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Needlestick and sharp injuries among hospital healthcare workers: an infection control challenge in Saudi Arabia

Adil Abalkhail[1], Russell Kabir[2], Yousif Mohammed Elmosaad[3], Ameen S. S. Alwashmi[4], Fahad A. Alhumaydhi[4], Thamer Alslamah[1], Khalid A. Almoammar[5], Yasir A. Alsalamah[6] and Ilias Mahmud[1*]

[1]Department of Public Health, College of Public Health and Health Informatics, Qassim University, Al Bukairiyah, Qassim 52741, Saudi Arabia; abalkhail@qu.edu.sa (A.A.); 4037@qu.edu.sa (T.A.)

[2]School of Allied Health, Faculty of Health, Education, Medicine and Social Care, Anglia Ruskin University, Chelmsford CM11SQ, Essex, UK; russell.kabir@aru.ac.uk (R.K.)

[3]College of Applied Medical Sciences, King Faisal University Al Hufuf 36362, Saudi Arabia; yelmosaad@kfu.edu.sa

[4]Department of Medical Laboratories, College of Applied Medical Sciences, Qassim University, Buraydah 52571, Saudi Arabia; f.alhumaydhi@qu.edu.sa (F.A.A.); aswshmy@qu.edu.sa (A.S.S.A.)

[5]Department of Pediatric Dentistry & Orthodontics, College of Dentistry, King Saud University, Riyadh 11545, Saudi Arabia; kalmoammar@ksu.edu.sa (K.A.A.)

[6]General Surgery Department, Collage of Medicine, Qassim University; y.alsalamah@qu.edu.sa (Y.A.A.)

* Correspondence: i.emdadulhaque@qu.edu.sa

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Abstract

Needlestick and other sharp injuries (NSIs) are critical occupational hazard for healthcare workers. Exposure to blood and body fluids through NSIs increases the risk of transmission of blood-borne pathogens among them. The objectives of this study were to estimate the one-year incidence of NSIs and investigate its associated factors among the healthcare workers in Saudi Arabia. A cross-sectional online survey was conducted between October and November 2021. A total of 361 healthcare workers participated in the survey from all over Saudi Arabia. The one-year incidence of NSIs among healthcare workers is estimated at 22.2%. More than half of the injury event (53.8%) was not reported to the authority by the healthcare worker. Incidence of NSIs was highest among the physicians (36%) and is followed by nurses (34.8%), dentists (29.2%), and medical technologists (21.1%). The likelihood of injury is higher (OR: 2.51; 95% CI: 1.04, 6.03) among the works aged 26 – 30 years compared to the 20 – 25 years age group and the workers directly deal with needles or other sharp objects while working (OR: 5.90; 2.69, 12.97). The high incidence rate of injury and low reporting rate highlight the needs of an education program targeting healthcare providers with higher risk.

Key words: Needlestick and other sharp injuries; hospital-acquired infection, biological hazards, infection control

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Background:

Needlestick and other sharp injuries (NSIs) are an occupational hazard for healthcare workers which is often associated with their practice standard [1][2,3]. Exposure to blood and body fluids through NSIs increases the risk of transmission of blood-borne pathogens such as human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus among the healthcare workers [4].

Despite the World Health Organization's (WHO) guidelines to reduce NSIs in healthcare settings, they continue to occur in every step of sharp devices usage or disposal [5]. Globally, an estimated 3.5 million healthcare workers suffer from accidental needlestick or sharp injury each year [6]. This constitutes 86% of all occupational infections in the healthcare settings [7] In the USA, according to a Centre for Disease Control and Prevention (CDC) report, there are an estimated 385,000 annual incident of NSIs among the hospital healthcare workers [8]. While 100,000 NSIs cases were reported annually among the hospital healthcare workers in Europe [9] and 500,000 in Germany [10].

The risk of injuries to healthcare workers is influenced by several factors, including the type of needle and other sharp objects used and their safety system [2]. The risks of NSIs in the healthcare facilities also depends on the number of patients with infection and the precautions the healthcare workers observe while dealing with these patients [2]. The risk of NSIs is high for physicians, nurses, laboratory technicians, and medical waste workers during screening, diagnosing, treating, and monitoring patients, and also during the medical waste management process [7]. Healthcare workers are at risk of acquiring hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV infections by sharps injuries. About 40% of all HBV, 40% of HCV, and 4.4% of HIV/AIDS cases among HCWs are due to NSIs [7]. More than 90% of these infections occur in healthcare settings in low-income countries where adherence to standard precautions is poor [11].

