


## Characteristics and Predictors of Occupational Sharp Injuries among Healthcare Workers: Analysis of 10-Year Practices in Teaching Hospitals in Two Iraqi Provinces

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### ABSTRACT

Large proportion of healthcare workers have suffered accidents with sharp materials such as syringes, suture needles and scalpels while working in hospitals and medical units. These injuries can spread blood viruses including HBV, HCV, and HIV, which can cause serious and possibly fatal illnesses. Most of these incidents are caused by mis-handling and disposing of syringes and needles or without using gloves, goggles, or glasses. Legislation and regulations that reduce workplace accident are essential. We aimed to identify the frequency and characteristics of occupational sharp injuries among healthcare workers in Teaching hospitals of Two Iraqi Provinces during a period of 10 years. Therefore, this study is based on an observational, descriptive, cross-sectional epidemiological study to determine the real epidemiology within teaching hospitals in two provinces in Iraq. We included all healthcare workers report s corresponding to the accident and review the integrated hospital management system. We can conclude that the prevalence of occupational exposures to sharps injuries in our workplace has fluctuated significantly over the 10 years studied, with differences according to work category, work area, professional experience and the activity performed, so that it continues to be a problem present in health personnel, regardless of whether they are permanent or temporary staff, Therefore, protective measures or adequate training for procedures involving the use of these objects should be reinforced, in addition to informing about the medical-legal and clinical relevance of reporting the occupational accident.

**Keywords:** Sharps; Accident; Injuries; Healthcare Worker

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## 1. INTRODUCTION

Almost half of health care workers (46.2%) have suffered accidents with sharp materials such as syringes, suture needles and scalpels while working in hospitals and medical units. The World Health Organization (WHO) reports close to two million sharps accidents among health care workers, but the same organization admits underreporting, so the real figure could be twice as high (1). This type of injury can lead to serious or fatal infection worldwide due to the spread of blood pathogens. Most serious pathogens include immune deficiency virus (HIV), hepatitis B (HBV) and hepatitis C (HCV) (2), however, when the viral load is high or the exposure is to large volumes of blood, this risk increases (3). There are four factors associated with increased risk for acquiring infection after an occupational accident: 1) depth of wound; 2) presence of blood on the object that produced the wound; 3) injury with a needle that has remained in the artery or vein of an infected patient; and 4) end-stage infected patient as the infectious source. Annually, more than 385,000 injuries with sharp materials occur among hospital healthcare workers and most of these injuries and accidents with exposure to blood or body fluids occurred during the first year in practice. From other point of view, the most frequent anatomical sites of sharps injuries were the fingers of the left hand, The most frequent instruments involved were needles for suturing , scalpel blades and needles with blood (3,4). Of the reported exposures, nursing staff and involved physicians are the more frequently exposed, to less extent, training staff, nursing students, medical residents, medical students, clinical assistants and cleaning personnel. In relation to the area of work, more than 50% of the exposures occurred in the surgical area (operating room and hospital ward for general surgery and surgical specialties), and almost 20% in the medical area (hospital ward for internal medicine and medical specialties); 15.4% occurred in the emergency department (5). Most injuries occur during recapping of needles , operation procedures, blood sampling, insertion of intravenous set and disposal of sharp materials (6), work factors that associated with needlestick injuries include heavy workload, particularly in intensive care and surgical units insufficient work experience and younger age healthcare workers (7). Nonetheless, the overall incidence of sharps injuries among healthcare workers showed a downward trend with increasing seniority and application of safety and regulations guidelines (8,9). For

