

# Occupational Injuries Prone to Infectious Risks amongst Healthcare Personnel in Kuwait: A Retrospective Study

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## Key Words

Occupational exposure · Blood-borne viruses · Healthcare personnel · Kuwait

## Abstract

**Objective:** The study aimed at determining the prevalence of incident occupational exposure to blood and other potentially infectious materials (OPIM) among healthcare personnel (HCP) during 2010 and at evaluating the factors associated with these incidents. **Subjects and Methods:** An epidemiological, retrospective, record-based study was conducted. All self-reported incidents of occupational exposure to blood and OPIM among HCP from all healthcare settings of the Kuwait Ministry of Health during 2010 were included. **Results:** The total number of the exposed HCP was 249. The prevalence of incident exposure was 0.7% of the HCP at risk. Their mean age was  $32.31 \pm 6.98$  years. The majority were nurses: 166 (66.7%), followed by doctors: 35 (14.1%), technicians: 26 (10.4%) and housekeeping personnel: 22 (8.8%). Needle stick injury was the most common type of exposure, in 189 (75.9%), followed by sharp-object injury, mucous-membrane exposure and contact with nonintact skin. The majority of needle stick exposures, i.e. 177 (93.7%), were caused by hollow-bore needles. Exposure to blood represented 96.8%,

mostly during drawing blood and the insertion or removal of needles from patients [88 (35.4%)] and when performing surgical interventions [56 (22.6%)]. Easily preventable exposures such as injuries related to 2-handed recapping of needles [24 (9.6%)] and garbage collection [21 (8.4%)] were reported. Exposures mainly occurred in the inpatient wards [75 (30.1%)] and operating theaters [56 (22.6%)]. Among the exposed HCP, 130 (52.2%) had been fully vaccinated against hepatitis B virus (HBV). **Conclusion:** Needle stick injuries are the most common exposure among HCP in Kuwait, and nurses are the most frequently involved HCP category. A good proportion of exposures could be easily prevented. HBV vaccination coverage is incomplete.

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## Introduction

Exposure to blood and body fluids remains a major occupational hazard in health care [1, 2]. Indeed, accidental exposure may lead to infections by blood-borne pathogens particularly hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) [1]. The greatest risk of infection transmission is via percutaneous exposure to infected blood. The transmission

of HBV, HCV or HIV after exposure to mucous membranes or nonintact skin has also been reported [3].

The risk of infection following a percutaneous injury, especially deeply penetrating injuries involving a hollow-bore needle or a device visibly contaminated with blood, has been estimated at 1 in 3 for HBV, 1 in 30 for HCV and 1 in 300 for HIV [4]. Assessment of the danger and the development of effective preventive and control strategies are the key elements in the reduction of exposure among healthcare personnel (HCP) [5–7]. Routine HBV vaccination, engineered safety devices, the implementation of standard precautions, injury surveillance programs, the provision of personnel protective equipment such as gloves, eye goggles, masks and gowns as well as postexposure prophylaxis (PEP) have yielded good results [8, 9]. For example, in the USA, the proportion of HCP who experienced  $\geq 1$  needle stick injuries in 1 year fell from 24 to 8.6% over a span of 8 years [8, 9].

In Kuwait, Ministry of Health (MOH) healthcare settings have a system of reporting exposure to blood and other potentially infectious materials (OPIM) among HCP via immediate reporting of the incidents to the Preventive Medicine and Infection Control Units. This is followed by evaluation and postexposure management (by the Preventive Medicine Unit) in addition to carrying out the proper corrective action after root cause analysis of the common factors predisposing to such exposures (by the Infection Control Unit). Earlier studies in Kuwait had reported only needle stick and/or sharp-object injuries among HCP in some hospitals [10, 11], hence the need for a comprehensive study of different modes of exposure to blood and OPIM among HCP in all Kuwait MOH healthcare settings (hospitals and primary healthcare centers). Our investigation aimed at determining the prevalence of incident exposures to blood and OPIM among HCP at risk during 2010 and evaluating the risk factors associated with these events.

