Original Article

High incidence of occupational exposures among healthcare workers in Erbil, Iraq

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Abstract

Introduction: The current status of percutaneous injury and mucous exposures (PMEs) of hospital workers and factors associated with the injuries have not been studied in Iraq. This study aimed to evaluate the epidemiology of PMEs with blood or body fluids that leads serious risks for healthcare workers (HCWs).

Methodology: An analytic, cross-sectional survey study was conducted among HCWs in Erbil city center, Iraq. The study was performed at sevenhospitals, and 177 participants were included. The dependent variable was the occurrence of PMEs in the last year, and the independent variables were age, sex, occupation of HCWs, working site, and work duration.

Results: A total of 177 HCW participants included 57 nurses/midwives (32.2%), 59 doctors (33.3%), 27 laboratory workers (15.3%), and 34 paramedics/multipurpose workers (19.2%) from seven hospitals. The study concluded that 67.8% of the participants reported at least one occupational PME in the last year. In all, 13.3/person/year PME incidents were reported for nurses, 9.74/person/year for paramedics/multipurpose workers, 6.71/person/year for doctors, and 3.37/person/year laboratory workers. The mean number of PME incidents was 8.91/person/year. HCWs showed 85.0% compliance with wearing mask in risky situations. The most dangerous action for occupational exposure was blood taking (39.0%). In the univariate analysis, none of the investigated variables were found to be significantly related to PME.

Conclusions: Occupational injuries and exposures in Iraqi HCWs are extremely common; awareness about protection is not sufficient. Nurses were found to be the highest risk group among HCWs. Preventive actions should be taken to avoid infection.

Key words: healthcare workers; nurses; occupational exposures; blood-borne infections.

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Introduction

Occupational exposure to blood-borne pathogens constitutes a severe risk for health care workers (HCWs). Around the world, the transmissions of different pathogens by percutaneous and mucosal exposures (PMEs) have been reported. In general, occupational PMEs may result in hepatitis B (HBV), hepatitis C (HCV), or human immunodeficiency virus (HIV) transmission and infections with needle-stick and other sharps injuries, skin lesions, abrasions, burns, and inoculation of a virus onto mucosal surfaces of the eyes, nose, or mouth through accidental splashes. Intact skin composes a reliable barrier against spontaneous penetration of HIV, HBV, and HCV [1-3].

According to World Health Organization (WHO) reports, approximately three million HCWs experience percutaneous exposure to blood-borne viruses. The same report estimated that these injuries resulted in 16,000 hepatitis C, 66,000 hepatitis B, and 200 to 5,000 HIV infections. The majority of these infections were reported from low-income countries [2]. There are significant differences between developing and developed countries in the risk of infection with blood-borne pathogens – particularly HBV, HCV, and HIV – because of the high prevalence of such pathogens in low-income countries. At the same, time a correlation has been reported between the frequency of injections and the prevalence of HBV, HCV, and HIV in the population [3,4].

We do not have any reliable information about the prevalence of blood-borne viruses in Iraq. Unfortunately, the country statistics over the last 20 years are missing or are very weak. According to data from the 1990s, Iraq has intermediate HBV endemicity and the carrier rate in this country has been reported to

be 2%–5% [5]. A study from Baghdad reported a significantly higher prevalence of hepatitis B surface antigen (HBsAg) among leukemic patients (32.3%) than control patients (2.3%) [6]. Another study reported 7.1% HBsAg positivity and 40.6% anti-HCV positivity among HCWs [7]. The prevalence of anti-HCV antibodies was 7.1% in hemodialysis patients and 66.0% in HIV-infected hemophilia patients [8]. The overall anti-HCV seroprevalence was 3.21% among pregnant women [9]. Although the prevalence of HIV is very low (0.1%), there is a potential risk for HCWs because some people are hidden carriers [10]. All of these blood-borne pathogens represent a significant health risk to medical workers. There are no remarkable studies about the risk of occupational PMEs to blood-borne pathogens among HCWs in Iraq.

Iraq, with a population of 30 million, has a healthcare system in which most hospitals are run by the government. In this system, there is no regulation to prevent HCWs from occupational hazards and no systematic record programs concerning PMEs in hospital settings. Therefore, a representative epidemiological study was needed to provide sufficient information about the real situation. This study aimed to fill that gap with a city sample. The purposes of this study were to determine current epidemiology, incidence, types, and predictor factors of exposure to blood-borne pathogens in hospital settings among Iraqi HCWs.