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A study done in few governmental hospitals in the Kingdom of Saudi Arabia (KSA) estimated that the annual sharp injury incidence was 3.2 per 100 occupied beds. Nurses were the job category most affected by NSIs [5]. A recent study conducted in a hospital in the Medina region estimated that the annual incidence of NSIs among healthcare personnel in the KSA is 32% [12]. A study reported that the nurses were the most affected profession [5], while AlDakhil et al. showed that 29.8% of the dentists experienced NSIs in the preceding one year period [13].

However, there is a marked underreporting of needlestick incidents acquired by healthcare workers, especially among dentist in Saudi Arabia like many other countries. A study found that more than half of the dental healthcare workers experiencing NSIs do not report their injuries to the authority [14]. Some studies conducted in different parts of the KSA in governmental hospitals regarding needle stick injury among health care workers. The dearth of literature on NSI risk among dentists in Saudi Arabia, prompted us to address this important research gap. The present study focuses on healthcare workers at hospitals and dental clinics in Saudi Arabia and determines the incidence and associated factors for NSIs from demographic characteristics, nature of work, exposure to the training program, and work experience and education.

Methods

Study design and sampling

We did a cross-sectional survey of the healthcare workers in the KSA. We conducted the survey online using the Google Form between October and November 2021. The online survey link was disseminated to the healthcare workers throughout the KSA through professional and social networks, such as emails and professional WhatsApp groups. We indicated our study objectives and title clearly in the front page of the online survey form and the participants were requested to avoid multi-registration. The participants provided

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informed consent was allowed visit the subsequent pages to participate in the survey. A total of 366 healthcare workers completed the online survey.

The instrument

The structured questionnaire collected information on the participants' socio-demographic variables, work characteristics, and NSIs events in the past twelve months. Respondents only recorded their last injury event within the past twelve months.

Variables

The main outcome variable was NSIs event in the past twelve months. The other outcome variables included reporting status of the injury event to the hospital authority, activities led to the injury, place of injury, type of device which caused the injury, contamination status of the device caused the injury and severity of the injury. Our explanatory or predictor variables included job title, age, gender, experience, training on NSIs prevention and whether the job requires them to directly deal with the sharp objects.

Analysis

SPSS version 20 was used for data analysis. We did descriptive analysis of the sociodemographic variables and the outcome variables including the NSIs event. We reported frequency and percentages for each of the categorical variables. We reported number and proportions of the healthcare workers had injuries in the past three months and proportion and number of the reported the injury event to the authority.

We did multivariable logistic regression analysis to investigate the predictors of NSIs. For multivariable logistic regression analyses we reported odds ratio (OR) with 95% confidence interval (CI). In addition, we reported corresponding *p* values. A *p* value of <0.05 was considered statistically significant.

Results

Table 1. Characteristics of the hospital healthcare workers

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Variables	Frequency	Percent
Job title		
Physician	50	13.9
Dentist	24	6.6
Nurse	69	19.1
Lab tech	90	24.9
Pharmacist	22	6.1
Housekeeping staff	9	2.5
Student	58	16.1
Volunteer	39	10.8
Age		
20-25	150	41.6
26-30	67	18.6
31-40	90	24.9
41-50	40	11.1
51-60	14	3.9
Sex		
Male	106	29.4
Female	255	70.6
Nationality		
Saudi	300	83.1
Non-Saudi	61	16.9
Professional experience		
up to 5 years	199	55.1
6 - 10 years	71	19.7

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11 - 20 years	63	17.5
more than 20 years	28	7.8
Received training on dealing with sharp objects		
No	198	54.8
Yes	163	45.2
Dealing with sharp objects at work		
No	156	43.2
Yes	205	56.8

A total of 366 HCWs participated in the study (5 of them were excluded because of incomplete responses), includes lab technician 90 (24.9%), nurse 24 (19.1%), students 58(16.1%), physician 50 (13.9%), volunteer 39 (10.8%), dentist 24(6.6%), pharmacist 22(6.1%) and housekeeping staff 09 (2.5%) respectively. The participants were predominantly female (70.6%), Saudi (83.1%) and 41.6% of them belonged to younger age (20-25) years. A total of 199 participants they had professional experience up to 5 years, only 163 (45.2%) they received training on dealing with sharp objects, despite of 205(56.8%) of the participants dealing with sharp materials Table 1.

