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Assessment of Knowledge, Attitude and Practices Regarding Safe Handling and Disposal of Surgical Sharps among Healthcare Workers in Mardan Medical Complex, Mardan

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Abstract

Background: Proper handling and disposal of surgical instruments that are sharp is an important part of preventing the spread of infection in the healthcare arena. Needle stick and sharps injuries are a serious workplace problem for healthcare professionals, where the risk posed to involve blood borne diseases like hepatitis B, hepatitis C and HIV. The objective of this study was to evaluate the Knowledge, attitude and practice (KAP) regarding surgical sharps handling and disposing of the Healthcare Workers at Mardan Medical Complex.

Methods: A cross-sectional study was performed with 263 healthcare workers comprising doctors, nurses, technologists and technicians. The questionnaire consisted of two questions that were structured and self-administered: socio-demographic questions and KAP-related questions. The data were analyzed statistically using statistical software. The association between variables was evaluated by the chi-square test, and frequencies and percentages were calculated. Logistic regression was run to determine the factors associated with good practices. P-value <0.05 was used to determine statistical significance.

Results: Most participants had a satisfactory level of awareness (69.20%) and positive attitude (60.08%) about sharps safety. But only 55.89% had good practices.

The proportion of people reporting having suffered needle-stick injuries was high (77.19%), with only 55.89% reporting it to a body. There were no statistically significant differences in socio-demographic variables in reporting behavior ($p > 0.05$). The logistic regression analysis showed that knowledge, training and experience were not significantly associated with good practice, while training was borderline (AOR = 0.61, $p = 0.08$).
Conclusion: Healthcare workers also have adequate knowledge and relatively positive attitudes about safe practices, but safe use of sharps is still suboptimal. The result signifies an important knowledge and practice gap. To improve compliance with the safe handling of sharps, it is key that training programs are strengthened, reporting systems are improved, and strict institutional policies are in place.

Introduction

Background

Sharps include things like needles, hypodermic needles, scalpels and other blades, knives, infusion sets, saws, shattered glass, and nails that could cut or puncture wounds. These things are typically regarded as extremely dangerous medical waste, regardless of whether they are infectious.(1). A needle stick injury is a major workplace risk for medical professionals. It is a wound created by a needle that unintentionally punctures the skin. Professionals, such as physicians, nurses, and paramedics, passing intravenous cannulas, blood collection needles, and sharp instruments during procedures, are the cause of needle stick injuries.(2).

A minor (7–8%) but significant percentage of these injuries are caused by scalpel blades. Scalpel blade injuries typically carry a risk of infection and structural harm to the body, generally the hand. When a patient with a blood-borne virus is deeply injured with a hollow-bore needle, the risk of contracting a potentially deadly infection is 0.2–0.5% for HIV, 2–40% for Hepatitis B, and 3–10% for Hepatitis C. General Anesthesia and several months of therapy may be required to repair damage to a digital nerve, artery, or tendon.(3).

The patient, the surgeon, and the theatre personnel are all at risk for percutaneous injuries from suturing needles. Both surgeons and theatre personnel are concerned about the potential of bloodborne infectious illnesses. Glove perforation poses a risk of contaminating the surgical field and raising the risk of surgical site infection (SSI). With the growing use of implants (such as mesh hernia repairs, orthopedic implants, etc.), where the consequences of SSI could be disastrous, the possibility of an increased risk of infection is especially worrisome. The possibility of suture needles causing direct tissue damage is another worry for patients.(4).

Sharp devices like needles and ampoules are frequently used in healthcare settings, and handling them is one of the most routine everyday tasks. However, handling sharp objects poses a serious risk to healthcare workers (HCWs), especially nurses. Needlestick injuries, percutaneous injuries, and mucocutaneous injuries—which affect the skin and a mucous membrane—are examples of injuries caused by sharp objects.(5).

Global Burden of Sharp Injuries

Needle sticks and sharp injuries (NSSIs) continue to be among the most frequent injuries in healthcare settings; according to the Centers for Disease Control and Prevention (CDC), over a million NSSI incidents occur each year, accounting for 8% of in-hospital injuries. Only half of these were reported. Unfortunately, about 20 different highly virulent diseases, such as hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) are transmitted by NSSIs. The proportion of HBV, HCV, and HIV-related infection among healthcare professionals are 37%, 39% and 4.4%, respectively, worldwide. About 5000 health-care workers are infected with HBV each year due to work exposure, according to the CDC. These

incidents have significant consequences – further chronic disease and disability, and mortality – resulting in a significant increase in health care costs (6).
In 2008, more than 35 million health care workers were exposed to NSIs. Between 600,000 and 1 million NSIs are estimated to happen each year in the USA, 50% of which are not reported. Modernly, NSIs are one of the primary risks of BBP transmission and work-related hazards. NSIs could infect the blood of roughly 20 categories of pathogens; this is worrisome since there is a risk for BBP transmission. Around 40% of the global healthcare workforce is infected with the hepatitis B virus, and 2.5% with HIV from the NSIs (7).

Epidemiology of Surgical Sharps

An estimated 35 million individuals work in the health care industry (HCW) globally, making up 12% of the working population. In the course of their employment, healthcare professionals—including nurses, doctors, paramedics, and lab technicians—are particularly vulnerable to harm from sharp objects. Intramuscular or subcutaneous injection is the most often used procedure during injury (22%). Intravenous cannulation or blood collection accounts for nearly 20% of events. Both operations are classified as high-risk. Replacing the cap on an already-used needle was the cause of up to 30% of events involving nurses and lab technicians.(8).
Reporting of NSSIs is an effective way of prevention and treatment. In general, injuries are reported, and problematic equipment or activities are identified, minimizing the risk of additional injuries. The use of safe precautions and HCW education, as well as installation of safety devices, has been proven to significantly reduce NSSIs (9).
NSI underreporting, which can stem from societal bias and/or a complex reporting process or a fear about the potential severity of the injury, is fairly common.
Interestingly, the rate of underreporting is 75% in low-income countries, 61.5% in middle- and high-income countries, and 52.4% in high-income countries. In the USA, 47.8% report using the lowest percentage, while Southeast Asia reports the highest, at 87.9% (10).

