathogen in HCWs

4.4.3 Consent for Blood Sample Collection

Regarding consent for blood sample collection, (n= 185, 66.1%) of the respondents reported that they provided informed consent during the surveillance process. However, a significant proportion (n = 95, 33.9%) stated they did not provide consent. This disparity may result from a lack of awareness among new or temporary staff regarding the importance of consent procedures in routine and post-exposure surveillance. Additionally, some may perceive screening as optional or fear stigmatization or breach of confidentiality, which warrants further staff education and reinforcement of ethical practices in clinical settings.

Table 14. Consent for Blood Sample Collection of the respondents

Consent	Frequency
YES	185
NO	95

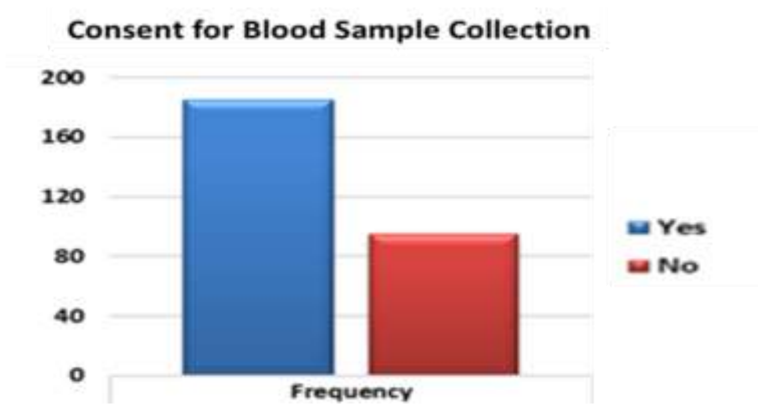

Figure 14. Consent for Blood Sample Collection

4.5 Association between Needle-stick Injuries and Pathogen Exposure, Training, Experience, and Screening Procedures

The findings of cross-tabulation and Chi-Square analyses that were conducted to evaluate the relationships between important variables and the incidence of needlestick/sharps injuries (NSIs), as well as screening and bloodborne pathogen (HBV, HCV, and HIV) positivity, are presented in this section. Finding potential risk factors for NSIs and pathogen exposure among medical staff at a tertiary care hospital in Dera Ismail Khan was the aim of the study.

4.5.1 Association between training on Bloodborne Pathogens and Needle-stick/Sharps Injury in Last 12 Months

Among the total staff surveyed (n = 280), 198 (70.7%) had received training on bloodborne pathogens (BBPs), while 82 (29.3%) did not. Out of those who received training, 65 staff members (23.2%) reported experiencing a needle-stick or sharps injury in the last 12 months, whereas 133 (47.5%) did not report any such injury. In contrast, among the 82 staff who had not received training, 31 individuals (11.1%) reported experiencing a needle-stick or sharps injury, while 51 (18.2%) did not report any such incident. Overall, a total of 96 staff members (34.3%) experienced a needle-stick injury in the last 12 months, while 184 (65.7%) remained injury-free.