Table 2. One-year incidence of needlestick and sharp injuries among hospital healthcare workers in Saudi Arabia

Variables	**Incidence (one year)**
	Percent (95% CI)
Total	22.2 (18.0 – 26.8)
Gender	
Male	28.3 (20.0 – 37.9)
Female	19.6 (14.9 – 25.0)
Age group	

20 – 29 years	17.1 (12.3 – 22.7)
30 – 39 years	30.0 (20.8 – 40.6)
40 years or more	29.6 (18.0 – 43.6)
Nationality	
Saudi	21.0 (16.5 – 26.1)
Non-Saudi	27.9 (17.1 – 40.8)
Job title	
Physician	36.0 (22.9 – 50.8)
Nurse	34.8 (23.7 – 47.2)
Dentist	29.2 (12.6 – 51.1)
Medical technologist	21.1 (13.2 – 31.0)
Pharmacist	13.6 (2.9 – 34.9)
Housekeeping staff	11.1 (0.3 – 48.2)
Student	12.1 (5.0 – 23.3)
Volunteer	2.6 (0.1 – 13.5)

A total of 80 participants experienced needle-stick and sharp injuries 22.2% (95%, CI. 18.0 – 26.8%) in the past year. The rate was 28.3%, (95%, CI: 20.0 – 37.9) among the males and 19.6% (95% CI: 14.9 – 25.0%) among the females. Incidence rate among the physician was 36.0%; nurses 34.8%; dentist in 29.2%; medical technologist 21.1%; housekeeping staff 11.1%; and nonclinical support staff 14.7%. Non-Saudi (27.9%, 95% CI: 17.1 – 40.8) healthcare workers are estimated to have higher incidence. Results also indicate that thirty (30.0%) of the incidents were reported among hospital healthcare workers belong to the age group (30 – 39) years Table 2.

Table 3. Predictors of needlestick and sharp injuries among hospital healthcare workers in Saudi Arabia

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Predictors	Unadjusted model		Adjusted model	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
Gender				
Female	1		1	
Male	1.62 (0.96, 2.73)	.072	1.17 (.61, 2.27)	.638
Age				
20-25	1		1	
26-30	2.90 (1.41, 5.99)	.004	2.51 (1.04, 6.03)	.040
31-40	3.14 (1.61, 6.13)	.001	1.43 (.47, 4.40)	.531
41-50	2.78 (1.19, 6.51)	.018	2.71 (.72, 10.13)	.139
51-60	4.07 (1.23, 13.51)	.022	3.48 (.61, 19.93)	.162
Nationality				
Non-Saudi	1		1	
Saudi	.69 (.37, 1.29)	.241	1.11 (.49, 2.51)	.811
Job title				
Volunteer	1		1	
Physician	21.37 (2.70, 169.03)	.004	6.77 (.74, 62.32)	.091
Dentist	15.65 (1.78, 137.31)	.013	5.53 (.56, 54.48)	.143
Nurse	20.27 (2.62, 156.87)	.004	7.20 (.82, 63.08)	.075
Lab tech	10.17 (1.31, 78.92	.027	3.78 (.42, 33.81)	.235
Pharmacist	6.00 (.58, 61.62)	.132	7.11 (.61, 83.41)	.118
Housekeeping staff	4.75 (.27, 84.17)	.288	1.32 (.06, 29.72)	.859
Student	5.22 (.62, 44.20)	.130	5.92 (.61, 57.54)	.125
Professional experience				
up to 5 years	1		1	