Methodology

Setting

A single-city survey study of HCWs at seven hospitals/health centers in the biggest city of northern Iraq, Erbil, was conducted. Eight of the hospitals were government-run and one was private. Hospitals located in the city center that included three general hospitals, two maternity hospitals, one pediatric hospital, one trauma hospital, one cancer center, and one cardiac center were included in the study. For the purposes of this study, a PME was defined as any percutaneous injury or mucous membrane contact with blood or a blood-soiled biological liquid.

Data collection

HCWs (*e.g.*, doctors, nurses, midwives, paramedics) from all departments in the study hospitals who had direct daily contact with patients or samples were surveyed. Hospital administrative personnel were not surveyed. The survey aimed to reach half of these departments at each hospital and included only day shift workers. All applicable HCWs who were available and willing to participate during the survey period were included in the study.

Questionnaire

A questionnaire created based on a review of the literature was pilot tested in one hospital (Sema Hospital). The questionnaire was made available in English, Arabic, and Kurdish. The Arabic and Kurdish versions were back-translated into English to ensure equivalence of the items. The first part of the questionnaire included questions eliciting personal information from the respondent (*e.g.*, age, sex, hospital site, job category). It also asked about the frequency of occupational PMEs to blood and other body fluids during the previous month and the previous year, as well as behavior after PME and compliance with universal precautions (UP). The questionnaires were distributed and collected by a trained physician in each city with the support of hospital management. All personal information was recorded without the respondent's name specified. HCWs' participation was voluntary, and respondents' anonymity was maintained. Formal approval from the local research ethics committee was obtained if the hospital management so demanded.

Data analysis and statistics

The outcome variables for occupational injury in the previous year were evaluated for association with the following predictor variables: hospital site (medical or surgical); respondent's age, sex, job category (*i.e.*, nurse/midwife, doctor, laboratory worker, paramedic/multipurpose worker); and length of time in the job. The data were analyzed using SPSS version 16.0 (SPSS Inc., Chicago, USA). The χ^2 test and independent sample *t*-test were used to assess the strength of the association between variables.

Number of PMEs

The mean number of PMEs during the previous year was calculated from the results of the survey.

Results

Demographic information

A total of seven hospitals, with an aggregate 1,645 beds, were included in the study. The average number of beds per hospital was 235 (range, 42 to 486 beds; standard deviation [SD], 180). The participants included 57 nurses/midwives (32.2%), 59 doctors (33.3%), 27 laboratory workers (15.3%), and 34 paramedics/multipurpose workers (19.2%). The

average age of the respondents was 31.1 years (range, 18 to 64 years; SD, 9.9), and 90 of them were male (50.9%). The average duration of employment was 8.2 years (range, 6 months to 40 years; SD, 7.8 years).

Amount of occupational exposures

A total of 120 respondents (67.8%) reported at least one PME in the previous year. The prevalence of PMEs was highest in the doctors, with 42 (71.2%) reporting at least one PME. Paramedics/multipurpose workers were next, with a prevalence of 70.6% (Table 1). On the other hand, the mean number of PMEs was the highest in nurses/midwifes (13.30 PMEs/person/year), followed by paramedics/multipurpose workers (9.74 PMEs/person/year) (Table 2).

Predictors of occupational PMEs

The possible predictors of occupational PME were evaluated. In the univariate analysis, none of the investigated variables were found to be significantly related for PME (Table 3).

Compliance with universal precautions

The universal precaution most adhered to was wearing a mask in high-risk situations (85.0%). The most common reason for injury was blood taking and major surgery (Table 4). Ninety-three (52.5%) of the participants stated that they were vaccinated against hepatitis B.

Discussion

This is the first study from Iraq that addresses important aspects of the epidemiology of occupational blood and body fluid exposures. The study indicates that a remarkably high level of occupational blood-borne risk exposure happens among HCWs in hospital settings in Iraq. However, the awareness of occupational PMEs to blood and body fluids is low. Previously, there was no specific study that targeted the occupational exposures of healthcare workers in Iraq. This report showed that more awareness of occupational exposure to blood and other body fluids among HCWs in Iraqi hospitals is needed.