Concept of Safe Handling and Disposal of Sharps

It is critical to find ways to prevent sharps injuries because of the severe, sometimes fatal, consequences of such injuries and the limited efficacy of post-exposure treatments.
The initial attempts to avoid sharps injuries focused on educating people about the practice of recapping and placing convenient containers for the disposal of old sharps that are resistant to punctures. The CDC has advised for over ten years that used needles should be stored in containers that can withstand punctures and not be recapped (CDC 1982, CDC 1987). Similar guidelines were implemented in Canada (LCDC 1987a). It is advised not to recap a used needle in the UK unless there is a safe way to do so.
Some people think that putting barriers between the sharp object and the person using it can lessen injuries caused by sharp objects. For example, it has been predicted that between 48 and 67% of sharps injuries can be prevented by devices with passive safety measures that don't require user activation. In contrast, it is anticipated that systems with user-activated mechanisms only reduce injuries by 17–28%(11).

Clinical and Public Health Importance

In the absence of seroconversion, a sharp injury will cause a psychological impact and can cause a high level of stress or anxiety, as well as debilitating post-injury morbidity.
As was found in 2 of 40 waste handlers in another study who suffered sharps wounds, this compromises the lives of the sewerers injured and of their partner or family group.

It can even compel them to cross over to another occupation or hinder their ability to become gainfully employed. The lack of knowledge about the identity and/or antigen status of the source patient and prior use of any hollow-bore needle that may have been contaminated by contact with blood or other body fluids, which could harm a waste handler, makes case management more difficult.
While more than 50% of these authors' study group had experienced delayed PEP and specialist referral or follow-up, whilst awaiting the wait time, the lack of specialist referral and follow-up was still concerning, as was the lack of baseline serological testing; however, recent European legislation ensures priority health care for those exposed to sharp injuries (12).

Local Context (Overview of MMC, Mardan)
Mardan Medical Complex is one of the tertiary care teaching hospitals in Mardan city of Khyber Pakhtunkhwa. It was established in the late 1990s and significantly expanded in 2008 to deliver the best healthcare services in northern Khyber Pakhtunkhwa. The hospital became a well-equipped medical institution with a bed capacity of around 700+, offering comprehensive inpatient, outpatient, and emergency services. The hospital operates under a modern administrative model and serves as the teaching hospital of Bacha Khan Medical College, which plays a central role in undergraduate and postgraduate academics, clinical training, and research activities. The hospital is well equipped with advanced diagnostic and therapeutic facilities, including radiology, laboratory services, intensive care units, and specialized departments covering medicine, surgery, pediatrics, gynecology, and various subspecialties. It provides 24/7 emergency services and a well-structured triage system for critical patients.
Overall, Mardan Medical Complex is a cornerstone institution in the Mardan region healthcare system, promoting patient care, medical education, and research to improve health outcomes in the community.

Statement of Problem
Surgical sharp injury exposure is a worldwide issue. Sharps are considered highly hazardous and potentially infectious types of waste. Healthcare workers are most likely exposed to sharp instruments, which can cause cuts or puncture wounds (needle stick injuries, for instance). Exposure to surgical sharps can cause injury that is in turn associated with different blood-borne infections like HBV, HCV and HIV. There is a chance that more than 20 pathogens could spread from even a small cut from a sharp object with minimal blood loss. In Pakistan, especially in hospitals like Mardan Medical Complex, there is a lack of local data on the assessment of safe handling of sharps. Due to the lack of availability of this data, it is difficult to identify gaps in the day-to-day practices of healthcare workers.

Significance of Study
This study is of prime importance as it states a critical aspect of occupational safety in the healthcare environment—namely, the safe handling and disposal of surgical sharps. Healthcare workers are readily exposed to sharps-related injuries, which can result in the transmission of serious infections such as Hepatitis B, Hepatitis C, and HIV/AIDS. This study will help in identifying the existing gaps and unsafe practices that may lead to such risks.
The results and findings of this study will be of more value for hospital management and policymakers in designing targeted training programs, improving infection control protocols, and reassuring adherence to standard safety guidelines. It will contribute to enhancing workplace safety and improving the quality of healthcare services in MMC, Mardan.

Furthermore, it can set a platform for future studies and will help in developing region-specific plans for infection prevention and control. By promoting awareness in the region, the study will play a crucial role in protecting both healthcare workers and the wider community.

Rationale of Study

Assessing the knowledge, attitudes, and practices (KAP) of healthcare workers regarding safe handling of sharps is important to ensure safe and effective healthcare services. Healthcare workers are the one's routinely exposed to occupational hazards, that includes needlestick and sharps injuries, which results in the transmission of different blood-borne infections such as hepatitis B, hepatitis C, and HIV. Despite the availability of standard precautions and disposal guidelines, unsafe practices continue in healthcare settings. Although many of the healthcare workers have enough knowledge regarding the safe handling and disposal of surgical sharps, the ratio of sharp injuries is increasing with time. In this study, we are going to identify these gaps that are the cause of sharp injuries in the healthcare environment. Although studies have been done on needle stick injuries in Khyber Pakhtunkhwa and adjacent regions, they were limited to a single department and didn't provide the overall practices in a big healthcare setting like Mardan Medical Complex.