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6 - 10 years	3.13 (1.69, 5.80)	.000	1.99 (.77, 5.15)	.155
11 - 20 years	1.84 (.93, 3.66)	.080	.79 (.26, 2.40)	.673
more than 20 years	1.81 (.71, 4.61)	.216	.53 (.12, 2.28)	.395
Received training on dealing with sharp objects				
No	1		1	
Yes	2.32 (1.39, 3.85)	.001	1.39 (.79, 2.47)	.253
Dealing with sharp objects at work				
No	1		1	
Yes	6.69 (3.40, 13.17)	.000	5.90 (2.69, 12.97)	<.001

Table 3 shows the unadjusted and adjusted odds ratios and their 95% confidence intervals (CIs) for the predictors of needlestick and sharp injuries among hospital healthcare workers. The younger participants (26-30) years experienced 2.5-fold higher risk of NSIs than older hospital healthcare workers [OR = 2.51, 95% CI (1.04–6.03)]. However, those who is dealing with sharp objects at work was significantly associated with NSIs experience, they have 5.9-fold higher risk of NSIs than non-dealing with sharp objects at work [OR = 5.9, 95% CI (2.69–12.97)].

Physician, nurse, Dentist and Lab tech were significantly associated with higher NSI experience; un-adjusted odds ratios (95% CI) were 21.37 (2.70, 169.03), 20.27 (2.62, 156.87), 15.65 (1.78, 137.31) and 10.17 (1.31, 78.92) respectively, but in the adjusted model no such association was evident. Gender and nationality were not also significantly predictors of needlestick and sharp injuries.

Table 4. Description of the injury event

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Variables	Frequency	Percent
Place of injury		
Dental clinic	6	7.5
Emergency unit	27	33.8
ICU	2	2.5
Laboratory	18	22.5
Surgery unit	14	17.5
Vaccination centre	9	11.3
Contamination status of the sharp item		
Contaminated with blood	27	33.8
Contaminated with other biohazards	13	16.3
Uncontaminated	19	23.8
Unknown	21	26.3
Device caused the injury		
Needle	43	53.8
Blade	18	22.5
Glassware	8	10.0
Plasticware	5	6.3
Pipette	3	3.8
Scissors	2	2.5
Not sure	1	1.3
The activity led to the injury		
While assembling or preparing the device to use	8	10.0
While using the device	38	47.5
While removing a disposal container or trash bag	2	2.5

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While recapping a used needle	13	16.3
While dissembling a device/equipment for cleaning/sterilization	9	11.3
While disposing off a used device	3	3.8
Other	7	8.8
Severity of the injury		
Mild (superficial- little or no bleeding)	56	70.0
Moderate (skin puncture/cut, some bleeding)	18	22.5
Sever (deep puncture/cut or abundant bleeding)	6	7.5
Notified the hospital authority about the injury		
No	43	53.8
Yes	37	46.3

The area of the hospital where most of the NSIs took place were the emergency unit (33.8%), followed by the laboratory (22.5%), surgery unit (17.5%), Vaccination center (11.3%), Dental clinic (7.5%) and lower NSIs was observed in the ICU (2.5%).

With regard contamination status of the sharp item, around 34% of the health workers were injured with sharp item contaminated with blood, (16.3%) were injured with sharp item contaminated with other biohazards, (23.8%) were injured with uncontaminated sharp items, while 26.3% were injured with sharp item unknown its status.

The results also showed that the most common devices leading to NSIs were Needles (53.8%), followed by Blade (22.5%), Glassware (10%), Plastic ware (6.3%) and Scissors (2.5%).

Most injuries occurred during using devices (47.5%), followed by recapping a used needle (16.3%) while dissembling a device/equipment for cleaning/sterilization (11.3%), and 3.8% occurred while disposing of a used device. About (8.8 %) of the HCWs received the NSI due to other activities.

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The majority (70.0%) of the injured hospital healthcare workers had suffered from mild injuries, (22.5%) had suffered from moderate injuries (skin puncture/cut, some bleeding), while only (7.5%) of the injured healthcare workers had suffered from severe (deep puncture/cut or abundant bleeding). Whereas, more than half of needle-stick injuries were not reported Table 4.