The percentage and quantity of HCWs reporting percutaneous exposures in this study is markedly higher than that reported in developed countries. For comparison, in North American studies, 24% of HCWs (compared to 67.8% in this study), 34% of doctors (compared to 71.2% in this study), and 9% of nurses (compared to 61.4% in this study) reported a percutaneous injury in the previous year.

Table 1. Occupational exposures among HCWs during the last month and the last year

Variables	Needle-stick injury n (%)		Mucosal exposures n (%)		Other sharps injuries n (%)		Total exposures n (%)
	Previous month	Previous year	Previous month	Previous year	Previous month	Previous year	Previous year
Nurses/midwives, n = 57 (%)	27 (47.4)	35 (61.4)	18 (31.6)	22 (38.6)	8 (14.0)	11 (19.3)	35 (61.4)
Doctors, n = 59 (%)	25 (42.4)	33 (55.9)	14 (23.7)	29 (49.2)	6 (10.2)	10 (17.0)	42 (71.2)
Laboratory workers, n = 27 (%)	4 (14.8)	10 (37.0)	8 (29.6)	10 (37.0)	2 (7.4)	5 (18.5)	19 (70.4)
Paramedics/multipurpose workers, n = 34 (%)	13 (38.2)	21 (61.8)	11 (32.3)	15 (44.1)	5 (14.7)	10 (29.4)	24 (70.6)
Total, N = 177 (%)	69 (39.0)	99 (55.9)	51 (28.8)	76 (42.9)	21 (11.9)	36 (20.3)	120 (67.8)

Table 2. Mean number of cutaneous and mucosal exposures per HCWs during the previous month and previous year for each occupational group

Group	Previous month				Previous year			
	Needle-stick injury	Mucosal exposures	Other sharps injuries	Total	Needle-stick injury	Mucosal exposures	Other sharps injuries	Total
Nurses/midwives	4.70	3.30	1.79	9.79	6.63	4.51	2.16	13.30
Doctors	2.46	1.27	0.34	4.07	3.83	2.42	0.46	6.71
Laboratory workers	0.26	0.74	0.07	1.07	0.63	2.48	0.26	3.37
Paramedics/MPWs	2.12	2.27	0.85	5.24	4.29	1.86	1.50	9.74
Total HCWs	3.35	2.03	0.86	6.24	4.33	3.40	1.18	8.91

MPWs: multipurpose workers

Table 3. Univariate analysis of related factors associated with occupational exposures among HCWs

Variables	Proportion of injured HCWs (%)	Proportion of uninjured HCWs (%)	OR	95% CI	P
Age	30.2 ± 8.3	31.5 ± 6.4	-	-	0.32
Work duration	7.0 ± 7.2	8.6 ± 6.1	-	-	0.41
Gender (male)	58/120 (48.3)	32/57 (56.1)	1.17	1.10–1.24	0.34
Working at surgical site	42/120 (35.0)	22/57 (38.6)	0.86	0.45–1.64	0.74
Doctors/dentists	42/120 (31.2)	17/57 (29.8)	1.27	0.64–2.50	0.61
Nurses/midwives	35/120 (29.2)	22/57 (38.6)	0.66	0.34–1.27	0.23
Laboratory workers	19/120 (15.8)	8/57 (14.0)	1.15	0.47–2.82	0.83
Paramedic/MPWs	24/120 (20.0)	10/57 (17.4)	1.18	0.52–2.66	0.84

MPWs: multipurpose workers; OR: odds ratio; CI: confidence interval

Table 4. Behaviors of HCWs to prevent in risky situations

Variables	n (%)
Wear a mask in a high-risk situation (mean ± SD)	85.0 ± 30.1
Wear a glove in a high-risk situation (mean ± SD)	80.3 ± 30.3
Wear protective eyewear in a high-risk situation (mean ± SD)	18.4 ± 34.1
Actions lead to injury	
Blood taking	69 (39.0)
Injection	43 (24.3)
Intravenous liquids implementation	14 (7.9)
Cleaning	18 (10.2)
Major surgery	48 (27.1)
In laboratory	21 (11.9)
Sewing	23 (13.0)
Minor surgery	20 (11.3)
Others	15 (8.5)
Compliance with recommendations after occupational exposures	
No answer	16 (9.1)
Yes	39 (22.0)
No	122 (68.9)
Reporting of injury to the hospital administration	
No answer	25 (14.1)
All of the exposures	19 (10.7)
Never	121 (68.4)
Some of the exposures	12 (6.8)

The approximate number of injuries of nurses in the United States was reported as 0.8 times per nurse per year [11]. The mean number of exposures per year for the nurses in this study was 13.3, which is one of the highest numbers around the world. In France, the incidence of accidental blood exposures per HCW was estimated to be 0.11 per year [12]. In a country-wide Turkish study, 50.1% of the HCWs reported at least one occupational PME in the last year [13].