## Subjects and Methods

The study was an epidemiological, retrospective, record-based review. All the reported incidents of occupational exposure to blood and OPIM among HCP in all Kuwait MOH healthcare settings (6 general hospitals, 9 specialized hospitals and 86 primary healthcare centers) [12] for the year 2010 were included. The OPIM included: (1) human body fluids, i.e. semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood and all body fluids in situations where it is difficult or impossible to differentiate between them, (2) any unfixed tissue or organ (other than in-

tact skin) from a human (living or dead) and (3) HIV-containing cells or tissue cultures, organ cultures, HIV- or HBV-containing culture medium or other solutions as well as blood, organs or other tissues from experimental animals infected with HIV or HBV [13].

The exposure was defined as contact with blood or OPIM and included percutaneous injuries (needle stick injuries and other sharp-object injuries), exposure of mucous membranes (splashes to nose, eyes or mouth), contact with nonintact skin and human bites [3, 13].

The HCP self-reported the incident to the Preventive Medicine and Infection Control Units in the corresponding healthcare settings using the specific MOH-approved report form. Data including age, the occupational group of the exposed person, the date, time and place of the exposure, the details of the activity being performed, the nature of the fluid/tissue involved, the mode of exposure and the HBV vaccination status were recorded. The total number of HCP who were employed in jobs with a potential risk of exposure to blood and OPIM was 33,364 [12].

Data were coded, entered and analyzed using the SPSS version 19 for Windows. Simple descriptive measures were used (mean  $\pm$  standard deviation for quantitative variables and frequency with percentage distribution for qualitative variables). Clearance of the study protocol was obtained from the MOH Standing Committee for the Coordination of Health and Medical Research.

## Results

Of the 33,364 HCP, 249 (0.7%) reported exposure to blood and OPIM. The mean age of the exposed HCP was  $32.31 \pm 6.98$  years (range 21–56 years). Of these, 249 individuals, 212 (85.2%) were 20–40 years old; 166 were nurses (66.7%), followed by 35 doctors (14.1%), 26 technicians (10.4%) and 22 housekeeping personnel (8.8%). Needle stick injury represented the most common mode of exposure in 189 (75.9%) followed by injury by sharp objects, mucous membrane exposure and contact with nonintact skin [45 (18.1%), 13 (5.2%) and 2 (0.8%), respectively]. Percutaneous (needle stick and sharp-object) injuries represented 234 (94%). The majority of needle stick injuries were from hollow-bore needles [177 (93.7%)]. Exposure to blood represented 241 (96.8%), with most incidents occurring during drawing blood and inserting or removing needles from patients [88 (35.4%)] followed by performing surgical interventions [56 (22.6%)]. Injuries related to 2-handed recapping of needles and garbage collection were reported in 24 (9.6%) and 21 (8.4%), respectively. Exposures mainly occurred in the inpatient wards [75 (30.1%)] followed by the operating theaters [56 (22.6%)]. Only about half of the exposed HCP were fully vaccinated with the HBV vaccine [130 (52.2%)]. The details are described in table 1.

Needle stick injury was the most common mode of exposure among all involved occupational groups, occur-

ring in 24 doctors (68.6%), 126 nurses (75.9%), 21 technicians (80.8%) and 18 housekeeping personnel (81.8%). However, doctors were more exposed to sharp objects than other groups [7 (20%)]. Doctors practised the prohibited technique of 2-handed recapping of needles [5 (14.3%)] much more than nurses and technicians [16 (9.6%) and 3 (11.5%), respectively]. Technicians had the best immunization coverage against HBV; 20 of the exposed technicians had been fully vaccinated (77.0%). In contrast, only 4 (18.2%) of the housekeeping personnel had completed the 3 doses of the vaccine. The complete results are presented in table 2.

## Discussion

The 0.7% prevalence of incident occupational exposure to blood-borne viruses in this study was lower than those reported previously (1.96–66.3%) [14–16]. This lower prevalence could be attributed to gross underreporting. Other studies [17–20] had underreporting as an important finding. A probable explanation for underreporting could be the absence of PEP, a lack of knowledge of the efficacy of PEP for prevention, an attitude that HCP are careless or are to blame for their own injuries, a lack of follow-up/workers' compensation, a misperception about the level of risk and time constraints [18, 21]. Hence, immediate reporting could facilitate risk stratification of such exposures with the administration of PEP, which prevents the acquisition of blood-borne pathogens [18] and helps with the quick application of corrective actions to prevent further exposures.