Discussion

Needlestick and sharp injuries (NSIs) are a prominent occupational threat for healthcare workers [2]. It is essential to identify the rate of NSIs and their associated factors among hospital healthcare workers in the KSA. Our findings showed that only 22.2% of the participants experienced needle-stick and sharp injuries. These findings are almost similar to those reported in turkey (20.75%)[15] and slightly lower than that reported in Germany (28.7%) [16] and China (27.5%) [17]. In contrast to our study findings, similar studies conducted in other parts of KSA [13] and Al-Madinah [12] reported slightly higher prevalence of about 29.8% and 32% respectively. Another study conducted in Dammam reports very less prevalence (8.4%) when compared to our study findings [5]. Conversely, much higher incidence prevalence was reported in South Korea (70.4%) [18], India (68.2%), Ethiopia (60.2%) [19], and Iran (42.5%) [20]. In comparison, the prevalence of needle-stick injuries in other developing countries was found to be lower. It is possible that the experience, greater compliance with infection control procedures, workplace safety awareness and available resources were associated with lower risk of NSIs. HCWs are exposed to NSIs while performing clinical activities, our findings showed the most common injured group were physicians (36.0 %), nurses (34.8%), dentists (29.2%) and medical technologists (21.1%). Our study findings are in contrast with another study as the injured physician and nurses were found to be higher and injured medical technologists is lower in this study when compared with the study conducted by [12]. In relation to the rate of NSIs among dentists, it is less than its average in neighboring countries such as Jordan

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(66.5%) [21], whereas 42% in the United Arab Emirates [22] and in 31 countries worldwide, 59.1% of the dentists are exposed to NSIs [9].

The low prevalence of NSIs among nurses, dentists, and lab technicians in KSA might be because of workplace safety, adequate clinical experience, continuous training programs in infection control, and an increased number of simulation laboratories.

Our findings illustrate that job titles such as Physician, Nurse, Dentist and Lab technician were significantly associated with needle stick and sharp injuries as dealing with sharp objects at work was significantly associated with NSIs experience. Age is also a significant predictor of the risk of needle stick injuries; it was found that younger participants of 26-30 years of age group were significantly associated with needle stick and sharp injuries. This result is similar to the previous studies [23-25].

Concerning the area of the hospital where most of the NSIs took place. In our study, the area of the hospital where most of the NSIs took place was the emergency unit, this finding was congruent with a study conducted in India [5,26]. The other most common place the NSIs took place is a laboratory, this finding is like a study done in Southern Ethiopia [27]. Moreover, our findings showed that the surgery unit is also associated with NSIs. This result is similar to other studies that show surgery units are the most common place of NSIs occurrence [28]. That can be explained by the nature of the work and the medical activities for each area.

We noted the different devices leading to NSIs. The most common devices were Needles followed by blades, Glassware, Plasticware and Scissors. The findings of our study especially related to the Needles are consistent with the results of other studies conducted in India [28], Japan [29] and Iran [30].

The most common activity leading to NSIs was while using the device and recapping needles. This is consistent with a previous investigation from Nigeria, Southern Ethiopia [27], Taiwan [31] and KSA [13]. The following common activity leading to NSI was

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dissembling a device/equipment for cleaning/sterilization. This contrasts with Amira et al., who reported improper disposal of needles and venous cannulation and setting of drips [32].

About the severity of injuries among hospital healthcare workers, our results showed that most of the injured hospital healthcare workers had suffered from mild, moderate, and severe injuries. In our study, 53.8% of participants had notified when they had NSI experiences. This indicates that there is a marked underreporting of needle stick incidents acquired by health care workers, especially among dentists in Saudi Arabia, like many other countries. The study shows that more than two-third of dental health care workers experiencing NSIs did not report those injuries to the appropriate department [14]. This might be due to the assumption that no blood-borne pathogens existed in the source patient, annoyance, and lack of awareness about the reporting procedure.

Conclusion

We conclude that it is evident from our findings that there is a significantly high prevalence of NSIs (22.2%), it ranged from mild to severe injuries and a low rate of reporting (46.3%). The most common injured group was the physicians, followed by nurses, dentists, and medical technologists. In addition, our study highlighted NSIs risk higher among younger HCWs, and NSIs took place in the emergency unit and surgery unit. The most common activity leading to NSIs was using the device and recapping needles. An education program should be designed targeting health care providers with higher risk. Moreover, a unified needle stick injuries policy covers safe work practices, safe disposal of sharps, procedures in the event of needle stick injury, training, and procedures for reporting needlestick injuries.

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