

RISK AND PREVENTIVE FACTORS OF SHARP INSTRUMENT INJURIES AMONG HEALTH CARE WORKERS: A CROSS-SECTIONAL SURVEY

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Abstract

Background: Sharp instrument and needlestick injuries (NSIs) are among the most common occupational hazards faced by healthcare workers (HCWs), exposing them to blood-borne pathogens such as hepatitis B virus, hepatitis C virus, and human immunodeficiency virus. Despite the implementation of infection prevention guidelines, these injuries remain a significant public health concern, particularly in resource-limited healthcare settings.

Objective: To determine the prevalence of sharp instrument and needlestick injuries among healthcare workers and to identify the associated risk factors and preventive practices in a district-level public hospital in Pakistan.

Methods: A cross-sectional observational study was conducted among 250 healthcare workers at District Headquarters Hospital Sheikhpura, Punjab, Pakistan, between July 2025 and May 2026. Participants included doctors, nurses, laboratory/surgical assistants, and sanitary workers selected through convenience sampling. Data were collected using a structured, pre-tested questionnaire covering demographic characteristics, injury history, risk factors, and preventive measures. Descriptive statistics and Chi-square tests were performed using SPSS version 20.0, with statistical significance set at $p < 0.05$.

Results: Overall, 96.8% of participants reported experiencing at least one sharp instrument or needlestick injury during their professional practice. Operating rooms (47.6%) and emergency wards (21.2%) were the most common locations of injury, while injector syringes (42.8%) and suture needles (26.8%) were the leading causative devices. Invasive procedures (32.0%) and blood collection or medication administration (21.2%) were the most frequent activities associated with injuries. Working in multiple shifts was significantly associated with injury

occurrence, whereas age, gender, and occupational category showed no significant association. Only 37.6% of injured workers received post-exposure treatment.

Conclusion: The study demonstrates an alarmingly high prevalence of sharp instrument injuries among healthcare workers, highlighting substantial deficiencies in occupational safety practices. Strengthening infection prevention programs, improving access to personal protective equipment, promoting safe needle handling, and enhancing post-exposure management are essential to reduce occupational risks and protect healthcare personnel.

INTRODUCTION

Healthcare workers (HCWs) constitute the backbone of healthcare systems and are routinely exposed to occupational hazards that threaten their health and safety. Among these hazards, injuries caused by sharp instruments and needlestick injuries (NSIs) represent one of the most significant risks because of their potential to transmit blood-borne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) (1,2). These injuries not only compromise the health of affected workers but also increase healthcare costs, reduce workforce productivity, and negatively impact the quality of patient care (3).

Needlestick and sharp injuries occur during a wide range of clinical procedures, including blood collection, medication administration, suturing, intravenous cannulation, waste disposal, and surgical interventions. Accidental exposure through contaminated needles or other sharp devices can result in the transmission of more than 20 infectious pathogens, with HBV, HCV, and HIV accounting for the majority of clinically significant occupational infections (4,5). The risk is particularly high in healthcare settings where adherence to standard infection prevention protocols is inadequate or where personal protective equipment (PPE) and safety-engineered devices are insufficiently available (6).

Globally, healthcare facilities report hundreds of thousands of occupational sharps injuries each year despite continuous improvements in infection prevention practices (7). The burden is disproportionately greater in low- and middle-income countries, where shortages of resources, heavy workloads, inadequate staff training, and weak reporting systems contribute to higher rates of occupational exposure (8). Underreporting of

injuries remains a persistent challenge, limiting surveillance efforts and delaying appropriate post-exposure management.

Pakistan has a relatively high prevalence of viral hepatitis, particularly HCV, making occupational exposure among healthcare personnel an important public health concern (9). Healthcare workers in the country frequently encounter patients with blood-borne infections while operating in environments characterized by overcrowding, insufficient infection control measures, and limited occupational safety programs (10). Previous studies conducted in various healthcare institutions across Pakistan have documented substantial rates of NSIs among doctors, nurses, laboratory personnel, and support staff, with many incidents remaining unreported and unmanaged (11,12). Such circumstances increase the likelihood of disease transmission and highlight deficiencies in workplace safety practices. Several factors have been associated with the occurrence of needlestick injuries, including prolonged working hours, fatigue, recapping of used needles, improper disposal of sharps, lack of training, inadequate use of PPE, stressful working conditions, and insufficient availability of safety devices (13–15). Operating theatres, emergency departments, intensive care units, and clinical laboratories are particularly vulnerable settings because of the frequency of invasive procedures and the high patient workload. Understanding these risk factors is essential for designing effective interventions that can reduce occupational injuries and improve compliance with standard precautions.