prevention of exposure blood-borne pathogens, different general measures have to be followed and applied; implementation of Standard Precautions, provide health personnel with protective equipment and safety material, and implementation of safe procedures are the most important measures. From other point of view, exposed personnel should be informed of the medical-legal and clinical relevance of reporting the occupational accident, how to make the report and to whom to report it, as well as have immediate access to an expert for appropriate counseling, treatment and follow-up (3). Currently, the prevalence of occupational accidents caused by sharps remains a serious problem due to the risk of contracting hepatitis B virus (HBV), hepatitis C virus (HCV) or acquired human immunodeficiency virus (HIV) infections. Most of these exposures are due to unsafe acts, which are preventable (10,11). Our goal is identifying categories and positions frequently affected will help us determine the areas to prioritize training in standards and guidelines, as well as informing the medical-legal and clinical relevance of reporting the work-related accident, how to make the report and to whom it should be reported, in addition to having immediate access to an expert to receive appropriate counseling, treatment and follow-up. All this with the purpose of reducing the number of this type of accidents as well as their adequate control in hospital units. The specific objectives of our study are identifying labor profile of the most affected healthcare workers such as category, position, shift and work place, the most frequently involved anatomical site, the presence of infectious disease development as a result of sharps injuries, the object (sharps) most frequently involved in the injury and procedure performed at the time of injury.

## **2. METHODOLOGY**

**Study design:** A retrospective cross-sectional study with analytic utility

**Study population:** Healthcare workers of Teaching Hospitals in two Iraqi Provinces; Baghdad and Al-Najaf Al-Ashraf.

### **Study Sample:**

We conveniently selected two large teaching Hospitals Baghdad Teaching Hospital from Baghdad province and Al-Sader Teaching Hospital in Al-Najaf Al-Ashraf province

All healthcare workers who suffered accidents caused by sharps were considered eligible.

Sampling technique: Non-probabilistic

**Inclusion Criteria**

1. All workers who work in the facilities of Hospital
2. Accidents reported in the period 2021-2023.

**Exclusion Criteria**

1. Sharp injuries that were not fully reported
2. Injuries of non-healthcare worker like administration staff.
3. Non-Teaching hospital or newly considered as teaching hospital

Definition of Studied Variables:

A. Accidents with sharp materials:

Exposure to injury caused by syringes, suture needles and scalpels while working in the hospitals and units.

B. Exposed personnel:

- Physician; specialist, general practitioner, resident.
- Nursing and training Staff: Nurse; Specialist, general.
- Technician; Laboratorian, Medical Assistant

C. Job title: Operating Room, Hospitalization, Emergencies, intensive care unit, Hemodialysis, vaccination, others.

D. Anatomical site: Left hand, right hand, forearm, others

E. infectious Diseases: HBV, HCV, HIV

F. Instrument involved in the accident: Syringes, Suture Needles and Scalpels, Lancet

G. Procedure involved in the accident: Medical procedure, handling and improper disposal of sharps and surgical procedure.

H. Working Shift: Morning, Evening and Night

I. Cause of injury (Unsafe Act or Unsafe Condition)

J. Initial assessment in Preventive Medicine: Yes or No

K. Follow-up in Preventive Medicine: Yes or No

L. Contact with HIV patient: Yes or No

M. Receive Antiretroviral treatment: Yes or No

N. Has a history of injury due to sharp material: Yes or No

### **Data collection:**

A database was created to record information and data analysis in Microsoft Office Excel with the collection of data obtained from:

- Injured Worker Reports (IWR) for sharps accidents with the support of the occupational Medicine and Public health units in the hospital.
- Search of Notes and review of Laboratories records of the Hospital
- Reports related to Infectious Diseases: Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) or Acquired Human Immunodeficiency Virus (HIV) or others, secondary to sharps accidents with the support of Expert Medicine.
- Reports related to care and follow-up of sharps injuries with the support of public health unit in the hospital

### **Ethical Approval:**

All official agreements were obtained from General Directorate of Baghdad Medical City, Baghdad teaching Hospital, Najaf Health Directorate; Center of Training and Human resources development, Al-Sader Medical City. Data were kept confidential and used for the purpose of this research only. All personal information were hidden and replaced with codes assuring the privacy of included personnel.

### **Statistical Analysis:**

Data were entered, managed and analyzed using the statistical package for social sciences (SPSS) software for windows version 28. Qualitative variables were summarized as frequencies and percentages and were compared using Chi-squared test when applicable and Fisher's exact test when chi-squared was inapplicable. Quantitative variables presented as mean and standard deviation (SD) and compared using parametric and non-parametric statistical tests accordingly; Student's t test, Analysis of variances (ANOVA), Mann-Whitney U tests were applied when applicable. Bivariate Pearson's correlation analysis used to assess the relationship between two scale variables and the correlation coefficient (R) was calculated. Regression analysis (Binary) used to assess the main factors associated with injuries. Odds ratio was calculated with its 95% confidence interval. Level of significance (P. value) of 0.05 used as a cutoff value below which the difference or association was considered significant.