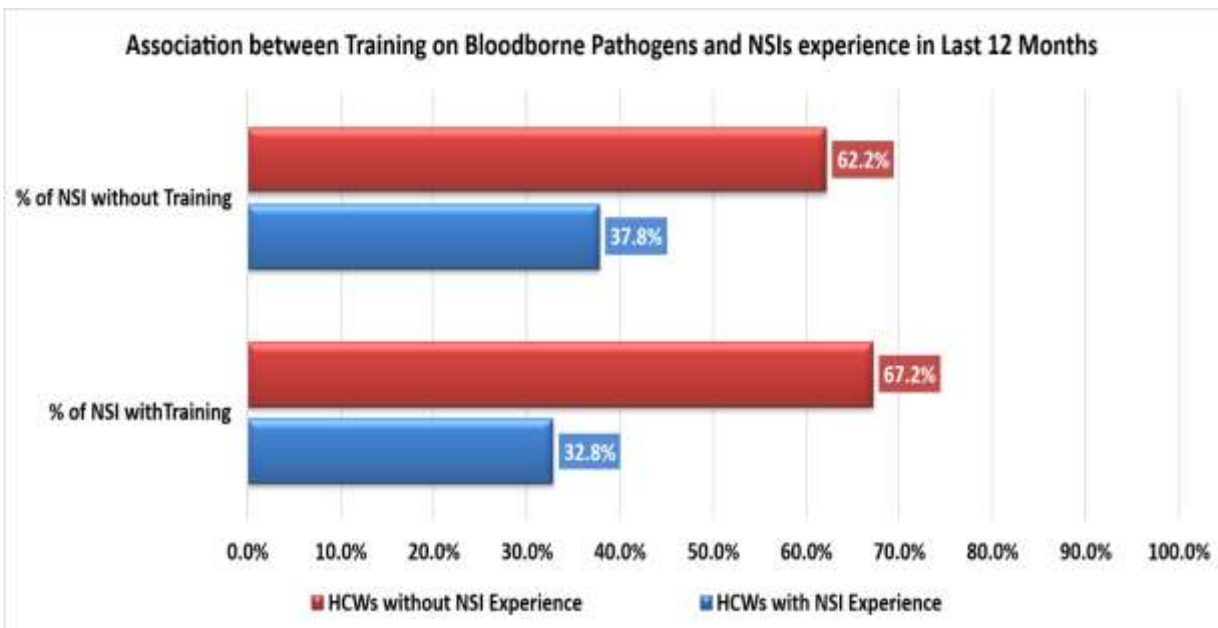

Figure 15. Association between training on Bloodborne Pathogens and Needle-stick/Sharps Injury in Last 12 Months

The association between receiving training on bloodborne pathogens and the occurrence of needle-stick or sharps injuries was further examined using the Chi-Square test as shown in Figure 15. The Pearson Chi-Square value was 0.637 with a p-value of 0.425, which is greater than the conventional significance level of 0.05. This indicates that there is no statistically significant association between training status and the incidence of needle-sticks or sharps injuries among the participants. These findings suggest that while training is important, it may not be sufficient in reducing injury rates without additional preventive measures and institutional protocols.

Table 15. Chi square test association between training on blood-borne pathogens and needle-stick/sharps injury in last 12 months

Chi-Square Tests					
	Value	**df**	**Asymptotic Significance (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	0.637[a]	1	0.425		
Continuity Correction[b]	0.436	1	0.509		
Likelihood Ratio	0.632	1	0.427		
Fisher's Exact Test				0.489	0.254
Linear-by-Linear Association	0.635	1	0.425		
N of Valid Cases	280				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 28.11.					
b. Computed only for a 2x2 table					

Despite a higher proportion of staff (70.7%) receiving training on bloodborne pathogens, the results showed no significant association between training and the occurrence of needle-stick/sharps injuries. This indicates that while training enhances knowledge about bloodborne pathogen transmission, it does not necessarily reduce the practical risk of injury. Needle-stick injuries are often influenced by factors such as workload, human error, inadequate safety practices, or emergency conditions. Thus, training alone is insufficient, and there is a need for reinforced practical measures, such as regular hands-on workshops, strict adherence to SOPs, and availability of safety equipment, to effectively reduce occupational exposures.

4.5.2 Use of Personal Protective Equipment (PPE) by Designation of Healthcare Workers (n = 280)

The findings of this study revealed varied patterns of Personal Protective Equipment (PPE) use among different categories of healthcare workers (HCWs). Out of the total participants (n = 280), the majority, 80% (n = 224), reported always using PPE, whereas

10.4% (n = 29) used it sometimes, 6.8% (n = 19) rarely, and 2.9% (n = 8) reported never using PPE. This indicates that while compliance was generally high, a notable minority still demonstrated inconsistent PPE usage.