Literature Review

Sharp Injuries

Sharps injuries are described as "a penetrating stab wound from a needle, scalpel, or other sharp object that may result in exposure to blood or other body fluids" by the US Centers for Disease Control and Prevention (CDC)(13).

Surgical procedures frequently result in sharp injuries, which increase the risk of blood-borne virus transmission. The frequency and kind of exposures, as well as the incidence of disease in the patient group, determine the risk of infection for medical staff. Because of the nature and frequency of the procedures they conduct, surgeons and surgical trainees are particularly vulnerable. There is no vaccine against hepatitis C or the human immunodeficiency virus (HIV), even though the majority of surgeons are already sufficiently immunised against hepatitis B. A worldwide pandemic is represented by blood-borne viruses (BBVs). Compared to wealthy nations, occupational blood exposure is an even more significant issue in developing nations. High-risk behaviors were far more common in underdeveloped nations, including noncompliance with universal precautions, two-handed needle recapping, inappropriate needle disposal, subpar injection techniques, and a lack of hepatitis B vaccine.(14).

Worldwide Prevalence of Sharp Injuries

Hospital workers are thought to sustain 385,000 sharps injuries annually.1 According to a 2020 worldwide meta-analysis sharps injuries were reported by 42.8% (95% CI=35.5–50.1; I2=99.7%) of nurses and 46.4% (95% CI=34.1–58.8; I2=98.8%) of doctors.2 According to single-institution research, between 30% and 58.8% of medical students report having been hurt by sharp objects. According to research, 59% of the residents suffered sharps injuries when they were medical students, and 47% of them chose not to disclose the injuries because of the time it takes to report them or because they happened while working with a low-risk patient. Additionally, 83% of the residents reported having been injured by sharp objects, according to this survey. The Occupational Safety and Health Administration (OSHA) estimates that 5.6 million workers could become ill from sharps accidents. In addition to having a detrimental effect on health and quality of life, the spread of occupational disease raises the possibility of financial obligation for employers(13).

However, because they represent 66–95% of all occupational exposures to blood-borne pathogens, percutaneous injuries (PCIs) carry a higher risk of infection. About 66000 HBV infections, 16000 HCV infections, and 1000 HIV infections are caused by PCIs annually. Every year, these infections can result in over 1100 fatalities and severe disabilities. Over 90% of these diseases happen in underdeveloped nations, where routine precautions are not always followed. The incidence and prevalence of percutaneous injuries among healthcare workers worldwide are poorly understood. According to a study, over 3 million healthcare workers globally suffer from occupationally associated PCIs every year. However, an updated analysis is required because this study was carried out more than ten years ago. Sharps injuries affected 42.8% of nurses and 46.4% of doctors, according to a 2020 meta-analysis; single-institution studies revealed prevalence rates of 30% and 58.8% among medical students. The need to tackle this issue in dental practice is shown by the alarming fact that up to 80% of dentists and 61.9% of dental nurses report occasional exposure events (15).

Occupational Hazards to Healthcare Workers

Both pre-analytical and post-analytical high-risk environments apply to all employees, including those in the clinical sector and hospital laboratories. It is essential to have information and awareness about NSI/sharps, blood splashes, and possibly infectious bodily fluids (BBF). Staff members who handled biomedical waste disposal and hospital cleaning also showed similar results. A study has also highlighted the need to educate or raise awareness among all healthcare workers, including employees who are not directly involved in patient care but are nevertheless exposed to such risks, such as laboratory technicians and waste disposal personnel. A trauma center is a busy surgical emergency medical facility where healthcare workers may be exposed to such risks. Little research has examined people's awareness of these exposures and how their understanding of NSIs, sharps, and splashes in trauma-based settings has improved. Through classes and evaluations of various HCWs, including comparability of knowledge level of such injuries and splashes to bodily fluid, such a study will assist in estimating the baseline knowledge of such exposures. Additionally, this will help minimize needless exposures and provide guidance on what to do in the case that such exposures occur among various hospital healthcare workers. It may also assist in establishing regulations in high-risk locations.(16).

Underreporting of Sharp Injuries

Sharps injuries are a hidden issue; most employees forget about them and continue working. Among healthcare workers, neither the extent of the danger of needle stick and sharps injuries nor the practices related to it are well understood. The percentage of underreporting varies from 22% to 99%. Healthcare professionals may fail to disclose sharp injuries for a variety of reasons. They may dread the infections to which they may have been exposed, believe that the injuries or the source patients are low risk, worry about their job stability, or worry about the additional paperwork and time required for follow-up. Additionally, they might not have received enough training or information regarding proper reporting procedures, or the reporting procedures themselves might be insufficient.(17).

Studies in Pakistan

The general population in Pakistan has a moderately high prevalence of hepatitis, with hepatitis B at 2.5% and hepatitis C at 4.9%. However, in Pakistan's rural areas, the prevalence of viral hepatitis C is steadily rising. In a similar vein, research on staff nurses exposed to HCV by percutaneous events or needle-stick injuries has shown an average frequency of 1.8% for anti-HCV seroconversion per injury. According to the

findings, a significant percentage of staff nurses may be exposed to blood-borne pathogen infections after needle stick injuries.8