### 3. RESULTS

A total of 127 participants' reports were reviewed and analyzed in this study. The age of study participants ranged between 25 and 60 years. Majority of the patients were older than 30 years. Males were dominant and contributed for 63.8% of the studied group, (Table 1). The distribution of reported injured staff according to their job category revealed that 38.3% were general nurses, 30.8% were laboratory technician, 23.4% specialist nurses and 15.9% were medical assistants. Medical staff (specialist physicians, resident physicians and general practitioners) were less frequent exposed staff, (Table 2). Affiliations and related variables of the studied group are summarized in (Table 3), most injuries was reported in participants with institute level of education, in those with lower years in practices, public sectors in the hospitals and surgical sectors. The work shift to which the participants belonged was morning shift 65.4% (83 cases), Evening /night shift 34.6% (44 cases).

Regarding the types of sharp materials associated with injuries, syringes were the most common type contributed for 63.2%, followed by lancets (22.4%), suture needles (10.4%) and the least frequent,(only 4%), were scalpels, (Figure 1). Surgical Procedures, Improper handling and disposal of sharps and Medical Procedures were the main causes of sharp injuries contributed for, 44.9%, 29.9% and 25.2%, respectively, (Table 5)

Left hand was the more affected anatomical site, (50.4%), right hand injuries reported in 40.2%, forearm (5.5%) and other sites injured in 3.9% of the studied group, (Table 6).

Among the 127 reported injuries during the studied period, 98 (77.2%) participants got an initial assessment in preventive medicine and public health department, 43.3% got a follow-up in preventive medicine and public health department, only 6.3% had a history of sharp injuries. However, Laboratory testing performed by only 109 (85.8%) of the participants, two of them showed positive (HBV). All these findings are summarized in (Table 7).

To assess the predictors of sharp injuries, binary regression analysis was performed and revealed that the incident sharp injuries were significantly associated with younger age, male gender, nursing and laboratory work, lower years in practice, evening/ night shift, syringes as agent of injury, unsafe act and improper handling and disposal of sharps and left hand site (Table 8). Moreover, according to the value of odds ratio (OR), handling syringes was the stronger predictor of incident sharp injuries with an OR of 6.05, followed by nursing work

(OR=3.32), laboratory work (OR= 3.00), evening/ night shift (OR= 2.51), lower years in practice (OR=2.25), left hand (OR=1.75), male gender (OR=1.39) and younger age (OR=1.26), in all these variable association was significant, (P. value < 0.05).

Table 1. Age and gender distribution of the studied group (N=127)

Variable		No.	%
Age (year)	≤ 30	27	21.3
	31 - 40	49	38.6
	41 - 50	32	25.2
	51-60	19	15.0
Gender	Male	81	63.8
	Female	64	36.2

Table 2. Distribution of reported injured staff according to their job category (N=127)

Category	No.	%
Specialist physician	2	1.6
Resident physician	5	4.7
General practitioner	4	3.7
General Nurse	41	38.3
Specialist Nurse	25	23.4
Medical Assistant	17	15.9
Laboratory Technician	33	30.8

Table 3. Affiliation and related variables of the studied group

Variable		No.	%
Education level	Institution	66	52.0
	College	34	26.8
	Postgraduate	27	21.3
Years in practice	< 5	38	29.9
	5 - 9	29	22.8
	10 - 14	26	20.5
	15 - 20	21	16.5
	> 20	13	10.2
Work place	Public wards	91	71.7
	Private wards	36	28.3
Work category	Medical	48	37.8
	Surgical	62	48.8
	Other	17	13.4
Shift	Morning	83	65.4
	Evening/night	44	34.6