Although numerous studies have examined the prevalence of NSIs in tertiary healthcare institutions, evidence from district-level public hospitals remains comparatively limited. Such

facilities often operate under constrained resources while serving large patient populations, potentially exposing healthcare workers to even greater occupational risks. Evaluating both the determinants of sharp injuries and the availability of preventive measures in these settings is therefore critical for informing local health policies and infection control strategies.

The present study aimed to assess the prevalence of sharp instrument and needlestick injuries among healthcare workers in a district headquarters hospital and to identify the associated occupational risk factors and preventive practices. The findings are expected to provide evidence for strengthening workplace safety policies, improving infection prevention programs, and reducing occupational exposure to blood-borne pathogens among healthcare professionals.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based cross-sectional observational study was conducted at the District Headquarters (DHQ) Hospital, Sheikhpura, Punjab, Pakistan, between July 2025 and May 2026. The study aimed to assess the prevalence of sharp instrument and NSIs among HCWs, identify associated risk factors, and evaluate existing preventive practices within the healthcare facility.

Study Population

The study population comprised healthcare workers employed at DHQ Hospital Sheikhpura who were directly involved in patient care or handled medical instruments and clinical waste. Participants included doctors, nurses, laboratory and surgical assistants, and sanitary workers (including ward servants, sweepers, and clinical waste handlers).

Inclusion Criteria

Healthcare workers were eligible for participation if they:

- Were employed as full-time staff members;
- Had direct contact with patients or patient-related equipment during routine duties;

- Were willing to provide informed consent for participation; and
- Included both male and female employees.

Exclusion Criteria

Administrative and financial staff members without patient contact, employees on leave during the study period, individuals unwilling to participate, and those unable to respond because of illness were excluded from the study.

Sample Size and Sampling Technique

A total of 250 healthcare workers were recruited using a convenience sampling technique. Data collection was carried out over a ten-month period from July 2025 to May 2026. The sample included participants from different professional categories and hospital departments to capture a broad representation of occupational exposure risks.

Data Collection Instrument

Data were collected using a structured, pre-designed, and pre-tested questionnaire administered through face-to-face interviews after obtaining informed consent from each participant. The questionnaire consisted of three sections:

1. **Sociodemographic characteristics**, including age, gender, educational qualification, occupation, work experience, and department of employment.
2. **History and characteristics of sharp instrument or needlestick injuries**, including frequency, circumstances, location, causative devices, and post-exposure management.
3. **Knowledge and preventive practices**, including use of personal protective equipment (PPE), awareness of occupational hazards, training in infection prevention, vaccination status, and perceived risk factors associated with NSIs.

The questionnaire was pilot tested before the commencement of the study to ensure clarity, consistency, and reliability.

Study Variables

The primary outcome variable was the history of sharp instrument or needlestick injury among

healthcare workers. Independent variables included demographic characteristics, occupational category, work experience, shift duties, workplace environment, perceived causes of injuries, and preventive measures such as PPE utilization and training.

Statistical Analysis

Data were entered and analyzed using the SPSS version 26.0. Descriptive statistics were used to summarize participant characteristics and study variables, with categorical data presented as frequencies and percentages. Associations between potential risk factors and history of sharp injuries were evaluated using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

Participation in the study was voluntary, and informed consent was obtained from all participants before data collection. Confidentiality and anonymity of the respondents

were maintained throughout the study by excluding personal identifiers from the dataset. The study was conducted in accordance with ethical principles governing research involving human participants and institutional approval was obtained prior to commencement of data collection.

RESULTS

Characteristics of the Study Population

A total of 250 healthcare workers (HCWs) participated in the study. The majority were female (67.2%), while males accounted for 32.8% of the sample. More than half of the participants (52.8%) were aged between 20 and 30 years, with a mean age of 31.5 ± 7.0 years. Doctors constituted the largest occupational group (40.0%), followed by nurses (27.6%), laboratory/surgical assistants (22.0%), and sanitary workers (10.4%). Approximately 41.6% of participants reported working in multiple shifts, whereas 58.4% worked in regular schedules.