Despite the fact that most biohazard exposures are avoidable, they are frequently viewed as a necessary part of the job. NSI exposures in the US dropped from an estimated one million annually in 1996 to 385,000 annually in 2000. The deployment of preventive measures and ongoing surveillance led to this drop. Biohazard exposures and the ensuing health effects are rarely tracked in resource-constrained nations like Pakistan. Nonetheless, reports of increased hepatitis B and C infection rates have come from Pakistan. Since these put a tremendous strain on an already overburdened health system, it is essential to obtain precise data about the prevalence of NSI in our population in order to implement preventative measures that will ultimately improve the standard of care. As a result, we are presenting monitoring data on NSIs among healthcare workers at a tertiary care hospital for the first time in Pakistan. Several studies have documented a decrease in the NSI rate with the use of multifactorial strategies, such as reusable sharps containment systems and safety-engineered equipment. Financial limitations hinder us from using these advanced preventive measures because we are a developing nation. Every solution must include the health care personnel's education, which can be successful on its own. In order to lower the rate of NSIs among healthcare workers at a tertiary care hospital, we created a robust NSI prevention educational program and put it into action as a quality improvement project in 2005. We describe how a tertiary care hospital's NSI prevention education program significantly reduced the rate of NSI among healthcare workers(18).

Gaps in Local Literature

There is no documented data in the local Mardan region, despite the well-known and acknowledged risks of sharp injuries. The majority of KAP studies come from various parts of Punjab, Peshawar, and Karachi. Despite their existence, these studies only address needlestick injuries and their post-exposure procedures. When other sharps are included in research, the necessary disposal methods are not sufficiently detailed and only the harm condition is discussed. Furthermore, studies that are now available only assess knowledge or address activities without taking attitudes into account. There is no proof that Mardan's medical staff adhere to Pakistan's formal waste disposal regulations. The problem mentioned in Pakistan is the absence of containers that are impervious to punctures. The availability of puncture-proof containers at healthcare professionals' earliest reach is not supported by any relevant research.

This study is crucial because it covers all three facets of knowledge, attitudes, and practices, as well as all the categories of healthcare professionals that have been mostly ignored by earlier research, despite being at high risk.

Furthermore, this study will establish a baseline for future research in Mardan and surrounding healthcare facilities that will raise the standard of medical care provided in the area.

Methodology

Objectives

To assess the level of knowledge, attitudes and practices of healthcare workers regarding safe handling and disposal of surgical sharps

Operational Definitions

Surgical Sharps

Any object used in a medical setting that is intended to cut, puncture, or incise and that presents a risk of needlestick or sharp object injuries is referred to as a surgical sharp.

Safe Handling of Surgical Sharps
Refers to the procedures that healthcare professionals take while handling sharp objects, such as not recapping the needles, passing sharps with instruments rather than their hands, handling them right away after usage, and donning safety gear.

Healthcare workers
Healthcare workers are the ones who provide care and services to the sick and ill, either directly as physicians and nurses or indirectly as assistants, laboratory technicians, medical waste handlers, or aides.

Knowledge, attitude, and Practice
The Knowledge, Attitude, and Practice survey is a quantitative approach that reveals misconceptions and misunderstandings by using prepared questions presented in standardized questionnaires.

Materials and Methods

Study Design
It was a Descriptive Cross-Sectional Study.

Study Settings
This study was conducted in multiple departments (i.e., Medical, Surgical, and Emergency, etc.) of Mardan Medical Complex, Mardan

Method of Sampling
The method employed in this investigation was non-probability convenience sampling.

Sample Size
The sample size was calculated through an open-epi calculator. (263) Healthcare professionals in a variety of roles within Mardan Medical Complex were surveyed. (Z=95, E=5, P=26). 2300 was the total number of healthcare workers in MMC which was our population size.

Sample duration
3 Months (January 2026 - April 2026)

Inclusion Criteria
Health care workers currently working in Mardan Medical Complex.
Willingness to take part in the research.

Exclusion Criteria
Non-Healthcare Employees.
Individuals who refuse to give their consent.

Data Collection Procedure
After the ethical approval of Khyber Medical University and approval of the Ethical Review Board of Bacha Khan Medical College, Mardan. A predefined and pretested well-structured questionnaire was distributed to collect data from the healthcare workers of Mardan Medical Complex. All data collected was stored securely and used only for academic and research purposes.

Data Analysis Procedure
Data was analyzed using SPSS (Statistical Package for Social Sciences). Descriptive statistics were used to summarize the data. Quantitative variables such as age and years of experience were calculated as mean and standard deviation. While qualitative

variables were calculated as frequencies and percentages. Chi-square test was applied to determine the association between demographic variables and the level of knowledge, attitude, and practices. A p value <0.05 was considered statistically significant.

Analysis and Results

Socio-Demographic Characteristics of Participants

The socio-demographic data of the subjects (263) revealed that 65.78% were males and 34.22% females. Nurses accounted for the highest portion of the respondents (74.52%), followed by doctors (12.93%), technologists (8.37%) and technicians (4.18%), suggesting that the largest part of the respondents was made up of nurses. Regarding their experience, 45.63% of the participants had 1-5 years of experience, and 43.73% had less than 1 year, while the rest of the population had more than 10 years of experience, which made up only 4.18% of the population. In terms of training, 63.50% of the participants indicated having undergone formal training about safe handling of sharps and 36.50% had none, highlighting a concern about the lack of preparation.