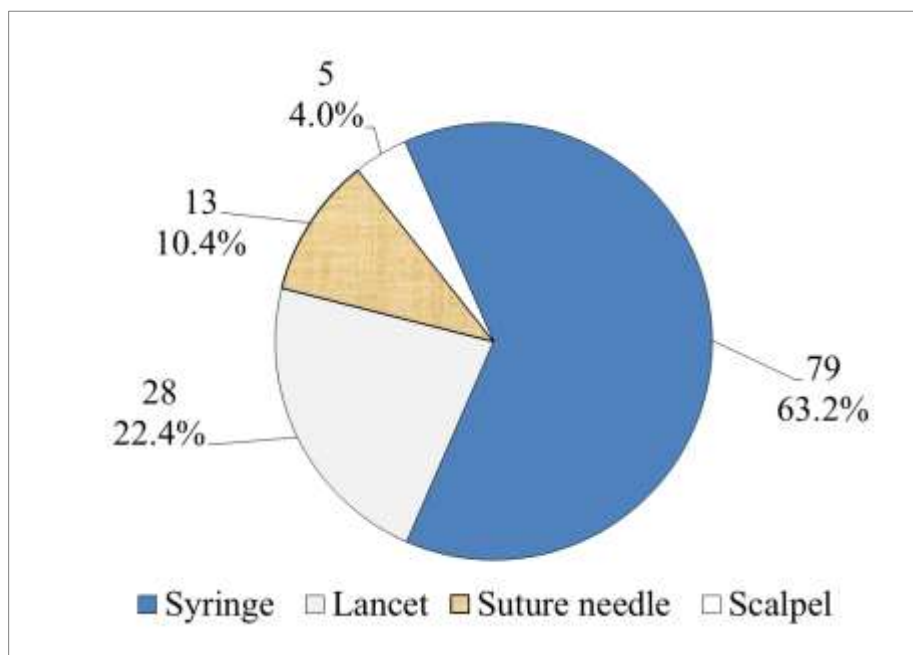


Figure 1. Distribution of Types of sharp materials associated with injuries



Table 5. Main causes of sharp injuries

Cause	No.	%
Surgical Procedures	57	44.9
Improper handling and disposal of sharps	38	29.9
Medical Procedure	32	25.2
Total	127	100.0

Table 6. Distribution of Anatomical site of injuries

Anatomical site of injury	No.	%
Left Hand	64	50.4
Right hand	51	40.2
Forearm	7	5.5
Other sites	5	3.9
Total	127	100.0

Table 7. Distribution of reporting of sharp injuries in public health and preventive medicine department and laboratory testing

		No.	%
Initial assessment in preventive medicine and public health department	Yes	98	77.2
	No	29	22.8
Follow-up in preventive medicine and public health department	Yes	55	43.3
	No	72	56.7
History of previous Sharp Injury	Yes	8	6.3
	No	119	93.7
Laboratory testing performed	Yes	109	85.8
	No	18	14.2
Positive Laboratory result for infection*	Yes	2	1.6
	No	107	98.4
Out of 109 to who performed lab testing, 2 participant were positive for HBV			

Table 8. Results of binary regression analysis for the predictors of incident sharp injuries

Predictors	Standardized Coefficients		OR	95% CI OR		P. value
	$\beta$	SE		Lower	Upper	
Age	0.23	0.05	1.26	1.159	1.359	0.032
Male gender	0.33	0.08	1.39	1.231	1.551	0.006
Nursing work	1.20	0.82	3.32	1.680	4.960	<0.001
Laboratory work	1.10	0.74	3.00	1.524	4.484	<0.001
Lower years in practice	0.81	0.68	2.25	1.568	3.608	0.025
Evening/ night shift	0.92	0.21	2.51	1.879	2.929	0.360
Syringes	1.80	1.10	6.05	3.850	8.250	<0.001
Left hand	0.56	0.14	1.75	1.343	2.026	0.022

OR: odds ratio, 95% CI: 95% confidence interval, SE: standard error of standardized coefficient beta ( $\beta$ ).