Table 1. Demographic characteristics of the study participants

Characteristics		Frequency (n)	Percentage (%)
Gender	Male	82	32.8
	Female	168	67.2
Age (years)	20-30	132	52.8
	31-40	84	33.6
	41-50	33	13.2
	>50	1	0.4
Occupation	Doctor	100	40.0
	Nurse	69	27.6
	Laboratory/Surgical Assistant	55	22.0
	Sanitary Worker	26	10.4
Working in Multiple Shifts	Yes	104	41.6
	No	146	58.4

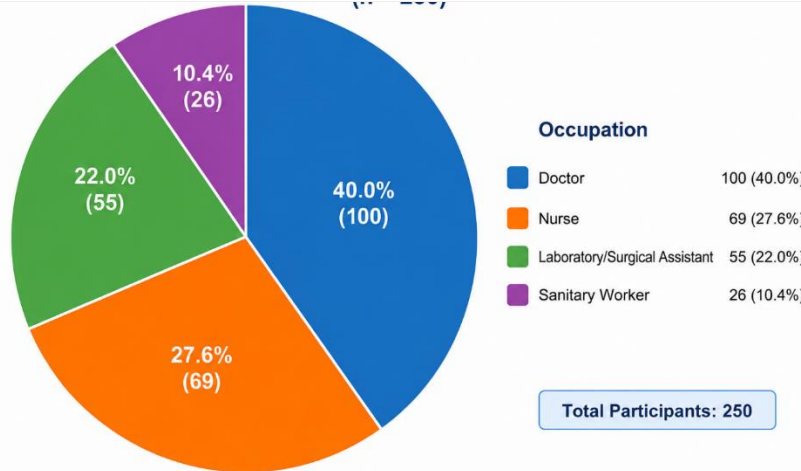


Figure 1: Distribution of healthcare workers by occupation

Risk Perception and Prevalence of Sharp Injuries

Nearly all participants (97.2%) perceived themselves to be at risk of occupational hazards while working in the hospital. Overall, 242 of 250 participants (96.8%) reported experiencing at least one sharp instrument or needlestick injury during their professional practice.

Among occupational groups, the prevalence of injury was consistently high, with 96.0% of doctors, 98.5% of nurses, 94.5% of laboratory/surgical assistants, and 100% of sanitary workers reporting previous injuries.

Table 2. Occupational risk perception and history of sharp injuries

Variable	Frequency (n)	Percentage (%)
Perceived occupational risk	243	97.2
History of sharp/needlestick injury	242	96.8
No history of injury	6	2.4
Unsure	2	0.8

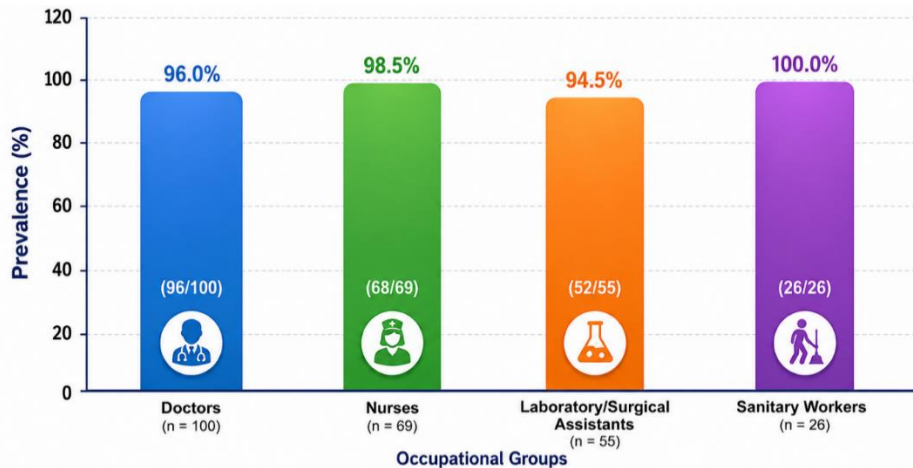


Figure 2: Prevalence of sharp injuries among different occupational groups

Frequency and Circumstances of Injuries

More than half of the respondents (63.2%) reported sustaining sharp injuries more than twice during their careers, whereas only 3.6% experienced a single injury. The operating room

was the most common location where injuries occurred (47.6%), followed by emergency wards (21.2%) and inpatient wards (19.2%). Most injuries (59.2%) were self-inflicted during routine clinical activities.