Table 1. Socio-Demographic Characteristics of Participants (n = 263)

Variable	Category	Frequency	Percentage (%)
Gender	Male	173	65.78%
	Female	90	34.22%
Profession	Doctor	34	12.93%
	Nurse	196	74.52%
	Technologist	22	8.37%
	Technician	11	4.18%
Experience	< 1 year	115	43.73%
	1–5 years	120	45.63%
	6–10 years	17	6.46%
	> 10 years	11	4.18%
Training	Yes	167	63.50%
	No	96	36.50%

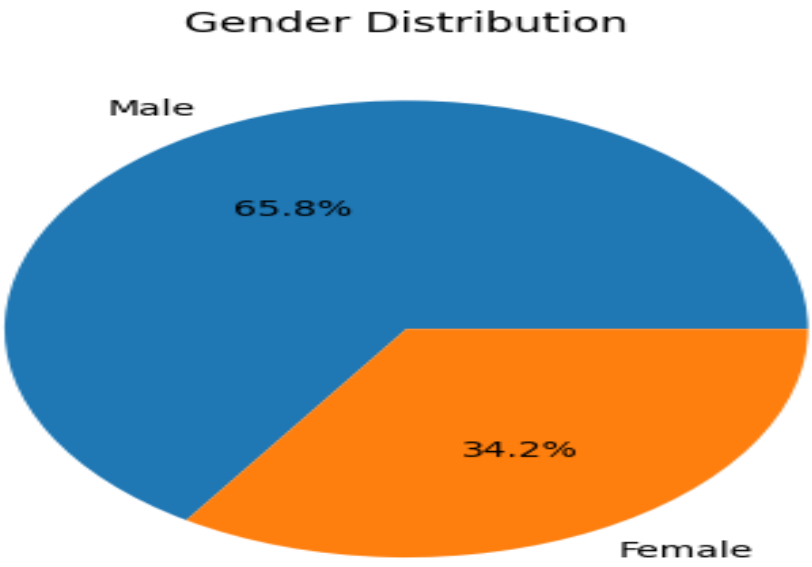


Figure 1. Socio-demographic gender distribution of participants.

Knowledge Regarding Safe Handling and Disposal of Sharps

Participants had overall good knowledge of how to handle and dispose of sharps. Surgical sharps were correctly identified by a large majority (88.97%), and the risk of disease transmission was correctly identified (89.73%). Understanding about the appropriate time to dispose of items was also fairly good (66.16%) but only 56.65% correctly identified that recapping is not appropriate, hence the lack of critical safety information. The majority (82.51%) knew that containers should never be overfilled to reduce the risk of injury, and the majority (69.20%) knew the proper level to fill the sharps containers with. Furthermore, 73.76% agreed that sharp injuries do occur, and 72.24% recognized that sharp injuries are frequently under-reported. However, there was inconsistent knowledge about post-injury practices; only 44.49% were aware that "milking out" blood is not recommended, and a large proportion (88.97%) recognized the correct cleaning of the wound.

Table 2. Knowledge Regarding Safe Handling and Disposal of Sharps

Variable	Correct Response	Frequency	Percentage (%)
Identification of surgical sharps	Yes	234	88.97%
Disease transmission awareness	Yes	236	89.73%
Proper disposal timing	Yes	174	66.16%
Recapping is unsafe	Yes	149	56.65%
Overfilling increases injury risk	Yes	217	82.51%
Correct fill level knowledge	Yes	182	69.20%
Injury is common	Yes	194	73.76%
Injuries underreported	Yes	190	72.24%
Milk-out practice is not recommended	Yes	117	44.49%
Washing after injury	Yes	234	88.97%

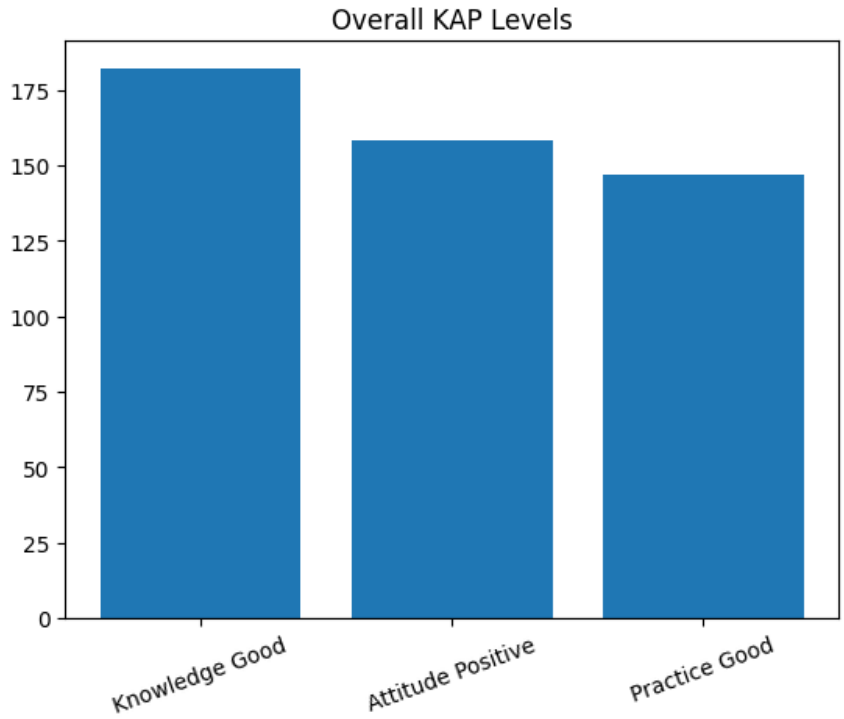


Figure 2. Overall knowledge, attitude and practice (KAP) levels.

Attitude Towards Sharps Safety

The findings on attitude towards sharps safety indicate a moderately positive perception among participants. Approximately 47.15% of respondents believed to a moderate or great extent that injuries occur during the disposal of used needles. Similarly, 54.00% agreed to a moderate or great extent that post-exposure prophylaxis (PEP) should be initiated within one hour of injury. Furthermore, 60.08% perceived that nurses report more needle-stick injuries compared to doctors. Overall, these findings suggest that while participants demonstrate a generally positive attitude toward sharps safety, the strength of this attitude is not consistently high across all areas.