In this study, 85.2% of the exposed HCP were 20–40 years old with a mean of  $32.31 \pm 6.98$  years, which is similar to an Iranian study with a mean age of  $30.6 \pm 6.9$  years [22]. In Egypt, HCP aged over 40 years were significantly less likely to be exposed [19]. Studies show that HCP with a longer professional life have a lower number of exposure incidents to blood-borne pathogens [22–24].

Our finding that the nurses had the highest rate of exposure (66.7%) confirmed those of other studies from various countries (55–62.3%) [6, 14, 19, 25] as well as an earlier study from Kuwait (53.9%) [11]. The probable explanation for this finding could be that nurses constitute the largest group of at-risk HCP in Kuwait (45.8%). Equally important, it is nurses who most frequently administer drugs, take blood and handle vascular access.

Although case reports [3, 23, 26] have documented the transmission of blood-borne viruses as a result of splashes of blood from infected patients onto HCP mucous

**Table 1.** Data on HCP exposed to blood and OPIM in Kuwait MOH healthcare settings in 2010 (n = 249)

Data of exposed HCP	n	%
Age group		
20+ years	110	44.2
30+ years	102	41.0
40+ years	30	12.0
50–56 years	7	2.8
Mean age $\pm$ SD, years	$32.31 \pm 6.98$	
Age range, years	21–56	
Occupation of exposed HCP		
Doctor	35	14.1
Nurse	166	66.7
Technician	26	10.4
Housekeeping staff	22	8.8
Work location during exposure		
Operating theater	56	22.6
Intensive care unit	15	6.0
Inpatient ward	75	30.1
Outpatient setting	26	10.4
Laboratory	23	9.2
Emergency room	22	8.8
Others	32	12.9
Mode of exposure		
Needle stick injury	189	75.9
Sharp-object injury	45	18.1
Mucous membrane exposure (splashes to eye)	13	5.2
Nonintact skin contact	2	0.8
Activity leading to exposure		
Drawing blood/inserting or removing needle	88	35.4
2-handed needle recapping	24	9.6
Administration of medication	23	9.2
Garbage collection	21	8.4
Cleaning surgical instruments	11	4.4
Performing surgical intervention	56	22.6
Disposing needle in sharps box	13	5.2
Others	13	5.2
Nature of body fluid/material		
Blood	241	96.8
Saliva in dental procedures	3	1.2
Urine	1	0.4
Pus	1	0.4
Tissues	3	1.2
HBV vaccination status		
Fully vaccinated	130	52.2
Unvaccinated	54	21.7
Incompletely vaccinated	42	16.9
Unknown	23	9.2

membranes, the highest proportion of transmission occurs via percutaneous injuries with hollow-bore needles for vascular access [26]. In our study, percutaneous injuries caused by needle sticks and other sharp objects con-

**Table 2.** Distribution of different professional categories of HCP exposed to blood and OPIM in Kuwait MOH healthcare settings in 2010

Variables	Occupation of exposed HCP				Total
	physician (n = 35)	nurse (n = 166)	technician (n = 26)	housekeeping (n = 22)	
Mode of exposure					
Needle stick injury	24 (68.6)	126 (75.9)	21 (80.8)	18 (81.8)	189
Sharp-object injury	7 (20)	31 (18.7)	3 (11.5)	4 (18.2)	45
Mucous membrane exposure	4 (11.4)	9 (5.4)	0 (0.0)	0 (0.0)	13
Nonintact skin contact	0 (0.0)	0 (0.0)	2 (7.7)	0 (0.0)	2
Activity leading to exposure					
Recapping needle	5 (14.3)	16 (9.6)	3 (11.5)	0 (0.0)	24
Others	30 (85.7)	150 (90.4)	23 (88.5)	22 (100.0)	225
HBV vaccination status					
Fully vaccinated	14 (40.0)	92 (55.4)	20 (77.0)	4 (18.2)	130
Unvaccinated	7 (20.0)	30 (18.1)	1 (3.8)	16 (72.7)	54
Incomplete vaccination	9 (25.7)	30 (18.1)	3 (11.5)	0 (0.0)	42
Unknown	5 (14.3)	14 (8.4)	2 (7.7)	2 (9.1)	23

Figures denote n (%).

stituted the vast majority of the exposure incidents (94%), thereby leading to a great potential for the risk of transmission of blood-borne viruses among the exposed HCP similar to previous studies (58.8–79.5%) [4, 22, 27]. The higher reporting in our study could be due to a misperception by HCP that other exposures have a low risk, and for this reason there was no need to report them. This explanation was confirmed by Kessler et al. [18].