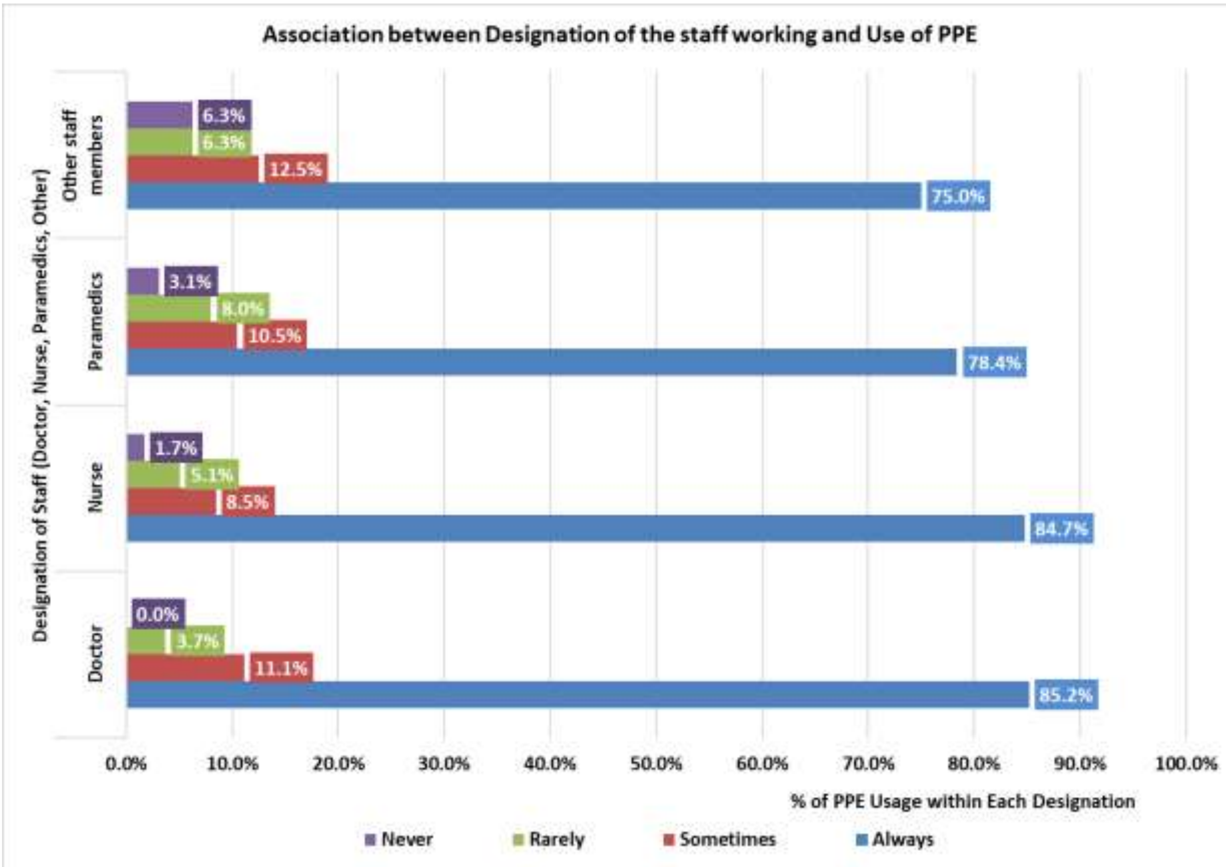

Figure 16. Association between designations of the staff working and use of PPE

When analyzed by designation, doctors (n = 27) exhibited the highest compliance, with 85.2% always using PPE, 11.1% using it sometimes, and 3.7% rarely using it. None of the doctors reported never using PPE. Similarly, nurses (n = 59) also demonstrated strong adherence, with 84.7% always using PPE, 8.5% sometimes, 5.1% rarely, and only 1.7% never using it. In contrast, paramedics (n = 162), the largest group in the study, reported comparatively lower adherence, as 78.4% always used PPE, 10.5% used it sometimes, 8.0% rarely, and 3.1% never. Among the "other staff" category (n = 32), compliance was the lowest, with 75.0% always using PPE, 12.5% sometimes, and 6.3% each reporting rarely or never using PPE.