Table 3. Attitude Towards Sharps Safety

Variable	Category (Higher Agreement)	Frequency	Percentage (%)
Injuries occur during disposal	Moderate–Great extent	124	47.15%
PEP should be initiated within 1 hour	Moderate–Great extent	142	54.00%
Nurses report more injuries than doctors	Moderate–Great extent	158	60.08%

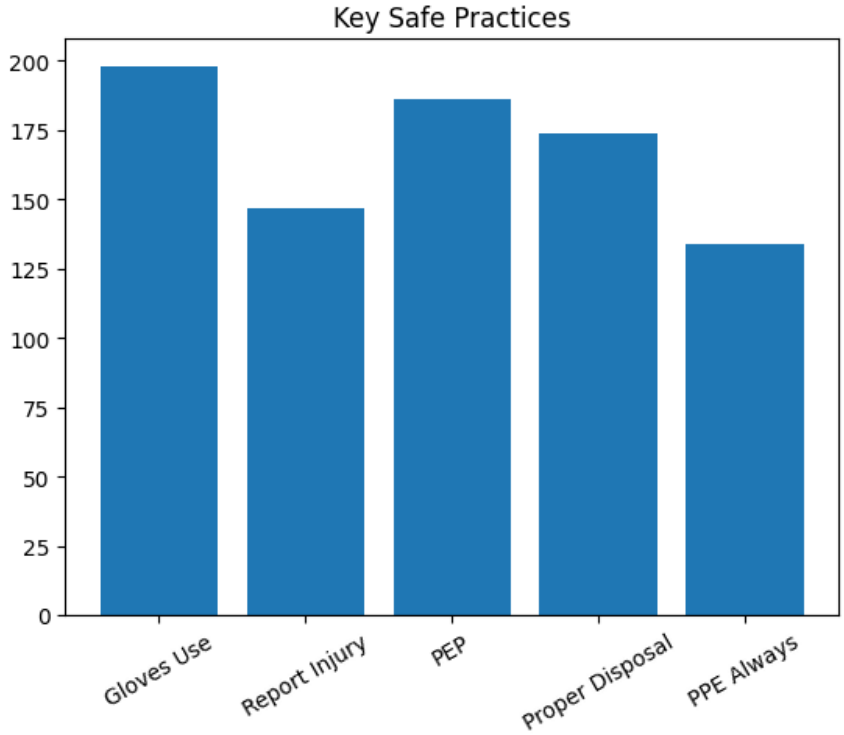


Figure 3. Key safe practices among participants.

Practices Related to Sharps Handling and Disposal

The results showed a medium level of knowledge about the attitude of participants with respect to the safety of sharps. About 47.15% of the respondents to a moderate or high extent believed injuries can happen during the disposal of used needles. Likewise, 54.00% agreed that post-exposure prophylaxis (PEP) should be taken immediately after an injury, within 1 hour. In addition, 60.08% felt that there were more needle stick injuries among nurses than among doctors. Overall, these results indicate that although participants generally hold a positive attitude towards sharps safety, it is not always strong in every aspect.

Table 4. Practices Related to Sharps Handling and Disposal

Variable	Safe Practice	Frequency	Percentage (%)
Use of gloves	Yes	198	75.29%
Reporting injuries	Yes	147	55.89%
Taking PEP after injury	Yes	186	70.72%
Proper disposal method	Yes	174	66.16%
Never recap needles	Yes	41	15.59%
Use of sharps containers	Always	147	55.89%
Availability of containers	Yes	228	86.69%
History of needle injury	Yes	203	77.19%
PPE use (Always)	Yes	134	50.95%

Overall, Knowledge, Attitude and Practice (KAP) Levels Among Participants

Sharps handling and disposal management practices were mixed—for some, non-compliant, and for others, compliant. Most indicated that they wore gloves when performing procedures (75.29%) and took PEP after an injury (70.72%). 66.16% of participants reported proper disposal methods, and 55.89% reported injuries to

authorities. Those that do report never recapping needles, however, do so too often (unsafe practice), as 15.59% report that they never do it. Sharps containers were available in a majority of departments, (86.69%); however, only half of those facilities stated that they always use them (55.89%). Also, 77.19% of the participants had needle stick injuries, and only 50.95% wore personal protective equipment consistently. The results demonstrate that there is a knowledge-actual behavior gap.

Table 5. Overall, Knowledge, Attitude and Practice (KAP) Levels Among Participants (n = 263)

Component	Level	Frequency	Percentage (%)
Knowledge	Good Knowledge	182	69.20%
	Poor Knowledge	81	30.80%
Attitude	Positive Attitude	158	60.08%
	Negative Attitude	105	39.92%
Practice	Good Practice	147	55.89%
	Poor Practice	116	44.11%

Association of Socio-Demographic Variables with Reporting of Sharps Injury

There were no statistically significant linkages between sociodemographic factors and reporting of sharps injury. Trained, 111 reported injury compared to 56 who did not; Untrained, 54 reported injury compared to 39 who did not, but the difference was not statistically significant ($p = 0.17$). Likewise, no significant correlation was found between experience and reporting behavior ($p = 0.42$), gender ($p = 1.00$) or profession ($p = 0.79$). It was concluded from these findings that training, experience, gender or job category were not significant factors involved in the reporting of sharps injuries among healthcare workers.