Injuries from hollow-bore needles, especially those used for blood collection or intravenous catheter insertion, are of particular concern because these devices are likely to contain residual blood and are therefore associated with an increased risk of HIV transmission [20]. In our study, needle stick injuries were the commonest mode of exposure in all occupational categories, and the majority were from hollow-bore needles (tables 1, 2) similar to previous findings [1, 4, 27, 28]. Probable explanations could be the large number of tasks performed for patients using needles and the underreporting of mucocutaneous exposures because of a misperception of this as a low risk factor [18].

Although housekeeping workers do not have direct clinical contact with patients, they are also at risk of exposure to blood-borne viruses. For this group, needle stick injuries that occurred during garbage collection were the most commonly reported incidents (81.8%) as reported in previous studies [22, 27]. The probable explanation for these injuries could be the incorrect or unac-

ceptable way in which the doctors, nurses and technicians discard the needles and sharp objects in the wastebaskets. This attitude reflects the incorrect management of sharp objects which should be disposed of in designated puncture-proof containers to prevent injuries [27]. In Kuwait, private companies recruit housekeeping workers through contracts with the MOH. It is possible that these workers may not be aware or properly trained about the dangers associated with these exposures or the need for prompt postexposure reporting and management. Therefore, this ignored professional category should be included in the prevention program.

For technical and nursing staff, when the need to recap a needle arises in between steps, a 1-handed technique or a fixed device that enables 1-handed recapping should be used to prevent needle stick injury [13, 20]. Injuries due to 2-handed recapping of used syringe needles were observed in our study and in previous studies [17, 19, 23, 27]. Equally important, physicians performed 2-handed recapping of needles more than nurses and technicians in our study (table 2). These easily preventable injuries could be avoided by the education/training of HCP in safe-work practice and safe usage of sharp objects as well as the convenient placement of puncture-proof containers close to the point-of-use.

In our study, most exposures occurred in inpatient wards where less intensive activities were carried out compared to areas like the emergency room and intensive

care unit; this is similar to previous findings [1, 4, 19, 22]. A probable explanation is that more qualified and experienced staff works in the emergency room and intensive care unit. Equally possible, HCP in the less intensive units may be responsible for more patients and have a greater workload, which could cause staff to rush through with the injections [19].

Vaccination is one of the best ways to protect HCP from infections, but vaccination is only available for HBV. In Kuwait, although the MOH offers free HBV vaccination for all the employed HCP, it was not compulsory until approximately 5 years ago and was first declared so by a ministerial decree only in 2013 [29]. In this study, the total HBV vaccination coverage of HCP was only 69.1% (table 1). Moreover, the fully vaccinated personnel represented only 52.2% of the exposed HCP. Incomplete coverage has been reported in Kuwait before, where total vaccination coverage was 74.7%, and those who completed the 3 doses were 62.7% of all the HCP interviewed [30]. The MOH has now made the vaccination of HCP compulsory before hiring [29]. Almost comparable to our finding, Zhang et al. [16] reported 68.3% vaccination coverage, while other studies reported higher results [1, 22].

The 77.0% full vaccination coverage among technicians was markedly higher than the 18.2% among housekeeping personnel, probably because the technicians had safety officers who were responsible for ensuring their vaccination, while the housekeeping personnel did not. Equally important, the housekeeping personnel were recruited by private companies that usually neglected this essential preventive measure. The MOH should mandate these companies to fully vaccinate their workers before they join the workforce.

## Conclusion

This study highlighted the commonest types of exposure and high-risk practices in which HCP are frequently involved. Significant measures for prevention should include seeking alternatives to needle usage wherever possible, using devices with safety features, providing sufficient training/education of HCP in the safe use and disposal of needles and sharp objects, immunizing HCP against HBV and enhancing the prompt reporting of such exposures.

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