Table 16. Chi Square Test for association between working staff designation & PPE use

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	4.149[a]	9	.901
Likelihood Ratio	4.720	9	.858
Linear-by-Linear Association	2.873	1	.090
N of Valid Cases	280		
a. 9 cells (56.3%) have expected count less than 5. The minimum expected count is .77.			

The Chi-square analysis assessed the relationship between staff designation and the use of personal protective equipment (PPE). The results revealed no statistically significant association ($\chi^2 = 4.149$, df = 9, p = 0.901), indicating that PPE usage patterns were broadly similar across doctors, nurses, paramedics, and other staff. Although most participants in all categories reported consistent PPE use, variability was observed particularly among paramedics and support staff. It is also important to note that more than half of the cells had expected counts less than 5, which reduces the robustness of the test results and suggests that findings should be interpreted with caution.

Chapter 5

DISCUSSION

This study investigated the prevalence and determinants of needle-stick and sharps injuries (NSIs) among healthcare workers in surgical suites of DHQ Hospital and MMMTH, Dera Ismail Khan. It also explored training, knowledge, PPE use, and screening practices in relation to NSI risk and bloodborne pathogen exposure.

This study aimed to examine whether staff who had received training on bloodborne pathogens (BBPs) had a lower incidence of needle-stick or sharps injuries (NSIs) in the last 12 months. According to the findings, 70.7% of staff had received training, whereas 29.3% had not. Among those trained, 32.8% experienced NSIs, while 67.2% had not. On the other hand, 37.8% of untrained staff reported NSIs, with 62.2% remaining injury-free. These figures suggest a slightly higher rate of injuries among untrained staff; however, the difference is not substantial.

The chi-square test revealed no statistically significant association between BBP training and NSI occurrence ($p = 0.425$), indicating that the observed variation could be due to chance. While training aims to equip staff with knowledge regarding BBPs and their transmission, the actual occurrence of NSIs may depend more on real-time working conditions, adherence to safety protocols, and availability of protective tools rather than theoretical understanding. Therefore, while BBP training is important for general awareness, it may not directly prevent NSIs unless accompanied by behavioral changes and environmental support.

Previous literature supports this interpretation. Studies have shown that training programs improve knowledge but do not always translate into behavior change or reduced injuries unless reinforced through supervision, auditing, and administrative controls (42,43). For example, research from tertiary care settings has emphasized that overconfidence after training might lead to carelessness in practical scenarios, thereby neutralizing the benefits of knowledge gained (44). Hence, training alone is not sufficient; hands-on practice, safety culture, and enforcement of standard precautions are crucial.

These findings highlight the need for a more integrated approach. While educational programs on BBPs are necessary, they must be coupled with routine drills, mentorship, regular surveillance, and provision of safety-engineered devices. Moreover, hospital management must assess whether training programs are achieving practical outcomes. A performance-based evaluation system, rather than attendance-only training certification, could help ensure that knowledge translates into improved practice.

The cross-tabulation results indicate that among staff who had received training on bloodborne pathogens, a significant proportion reported consistent use of personal protective equipment (PPE). Specifically, those who had training were more likely to always wear gloves, gowns, masks, and eye protection compared to their untrained counterparts. This suggests a positive relationship between theoretical training and adherence to PPE protocols in routine practice.

These findings align with studies conducted in both high-income and low-resource healthcare settings. According to a study conducted in Karachi, trained healthcare workers were twice as likely to report adherence to glove and gown usage compared to untrained ones (45). Another study in sub-Saharan Africa found that formal training had a significant impact on mask and eye-protection practices, especially among surgical staff (46). These results reinforce the importance of education in reinforcing protective behaviors in the workplace.