Table 6. Association of Socio-Demographic Variables with Reporting of Sharps Injury (n = 263)

Variable	Category	Reported Yes	Reported No	Total	p-value
Training	Trained	111	56	167	0.17
	Untrained	54	39	93	
	Others	3	0	3	
Experience	<1 year	71	44	115	0.42
	1–5 years	79	41	120	
	6–10 years	9	8	17	
	>10 years	9	2	11	
Gender	Male	111	62	173	1.00
	Female	57	33	90	
Profession	Doctor	20	14	34	0.79
	Nurse	127	69	196	
	Technologist	13	9	22	
	Technician	8	3	11	

Logistic Regression Analysis of Factors Associated with Good Practice of Sharps Safety (n = 263)

The logistic regression analysis model used to test the factors associated with good practice of sharps safety found that no variable (DF, gender, cusp, or contact glove use) was statistically significantly associated with good practice of sharps safety. There was a negative association between knowledge level and practice (β = -0.47, p = 0.137), and a borderline association with training (β = -0.49, p = 0.080), suggesting that practice and training may have a possible, but not significant impact. Experience (β = 0.15, p = 0.420) and gender (β = 0.22, p = 0.477) were not significantly associated with good practice. As a whole, the model suggests that knowledge and socio-demographic factors are not sufficient to predict safe handling of sharps practices, highlighting the need for better behavioral/pathological and institutional interventions.

Table 7. Logistic Regression Analysis of Factors Associated with Good Practice of Sharps Safety (n = 263)

Variable	Coefficient (β)	Std. Error	p-value	95% CI (Lower–Upper)
Constant	1.54	0.67	0.021	0.23 – 2.85
Knowledge Level	-0.47	0.32	0.137	-1.09 – 0.15
Training	-0.49	0.28	0.080	-1.04 – 0.05
Experience	0.15	0.19	0.420	-0.22 – 0.53
Gender	0.22	0.32	0.477	-0.39 – 0.84

Discussion and Limitations

Discussion

This descriptive cross-sectional study included 263 healthcare workers working in MMC to study their knowledge, attitude and practices. The findings of this study presented that although the majority of the healthcare workers illustrated good knowledge 69.20% and a positive attitude60.08% but only 55.89% indicated good safe practices. This suggests a considerable gap between knowledge and practices of the healthcare workers.

It is observed that the Sociodemographic Characteristics of the participants in the study (n = 263) showed a predominance of males (65.78%) and females (34.22%). The majority (74.52%) of the respondents were nurses, and the least (4.18%) were technicians, while the doctors made 12.93% and the technologists 8.37% of the study population. Just more than a fourth of participants gained over a decade of experience in their jobs (4.18%), with more than half (45.63%) having one to five years' experience, closely followed by under a year (43.73%). As far as training is concerned, there is a difference in professional preparedness, as 63.50% indicated that they did receive formal training in safe handling of sharps, while 36.50% indicated that they did not receive formal training.

88.97% were correct about surgical sharps, and 89.73% were correct regarding the possibility of disease transmission. While 56.65% correctly answered that recapping is detrimental, the knowledge regarding the appropriate time for disposal was also good (66.16%), which was a significant gap with very important safety information. Most participants were aware of the correct fill level (69.20%) and knew that leaving sharps containers more than half full is a risk for harm (82.51%). Moreover, 73.76% of respondents stated injuries due to sharp objects are common, and 72.24% agreed that such injuries are commonly underreported. 44.49% were aware that blood should

not be milked out, but a high proportion (88.97%) recognised the appropriate post-injury cleansing procedures.
Results from this indicate that participants had a reasonably positive opinion on sharps safety. 47.15% responded that injuries occur when used needles are disposed of to moderate or high levels. In a similar vein, 54.00% of respondents moderately or strongly agreed that post-exposure prophylaxis (PEP) ought to be started within an hour of the injury. In addition, 60.08 % of the respondents indicated that the number of needlestick injuries reported by nurses was greater than that of doctors. Overall, the results suggest that the attitude toward sharp objects being safe is overall positive, but may not be as strong as it is for all contexts.
Participants' adherence to sharps handling and disposal procedures was not found to be consistent. Most reported 31.16 % using PEP, post-exposure prophylaxis, after the accident; 75.29 % wearing gloves during operations. 55.89% of people reported having been injured by cops, and 66.16% of them used proper disposal procedures. Relying on some of the results here, there is a significant risk, as only 15.59% of respondents say they have never recapped needles. Although sharp containers were available for people to use, only 55.89% of the respondents reported using them always. In addition, the participants regularly wore personal protective equipment in only 50.95%, and a significant share of them had suffered from needlesticks (77.19%). The findings indicate a lack of correspondence between what they know and what is safe.
About the assessment of nurses' knowledge and attitudes of medical waste management, a study was done at Soba University Hospital in Sudan. This study also states that most of the nurses had good knowledge (76.2%) of medical waste management. The results of these studies are generally comparable with those of this study about knowledge and various safe waste handling methods.
A study at the district hospital in KwaZulu-Natal, South Africa, was done related to knowledge, attitude and practices of the healthcare waste management among the healthcare workers.
The study findings were quite different in terms of knowledge, which states that the majority of the participants had a low level of knowledge (47.2%), scoring poorly overall. Just above half (54%) of the participants were found to have a positive attitude towards medical waste management, and more than 50% participants had good practice.

Limitations

This study was carried out in a single tertiary care hospital, i.e., Mardan Medical Complex. The findings are restricted to a specific region and cannot be generalized to other hospitals or regions in Khyber Pakhtunkhwa. Social desirability bias may influence responses, leading participants to provide "correct" answers rather than truthful ones.
The findings might not accurately reflect healthcare professionals in remote or low-resource environments.