Occupational risk for Iraqi HCWs was found to be very similar to that in some developing countries. For example, 63% of HCWs in north India and 57% of injection providers in Mongolia reported a percutaneous injury in the last year (compared to 67.8% in this study) [11]. More than three-quarters (75%–82%) of Chinese nurses and 69% of Indian doctors reported an occupational injury in the previous year [1,14]. The number of percutaneous exposures reported by Indian nurses (3.5 per person per year) is also lower than what was observed in this study (8.91 per person per year) [1]. A study from Mongolia reported that the incidence of needle-stick and sharps injuries during the previous three months was 38.4% [15]. A West African survey of 1,241 HCWs reported that 45.7% had experienced accidental blood exposure in the previous year, with 80.1% due to percutaneous injury. The source patient's HIV serostatus was positive in 74 cases (13.1%), negative in 65 cases (11.5%), and unknown in 416 cases (73.4%) [16]. When we compare African countries with Iraq, the awareness about body fluid exposure is much higher in Africa because of HIV risk.

In this study, there was no significant difference among occupational types such as doctors or nurses for percentage of exposures. The number of exposures was found to be different among the occupations. The highest number of exposure was found among nurses (13.3 per year) and the lowest was found among laboratory workers (3.37 per year). Many studies showed that doctors and nurses/midwives have a higher risk for occupational exposures than do other HCWs. In a multicenter study from three African countries, the incidence of accidental blood exposures and percutaneous injuries per HCW per year was two times higher for nurses compared to doctors [16]. In the United States, nurses are most frequently exposed to blood-borne pathogens [17].

In this study, working at a surgical site was not a predictive factor for occupational exposures. In contrast, some studies reported that workers at surgical sites are at higher risk than are medical site workers. Similarly, a Turkish study reported that surgical residents had 5.5 times more occupational injuries than did the residents in internal wards [13].

In our study, the average rate of mask and glove wearing was found to be relatively high when compared to the wearing of an eyewear apron. In developed countries, the compliance with guidelines for protective material use is very high. In Italy, 88.6% of HCWs, reported wearing gloves when in direct contact with a patient, 35.8% reported wearing protective eyewear, and 35.5% reported wearing a mask [18]. Similarly, compliance with glove use was reported to be 94% and disposal of sharps was reported to be 92% in an American study [19]. In developing countries, compliance with universal precautions is low. In Tanzania, gloves were reported to be worn in 16% of blood-taking procedures [20]. In a Nigerian study, 93.2% of dentist participants wore gloves routinely, but only 43.2% knew HIV could be transmitted through the conjunctiva. Therefore, the basic knowledge about universal precautions was found to be insufficient [21]. Our results were not excessively bad for glove and mask use. The knowledge, awareness, and regulations about the protection of HCWs from blood-borne exposures are not satisfactory in Iraq.

Organizational and educational improvements can solve many problems [22]. In Iraq, because of longtime isolation, sanctions, wars, and instability, the healthcare system does not work well; HCWs are not sufficiently trained, and new regulations are not sufficiently implemented. To reduce occupational exposures in Iraqi hospital settings, a standard educational program should be developed. The programs should emphasize the education and vaccination of HCWs, the value of wearing protective gear, the importance of first aid after exposures, the relative risk of transmission for each pathogen, and surveillance of injuries.

This study has some limitations. It was performed in only one city center and the representative value is questionable. After 2003, many HCWs, especially doctors, moved to Erbil from other cities of Iraq for security reasons. HCWs in Erbil may be representative of HCWs all over Iraq. The other limitation is that the number of participants was not high. In Iraq, the central authority is very weak, and performing this kind of survey study is not easy.

In conclusion, this study provided first data on occupational exposures in Iraqi hospital settings. The percentage and number of exposure are extremely high

among Iraqi HCWs. Organizational, administrative, and individual actions are necessary to reduce the risk of occupational exposure among HCWs.

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