However, it must be acknowledged that training alone does not guarantee 100% compliance. Various factors, including PPE availability, departmental policies, workload, and perceived urgency, can influence behavior. In certain situations, trained staff may choose to neglect PPE use due to time constraints or overfamiliarity with procedures. This gap between knowledge and practice has been observed globally and highlights the importance of periodic refresher training and institutional monitoring mechanisms (47).

In conclusion, training programs must be paired with an enabling environment, such as uninterrupted PPE supply, peer accountability, and administrative support. These external factors ensure that the knowledge imparted through training translates into consistent and safe practices. Hospitals should also promote a culture where the proper use of PPE is seen not only as a requirement but as a professional responsibility and standard of care.

The study also evaluated the relationship between staff knowledge of bloodborne pathogens and their vaccination status, particularly for Hepatitis B. It was observed that a majority of respondents with good knowledge of BBPs had received full vaccination doses, whereas those with poor knowledge had lower vaccination coverage. This pattern suggests a possible association between awareness levels and personal preventive measures.

These findings are consistent with previous literature indicating that knowledge is a strong predictor of proactive health behavior. A study from Lahore demonstrated that staff who were aware of HBV risks were significantly more likely to complete their vaccination schedules (48). Similarly, research in Bangladesh found a direct correlation between training on infection control and increased vaccine uptake among OT and emergency staff (49). These studies support the notion that improved awareness contributes to responsible health behavior.

However, vaccination coverage is not solely determined by knowledge. Factors such as vaccine availability, institutional policies, and affordability may play significant roles. In resource-constrained settings, even knowledgeable staff may fail to complete the vaccine schedule due to unavailability or cost-related barriers. Hence, institutions must take responsibility to ensure accessible and free immunization programs for their employees (50).

From a policy perspective, the integration of vaccination status checks into routine hospital audits and performance reviews can enhance coverage. Mandatory documentation and periodic verification of vaccination records can reinforce the importance of this preventive measure.

The occupational risk of HBV and related infections among healthcare workers may ultimately be considerably decreased by improving BBP-related knowledge and combining it with system-level vaccination campaigns. The association between self-reported HBV, HCV, and HIV screening and BBP knowledge was another noteworthy discovery. Bloodborne infection screening was more common among employees who knew more about BBP. This pattern suggests that informed employees are aware of the dangers of occupational exposure as well as the value of early diagnosis and personal health monitoring.

Evidence from research done in healthcare facilities throughout Asia and Africa supports this trend. Healthcare workers who performed better on BBP knowledge tests, for example, were more likely to take part in voluntary HBV-HCV screening programs, according to a study conducted in Nepal (51). Similarly, despite worries about stigma, higher awareness was associated with a higher willingness to get tested for HIV in Nigeria. Therefore, raising awareness is essential to promoting health-seeking attitudes and preventive actions. Even with the positive correlation found, psychological and structural barriers may still restrict screening practices. While some employees might be deterred by the lack of confidentiality in hospital settings, others might be afraid of positive outcomes because of stigma or potential repercussions on their employment. These issues must be addressed by implementing anonymous or confidential screening programs, coupled with strong anti-discrimination policies (52).

The current study explored the relationship between Bloodborne Pathogen (BBP) training and the incidence of needle-stick and sharps injuries (NSIs) among operating theater staff in public sector hospitals in Dera Ismail Khan. Out of 280 total respondents, 198 staff members (70.7%) reported receiving BBP training, while 82 (29.3%) did not receive such training. Among trained individuals, 65 (32.8%) experienced NSIs within the last 12 months, and 133 (67.2%) did not. Conversely, among the untrained group, 31 (37.8%) reported NSIs, while 51 (62.2%) had no such experience.