Table 3. Characteristics of sharp instrument injuries among healthcare workers

Variables		Frequency (n)	Percentage (%)
Number of injuries experienced	Once	9	3.6
	Twice	16	6.4
	More than twice	158	63.2
	Do not remember	61	24.4
Location of injury	Operating room	119	47.6
	Emergency ward	53	21.2
	Patient ward	48	19.2
	ICU/CCU	10	4.0
	Labor/Delivery room	10	4.0
	Clinical laboratory	8	3.2
	Waste handling unit	1	0.4
Source of injury	Self-inflicted	148	59.2
	Caused by another person	45	18.0
	Unknown	54	21.6

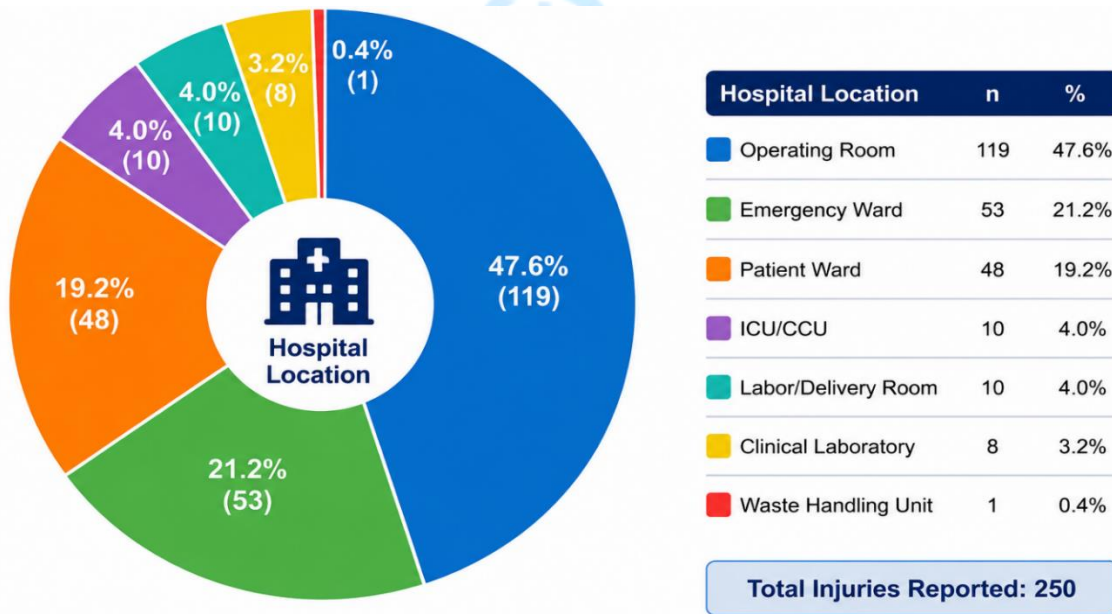


Figure 3: Distribution of injuries according to hospital location

Devices and Activities Associated with Injuries

Injector syringes were responsible for the largest proportion of injuries (42.8%), followed by suture needles (26.8%) and glass items (22.4%). Invasive

procedures such as surgeries and suturing accounted for 32.0% of injuries, while drawing blood or administering injections accounted for

21.2%. Needle recapping contributed to 19.2% of reported injuries.

Table 4. Causative devices and activities leading to sharp injuries

	Variable	Frequency (n)	Percentage (%)
Causative device	Injector syringe	107	42.8
	Suture needle	67	26.8
	Glass item	56	22.4
	Scalpel blade	16	6.4
	Blood glucose lancet	4	1.6
Activity leading to injury	Invasive procedures	80	32.0
	Drawing blood/Injecting medication	53	21.2
	Needle recapping	48	19.2
	Devices left in inappropriate places	34	13.6
	Disposal/Cleaning	13	5.2
	Washing instruments	8	3.2
	Discarding used needles	8	3.2
	Putting items in disposal container	5	2.0
	IV cannulation	1	0.4

Perceived Risk Factors

Participants identified several workplace factors contributing to sharp injuries. Inappropriate working environments (74.4%), stress or prolonged standing (70.8%), negligence (70.0%),

inadequate use of facilities (64.0%), lack of personal protective equipment (58.0%), and inadequate training (55.6%) were commonly perceived contributors. Conversely, only 21.2% considered long working hours as a major cause.