Conclusion and Recommendations

Conclusion

The knowledge, attitudes, and practices of MMC, Mardan healthcare personnel regarding the proper handling and disposal of surgical sharps were evaluated in this study. The study's findings demonstrated that many healthcare professionals had a favorable attitude and good understanding regarding the proper management and disposal of surgical sharps. The procedures were fair and demonstrated the discrepancy between the staff's daily clinical practice and current knowledge.
According to the study's findings, years of experience do not substantially correlate with knowledge level. It implies that having a lot of experience does not equate to

having sound knowledge and skills. Therefore, regardless of a healthcare worker's length of service, formal, structured, and frequent training programs are crucial.
The gaps in knowledge and practice indicate the necessity of regular training, institutional support, and strict compliance with standard operating procedures concerning the handling and disposal of sharps.

Recommendations

Regardless of the title, department, or years of experience of the healthcare employees at Mardan Medical Complex, everyone should participate in frequent, structured training sessions, according to the study's findings. To keep healthcare professionals up to date on the most recent national and international rules for sharp safety and disposal procedures, regular refresher courses and workshops should be arranged. To produce more broadly applicable results across Pakistani healthcare settings, future multicenter research with bigger and more varied sample sizes is suggested.

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Supplementary Appendix A: Questionnaire

ASSESSMENT OF KNOWLEDGE, ATTITUDES AND PRACTICES RELATED TO SAFE HANDLING AND DISPOSAL OF SURGICAL SHARPS AMONG HEALTH CARE WORKERS IN MARDAN MEDICAL COMPLEX, MARDAN.

SECTION: A Socio-Demographic Information

1: Age (in years): _____

2: Gender: ☐ Male ☐ Female

3: Professional category:

☐ Doctor ☐ Nurse ☐ Technologist ☐ Technician

4: Department/Unit: _____

5: Years of work experience:

☐ < 1 year ☐ 1–5 years

☐ 6–10 years ☐ > 10 years

6: Have you ever received formal training on safe handling of sharps? ☐ Yes ☐ No

SECTION: B Knowledge Section

7: Surgical sharps include:

☐ Needles only ☐ Scalpels and blades only

☐ Needles, blades, scalpels ☐ Don't know

8:Needle-stick injuries can transmit:

☐ Hepatitis B ☐ Hepatitis C

☐ HIV ☐ All of the above

9:Used sharps should be disposed of:

☐ After recapping ☐ Immediately after use

☐ At the end of duty ☐ Don't know

10: Recapping of needles after use is:

☐ Safe ☐ Unsafe ☐ Don't know

12: Overfilling of sharps containers increases risk of injury:

☐ True ☐ False ☐ Don't know

13: The maximum fill level of a sharp container is:

☐ Half full ☐ Three-quarters full ☐ Completely full ☐ Don't know

14: Needle stick and sharps injury are common events in the healthcare environment. ☐ Yes ☐ No ☐ I don't know

15: Most needle sticks and sharp injuries have been neglected and unreported by doctors and nurses in the past.

☐ Yes ☐ No ☐ I don't know

16: After a sharp injury, the practice to 'milk out' more blood is not recommended by the CDC

☐ Yes ☐ No ☐ I don't know

17: After a sharp injury, the affected area should be rinsed and washed thoroughly with soap and running water or with an antiseptic

☐ Yes ☐ No ☐ I don't know

18: Which reasons do people give for not reporting sharp injuries?

☐ Because the needle was sterile

☐ Fear of being blamed

☐ Ignorance of the reporting procedure

☐ Feeling that it is not important

☐ Confidence in personal high immunity

☐ Overworked

☐ No time to report

☐ Fear of confidentiality

Section C: Attitude Section

Please tick x in the boxes provided

Level of extent

To no extent 1

To some extent 2

To a moderate extent 3

To a great extent 4

1. To what extent do you think most injuries occur during the disposal of used needles?

☐ 1 ☐ 2 ☐ 3 ☐ 4

2. To what extent do you perceive PEP should be initiated within 1 hour of the injury?

☐ 1 ☐ 2 ☐ 3 ☐ 4

3. To what extent do you think most reported needle stick injuries are more conceded by nursing staff than doctors?

☐ 1 ☐ 2 ☐ 3 ☐ 4

SECTION D: PRACTICE LEVEL

1: What are the reasons for sharps injury?

☐ Long working hours

☐ Inappropriate environment

☐ Stress

☐ Inadequate training

☐ Poor lighting

☐ Poor restraint

☐ Lack of safety measures

2: What procedure causes exposure to injury?

☐ Injecting

☐ Recapping

☐ Handling garbage

☐ Suturing

☐ Taking the cap off the needle

☐ Manipulating needles in patients

☐ Handling an uncooperative patient

3: Do you use gloves for phlebotomy procedures?

☐ Yes ☐ No

4: Do you report the incidence of sharps injury to the hospital authority?

☐ Yes ☐ No

5: Do you take PEP when you get pricked accidentally?

☐ Yes ☐ No

6: What do you do with used syringes and needles?

☐ Recapping ☐ Place in a sharp container

☐ Throw in the blue bag ☐ put in my ward/ lab coat pocket

7: After using needles, do you recap them?

☐ Always ☐ Occasionally ☐ Never

8: Do you use containers for sharp objects that are impervious to punctures? ☐ Always ☐ Occasionally ☐ Never

9: Does your workplace have sharps containers available at the point of use? ☐ Yes ☐ No

10: Have you ever been hurt by a needle stick? ☐ Yes ☐ No

11: If so, did you report the injury? ☐ Yes ☐ No

12: When handling sharp objects, do you wear gloves or other personal protective equipment?

☐ Always ☐ Occasionally ☐ Never

13: Do you break or bend needles before discarding them? ☐ Yes ☐ No