Overall, the prevalence of NSIs among all respondents was 34.3% (n = 96), highlighting a significant occupational hazard in this high-risk clinical environment. This finding aligns with previous studies that reported similar or higher prevalence in surgical and anesthetic departments, especially in low-resource healthcare systems where the availability of protective equipment and adherence to infection control protocols may be suboptimal (53). A study conducted in Ethiopia reported NSI prevalence among healthcare workers ranging from 30% to 44%, particularly among surgical teams (54). Similarly, research from Nigeria found that 40% of OT staff had experienced at least one NSI in the previous year, reinforcing the global nature of this occupational challenge (55).

Despite expectations that BBP training would significantly reduce NSI rates, the chi-square analysis revealed no statistically significant association between training and NSI occurrence ($\chi^2 = 0.637$, $p = 0.425$). This suggests that while training improves knowledge about BBPs, it may not effectively reduce injury occurrence unless accompanied by broader institutional safety measures and behavioral enforcement mechanisms. These outcomes are consistent with research by Tadesse et al. (2016), which highlighted that training without motivation, policy reinforcement, and supervision frequently does not result in safe practice (56).

The discrepancy between practice and training could have several causes. One significant contributing factor is that training is frequently restricted to theoretical components, and programs for continuing medical education hardly ever incorporate hands-on demonstration or simulation-based learning. Staff members may be aware of the risks in these situations, but they might not fully understand how to prevent them in high-stress scenarios like emergency surgeries. Furthermore, a lot of institutions only offer training once or sporadically, with no audits, refresher courses, or follow-up tests to gauge compliance (57).

The workplace environment is another contributing factor. The long shifts, few breaks, and heavy patient loads that OT staff frequently work in can cause fatigue and jeopardize adherence to safety procedures. Research has indicated that employees who are overworked or exhausted are more likely to sustain an unintentional needle prick, irrespective of their level of training (58). Furthermore, training evaluations may be skewed and injury frequency may be underreported due to a lack of reporting culture brought on by fear of stigma or punishment (59). The cycle of occupational exposure is sustained when healthcare workers fail to report NSIs, thereby missing out on opportunities for preventive intervention and root cause analysis.

Another important consideration is the accessibility of safety-engineered equipment, such as needleless IV systems or retractable needles. Despite their demonstrated efficacy in lowering injuries, research from Pakistan and other low-income nations has revealed that these devices are either unavailable or underutilized because of financial limitations (60). Even when they are available, employees might not get enough training on how to use them properly, or they might use their comfortable, risky devices again out of habit or convenience.

Another important factor is the organizational safety climate. When safety is actively promoted and prioritized by institutional leadership, including through consistent protocol implementation, monitoring, and open channels for reporting, staff behavior improves. In contrast, a lack of accountability, monitoring, or safety culture can undermine even the most comprehensive training programs (61). Thus, the effectiveness of BBP training is highly dependent on contextual and systemic reinforcements.

The findings of this study suggest that hospital administrators should incorporate regular screening as part of occupational health policies, especially for high-risk departments such as surgery, emergency, and anesthesiology. Providing incentives or integrating screening into annual medical evaluations can help increase participation rates. Education programs must not only provide knowledge but also normalize routine screening as a critical part of occupational safety. The underline study has also limitations which need to be addressed for future studies. The limitations of this study are under;

This study was limited to specific two hospitals in a district that may restrict the generalizability of the outcomes to other areas and hospitals. The cross sectional design collect data at a specific point in one time, preventing the evaluation of other causal associations. The screening for BBPs in this study was based on specific available participants that might not show all health workers with previous exposures with NSIs or BBPs.

Chapter 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study assessed the prevalence, associated risk factors, and preventive practices regarding needle stick injuries (NSIs) and bloodborne pathogens (BBPs) among healthcare workers (HCWs) in a tertiary care hospital in Dera Ismail Khan. The findings revealed a significant proportion of HCWs, particularly those in surgical and paramedical departments, experienced at least one NSI in the past 12 months. Despite moderate awareness about BBPs, many HCWs lacked formal training in infection prevention and control, highlighting a critical gap between knowledge and practical safety behaviors.