Table 5. Perceived factors contributing to sharp instrument injuries

Risk Factor	Participants Agreeing (%)
Inappropriate working environment	74.4
Stress/Long standing	70.8
Negligence	70.0
Inadequate use of facilities	64.0
Lack of PPE	58.0
Inadequate training	55.6
Long working hours	21.2

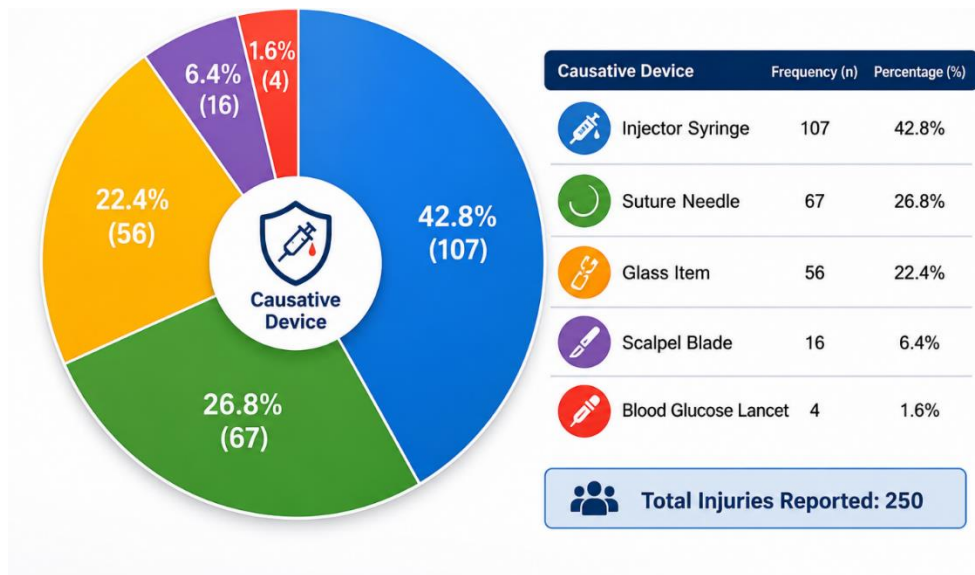


Figure 4: Distribution of injuries by causative device

Post-Exposure Management

Only 94 participants (37.6%) reported receiving post-exposure treatment following injury, while

62.0% did not seek any treatment. Furthermore, only 32.0% expressed satisfaction with the post-exposure management they received.

Table 6. Post-exposure management following sharp injuries.

Variable	Frequency (n)	Percentage (%)
Received post-exposure treatment	94	37.6
Did not receive treatment	155	62.0
Satisfied with treatment received	80	32.0
Not satisfied	16	6.4

Factors Associated with Sharp Injuries

Chi-square analysis demonstrated no statistically significant association between history of sharp injury and participants' age ($p = 0.635$), gender ($p = 0.410$), or occupational category ($p = 0.404$). However, working in multiple shifts showed a significant association with the occurrence of injuries (Likelihood Ratio $p = 0.036$), suggesting that shift work may increase occupational exposure to sharp instrument injuries among healthcare workers.

DISCUSSION

The present study investigated the prevalence, risk factors, and preventive practices related to sharp instrument and NSIs among HCWs in a district-level public hospital in Pakistan. The findings

demonstrate an alarmingly high prevalence of occupational exposure, with 96.8% of participants reporting at least one sharp injury during their professional career. This highlights the substantial occupational risk faced by HCWs and emphasizes the need for strengthened infection prevention and occupational safety programs.

The prevalence observed in the current study is considerably higher than that reported in previous national and international studies. Maken et al. (2016) reported that 40.8% of healthcare workers in a tertiary care hospital in Islamabad experienced needlestick injuries, while Afridi et al. (2013) documented a prevalence of 64% among Pakistani healthcare professionals. Similarly, Gupta et al. (2015) reported an overall prevalence of 52.6% among healthcare workers in India, whereas

Bekele et al. (2015) found a prevalence of 37.1% in Southern Ethiopia (16–19). The substantially higher prevalence in the present study may reflect differences in reporting methods, workload, infection control practices, and resource availability at district-level healthcare facilities.

Although doctors represented the largest occupational group in the study population, the frequency of sharp injuries was uniformly high across all professional categories, with sanitary workers reporting universal exposure. However, no statistically significant association was observed between occupation and history of injury. Similar observations have been reported by Memish et al. (2013), who found that occupational exposure affects multiple healthcare professions despite differences in clinical responsibilities (20). The consistently high prevalence across cadres suggests that occupational hazards are systemic rather than profession-specific and require institution-wide preventive interventions.

An important finding of the present study was the significant association between working in multiple shifts and the occurrence of sharp injuries. Healthcare workers performing extended or irregular duties may experience fatigue, reduced concentration, and impaired decision-making, increasing the likelihood of accidental injuries. Choi et al. (2017) similarly identified excessive workload and work-related stress as important contributors to occupational exposures among healthcare personnel (21). Conversely, age and gender were not significantly associated with injury occurrence in the present study, indicating that workplace conditions may play a greater role than demographic characteristics.