#### 4. DISCUSSION

In accordance with the objective of this study to identify categories and positions frequently affected by occupational sharps injuries while they are working in the hospitals over a period of 10 years, as well as to identify the most affected labor profile (Category, Position, Shift, Contractual Regime), most frequently involved anatomical site, presence of incident infectious diseases as a result of sharps injuries, object (sharps) most frequently involved in the injury, the determination of the frequency and the effect of sharps injuries among healthcare workers will help us determine the areas to prioritize training in norms and guidelines, as well as informing the medical-legal and clinical relevance of reporting the occupational accident, how to make the report and to whom it should be reported, in addition to having immediate access to an expert to receive appropriate counseling, treatment and follow-up. All this with the purpose of reducing the number of this type of accidents as well as their adequate control in the hospital units. Based on the total number of reported accidents of sharp injuries, the percentages were calculated and their relationship with the type of sharp material that caused injuries was estimated. We found that, the syringe was the instrument involved in the injuries, which coincides with that

reported in previous Iraqi study conducted in Sulaimani Hospitals -North of Iraq (12) As reported in several studies, the highest incidence of injuries have shown to be corresponded to syringe and suture needle punctures, similar findings reported in other countries like Saudi Arabia (13), Jordan (14) and Iran (15).

In relation to the most frequently healthcare worker, we found that general nurses, were the more affected followed by laboratory technicians, specialist nurse and medical assistant in a rate of 38.3%, 30.8%, 23.4% and 15.9%, respectively. The least affected group was the specialist physicians followed by general practitioners and resident physicians in a rate of 1.6%, 3.7% and 4.7% respectively. This could be attributed to the fact that nurses and laboratory technicians more prone to these injuries to higher rates of contact with the patients and handling of sharp materials. However, these findings may reflect that these groups of healthcare workers were less adhere to protective measures and improper handling of sharp materials, needle sticks and syringes that make them at higher risk of injuries with sharps (16).

It is important to point out that the shift where more injuries were reported was the morning shift, the same was reported in the literature, to which they attribute that this could be due to the fact that in the evening and night shift the number of working healthcare personnel is lower or may mean better attention to conventional safety measures when performing some type of procedure, in addition to the fact that there is also a lower proportion of procedures in patient care (17).

In relation to the area of work, surgical services were the most affected. Other studies reported that surgical and intensive care services have a higher proportion of accidents (18). The main cause related to this type of accident was identified as surgical procedures (44.9%) improper handling and disposal of sharps or unsafe acts of the worker (19). Injuries primarily arise from needle recapping, surgical procedures, blood sample collection, administration of intravenous lines, and improper waste disposal techniques, which were also identified in our study. Exposures due to this type of actions are totally preventable, and therefore avoidable, so we should continue to focus on them in future interventions.

In one study, the most frequent anatomical sites of sharps injuries were the fingers of the left hand, mainly the index figure, followed by middle finger, while the right hand was less

frequently affected compared to left one, this corresponds to the same results obtained, since more accidents occurred in the left hand than in the right (20)

It is important to point out that of the 127 cases reported in this 10-year analysis, only 77.2% (98 cases) went for initial care in preventive medicine and public health department while only 43.3% went for follow-up. Unfortunately, two participant got infection with HBV which was proved by laboratory testing.

It should also be emphasized that in this surveillance and data comparison study reveals that in the year 2021, 16.7% of cases were reported, in 2022 33.3% of cases and in 2023, 13.3% of cases, which represents a higher incidence in terms of sharps injuries, with respect to cases reported in previous years, where 6.7% of injuries occurred in each of the years 2014-2019 and 10% in 2020. Therefore, attention must be directed to this problem because the trend of incident sharp injuries seemed to be rising which may reflect the non-adherence to safety measures and unawareness of healthcare workers about the serious occupational hazards, improper handling of sharps and unsafe acts.

## **5. CONCLUSIONS**

We can conclude that the prevalence of occupational exposures to sharps injuries in our workplace has fluctuated significantly over the 10 years studied, with differences according to work category, work area, professional experience and the activity performed, so that it continues to be a problem present in health personnel, therefore, protective measures or adequate training for procedures involving the use of these objects should be reinforced, in addition to informing about the medical-legal and clinical relevance of reporting the occupational accident, how to make the report and to whom it should be reported, as well as commenting on the importance of going for review and follow-up, since according to what has been reported, some injured persons do not go to initial appointments or to laboratories, which is a serious problem.

### **Ethical Approval:**

All ethical issues were approved by the author. Data collection and patients enrollment were in accordance with Declaration of Helsinki of World Medical Association , 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

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