Furthermore, while personal protective equipment (PPE) use was generally reported as high, inconsistencies in its proper and regular application were evident across different staff categories. Surveillance systems for BBP exposure and post-exposure prophylaxis (PEP) remain either underutilized or inadequately implemented. The study also noted low HBV vaccination coverage among some groups, exposing them to avoidable risks. These gaps underline an urgent need for strengthening hospital infection control programs, increasing staff training, and institutionalizing regular monitoring mechanisms to reduce the burden of occupational exposure.

6.2 Recommendations

- Regular, department-wise training sessions on infection control, NSI prevention, and BBP transmission should be made mandatory for all HCWs, especially new inductees and OT staff.
- Establish a formal, anonymous, and non-punitive reporting system for needle stick injuries and BBP exposures. Data should be reviewed monthly for targeted interventions.
- Ensure 100% HBV vaccination coverage among healthcare staff, with proper documentation and follow-up for booster doses where necessary.

- Enforce the correct and consistent use of personal protective equipment (PPE) through audits, supervision, and accountability measures across all hospital departments.
- Develop and implement clear guidelines for post-exposure prophylaxis (PEP) that include immediate access to treatment, counseling, and follow-up care for exposed individuals.

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APPENDICES

ENGLISH CONSENT FORM

The study you are about to participate is a randomized control trial survey titled as;

"Determination Of Needle Stick Injury Regarding Bloodborne Pathogens Among Healthcare Workers At Tertiary Care Hospital Dera Ismail Khan"

The study has no potential harm to participants. All data collected from you will be coded in order to protect your identity, and should not be disclosed to anyone. Following the study there will be no way to connect your name with your data. Your answers to the questions will not affect the quality of education given to you. Any additional information about the study results will be provided to you at its conclusion, upon your request.

You are free to withdraw from the study at any time. You agree to participate, indicating that you have read and understood the nature of the study, and that all your inquiries concerning the activities have been answered to your satisfaction.

NAME ________________________ **SIGNATURE**___________________

DATE___________________________

URDU CONSENT FORM

میں____________ تصدیق کرتا/ کرتی ہوں کہ**Mr. zaMuhammad Fayy**(نے اپنی اس تحقیق

"Determination Of Needle Stick Injury Regarding Bloodborne Pathogens Among Healthcare Workers At Tertiary Care Hospital Dera Ismail Khan**"**

.زیرنگران **Tehmina TariqMiss**کے متعلق بتا دیا ہے۔ مجھے اس تحقیق کی نوعیت، مقاصد، احداف، توقعات، فوائد اور خطرات کے متعلق ، ۔ساری معلومات فراہم کر دی گئی ہیں

اس تحقیق کے دوران ساری معلومات صیغۂ راز میں رہیں گی اور مریض کا نام اور دیگر معلومات صرف تحقیق کے لیے استعمال ہوں گی۔مجھے یہ بھی بتا دیا گیا ہے کہ میں اس تحقیق سے متعلقہ ہر قسم کے سوال پوچھنے کا مجاز ہوں اور یہ تحقیق صرف ایک شخص ک مفاد میں نہیں ہے بلکہ بحسثیت مجموعی انسانیت کا مفاد اس سے وابسطہ ہے۔ تمام تفصیلات جاننے کے بعد یس تحقیق میں شامل ہونے یا نہ ہونے پر کسی کا قائل نہیں ہوں۔ اس تحقیق سے کسی بھی وقت علیحدہ ہونے پر مجھ پر کوئی پابندی نہیں ہو گی۔ میں بذاتِ خود بقائمی حوش و حواس
۔اور رضا مندی سے اس تحقیقاتی عمل میں شامل ہوتی/ ہوتا ہوں