Operating rooms accounted for nearly half of all reported injuries, followed by emergency departments and inpatient wards. These findings are consistent with those reported by Memish et al. (2013), who observed the highest incidence of needlestick injuries in inpatient wards, emergency units, and operating theatres due to the frequent performance of invasive procedures (20). Likewise, Mbaisi et al. (2013) found that suturing and obstetric procedures contributed substantially to occupational injuries among nurses in Kenya (22). The concentration of injuries in high-intensity

clinical environments underscores the importance of targeted safety interventions in these departments.

Injector syringes were identified as the most common causative device, followed by suture needles and glass items. Furthermore, invasive procedures and blood collection activities accounted for more than half of all injury events, while nearly one-fifth occurred during needle recapping. These findings corroborate those of Hussain et al. (2012), who reported hollow-bore needles as the leading cause of injuries among healthcare students and emphasized the persistent practice of unsafe needle recapping despite established recommendations against it (23). Similarly, Zafar et al. (2008) observed that procedural activities involving injections and blood sampling represented the major circumstances leading to occupational injuries (24).

The majority of participants perceived inappropriate working environments, stress, negligence, inadequate facilities, lack of personal protective equipment, and insufficient training as important contributors to sharp injuries. Comparable findings were reported by Adib-Hajbaghery and Lotfi (2013), who identified carelessness, overcrowded wards, lack of facilities, and imprudence as major predisposing factors among Iranian healthcare workers (25). The perception that organizational and environmental factors contribute substantially to injuries highlights the need for institutional improvements beyond individual behavioral change.

Despite the extremely high prevalence of occupational exposure, only 37.6% of injured participants received post-exposure treatment, and an even smaller proportion expressed satisfaction with the care provided. Underutilization of post-exposure management has been consistently documented in previous studies. Choi et al. (2017) reported that approximately two-thirds of healthcare workers failed to report occupational exposures, while Hussain et al. (2012) observed that the majority of healthcare students did not seek appropriate post-exposure follow-up after sustaining injuries (21,23). Failure to report and appropriately manage injuries may increase the

risk of transmission of blood-borne infections and delay preventive interventions.

The findings of this study have important implications for occupational health policy in Pakistan. Regular infection prevention training, strict adherence to standard precautions, elimination of needle recapping practices, adequate provision of personal protective equipment, implementation of safety-engineered devices, and establishment of effective injury reporting systems should be prioritized. In addition, reducing excessive workloads and improving staffing patterns may decrease fatigue-related injuries among healthcare personnel.

This study has several limitations. The use of convenience sampling and recruitment from a single district hospital may limit the generalizability of the findings to other healthcare settings. The reliance on self-reported history of injuries introduces the possibility of recall bias, particularly regarding the number and circumstances of previous exposures. Furthermore, the cross-sectional design precludes establishing causal relationships between identified risk factors and injury occurrence. Nevertheless, the study provides valuable evidence regarding occupational hazards among healthcare workers in district-level hospitals, where data remain relatively scarce.

Overall, the exceptionally high prevalence of sharp instrument injuries observed in this study highlights an urgent need for comprehensive occupational safety strategies and stronger infection control measures. Addressing modifiable workplace factors and promoting a culture of safety could substantially reduce preventable injuries and protect healthcare workers from blood-borne infections.

CONCLUSION

The present study revealed an exceptionally high prevalence of sharp instrument and needlestick injuries among healthcare workers in a district-level public hospital, indicating that occupational exposure remains a major concern. Multiple factors, including shift work, invasive procedures, inadequate workplace conditions, insufficient training, and limited use of preventive measures,

contribute to the occurrence of these injuries. Furthermore, the low rate of post-exposure treatment highlights significant gaps in occupational health practices. Strengthening infection prevention programs, ensuring the availability of personal protective equipment, promoting safe needle-handling practices, implementing effective reporting systems, and providing regular training are essential to reduce occupational injuries and protect healthcare workers from blood-borne infections.

Running Title

Sharp Instrument Injuries among Healthcare Workers

Funding

The authors declare that no external funding was received for this study.

Conflict of Interest

The authors declare that they have no competing interests.

Ethical Approval

The study was conducted in accordance with institutional ethical guidelines, and informed consent was obtained from all participants prior to data collection.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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