دستخط محقق --------------------------

دستخط شرکت کار --------------------------

تاریخ --------------------------

Appendix III: Plagiarism Report

Report:Determination of Needle Stick Injury Regarding Bloodborne Pathogens Among Healthcare Workers at Tertiary Care Hospital Dera Ismail Khan (FAYYAZ MUHAMMAD KHAN)

ORIGINALITY REPORT

11%	9%	6%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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5	Alenezi, Meshal Saad B.. "Knowledge, Attitude, and Practice (KAP) of Healthcare Workers Toward Needle Stick and Sharps Injury (NSSI) in a Tertiary Hospital in Saudi Arabia", Alfaisal University (Saudi Arabia), 2025 Publication	<1%
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Appendix IV: Performa for Data Collection

Section A: Demographics	Questions/Options
Gender:	☐ Male ☐ Female
Age:	____________ years
Designation:	☐ Doctor ☐ Nurse ☐ Paramedic ☐ Technician ☐ Other (Specify): __________
Work Experience:	☐ Less than 1 year ☐ 1–3 years ☐ 4–6 years ☐ More than 6 years

Section B: Knowledge of Bloodborne Pathogens	Questions/Options
Training on Bloodborne Pathogens:	☐ Yes ☐ No
Awareness of Pathogens (Select All):	☐ HBV ☐ HCV ☐ HIV ☐Treponema pallidum (Syphilis) ☐ Mycobacterium tuberculosis (TB) ☐ Staphylococcus aureus (MRSA) ☐ Streptococcus spp. ☐ Neisseria meningitidis ☐ Others (Specify): __________
Routes of Transmission Awareness:	☐ Yes ☐ No

Section C: Practices Related to Infection Control	Questions/Options
Use of PPE (Gloves, Face Masks):	☐ Always ☐ Sometimes ☐ Rarely ☐ Never
Needle-stick/Sharps Injury in Last 12 Months:	☐ Yes ☐ No
Actions Taken After Injury (Select All):	☐ Washed the wound ☐ Post-exposure prophylaxis ☐ No action
Frequency of Disinfection Protocols:	☐ Always ☐ Sometimes ☐ Rarely ☐ Never

Section D: Surveillance and Blood Sample Screening	Questions/Options
Formal Surveillance Program:	☐ Yes ☐ No ☐ Don't know
Frequency of Screening for Bloodborne Pathogens:	☐ Annually ☐ Every 6 months ☐ Only after exposure ☐ Never
Consent for Blood Sample Collection:	I consent to providing my blood sample for screening of the following pathogens as part of research and infection control improvement. Confidentiality of results will be maintained. ☐ Yes ☐ No
Screening for the following infections (Select All):	☐ HBV ☐ HCV ☐ HIV ☐Treponema pallidum (Syphilis) ☐ Mycobacterium tuberculosis (TB) ☐ Staphylococcus aureus (MRSA) ☐ Streptococcus spp. ☐ Neisseria meningitidis ☐ Others (Specify): __________

Appendix V: Ethics Approval Committee Letter

SUPERIOR UNIVERSITY

OFFICE OF THE DEAN-FAHS

Ref.: IRB /FAHS/Allied/04/25/MS/AHS-3734

Date: 18th March 2025

Program: MS Allied Health Sciences

Name: Fayaz Muhammad Khan

Registration: SU91-MSAHW-F23-017

Subject: Ethical Approval Letter

The Research Ethical Committee convened on Dated: **17th March, 2025** to discuss your protocol titled "**Determination Of Needle Stick Injury Regarding Bloodborne Pathogens Among Healthcare Workers at Tertiary Care Hospital Dera Ismail Khan**"

No further corrections and recommendations were suggested. The above-mentioned protocol has been approved after considering various research issues including ethical concerns with condition that the researcher will submit completion report at the end of his/her research.

Prof. Dr. Muhammad Naveed Babur
Dean/Convener REC
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