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# Benchmarking of Percutaneous Injuries at the Ministry of Health Hospitals of Saudi Arabia in Comparison with the United States Hospitals Participating in Exposure Prevention Information Network (EPINet™)

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## Abstract

**Background:** Exposure to blood-borne pathogens from needle-stick and sharp injuries continues to pose a significant risk to health care workers. These events are of concern because of the risk to transmit blood-borne diseases such as hepatitis B virus, hepatitis C virus, and the human immunodeficiency virus.

**Objective:** To benchmark different risk factors associated with needle-stick incidents among health care workers in the Ministry of Health hospitals in the Kingdom of Saudi Arabia compared to the US hospitals participating in Exposure Prevention Information Network (EPINet™).

**Methods:** Prospective surveillance of needle-stick and sharp incidents carried out during the year 2012 using EPINet™ ver 1.5 that provides uniform needle stick and sharp injury report form.

**Results:** The annual percutaneous incidents (PIs) rate per 100 occupied beds was 3.2 at the studied MOH hospitals. Nurses were the most affected job category by PIs (59.4%). Most PIs happened in patients' wards in the Ministry of Health hospitals (34.6%). Disposable syringes were the most common cause of PIs (47.20%). Most PIs occurred during use of the syringes (36.4%).

**Conclusion:** Among health care workers, nurses and physicians appear especially at risk of exposure to PIs. Important risk factors of injuries include working in patient room, using disposable syringes, devices without safety features. Preventive strategies such as continuous

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training of health care workers with special emphasis on nurses and physicians, encouragement of reporting of such incidents, observation of sharp handling, their use and implementation of safety devices are warranted.

**Keywords:** Needlestick injuries; Benchmarking; Health personnel; Blood-borne pathogens; Occupational exposure

## Introduction

Exposure to blood and body fluids occurs across a variety of occupations. Health care workers (HCWs), emergency response and public safety staff, and other workers are exposed to blood through needle-stick and other sharps injuries, and mucous membrane and skin exposures. The pathogens of primary concern are the human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV).<sup>1-3</sup>

The risk of blood exposure is high for HCWs performing invasive procedures, those procedures which involve the use of sharp instruments and/or where there is a risk of contact between a patient's blood or body fluids and the blood of the HCW.<sup>4</sup>

The risk of HBV, HCV and HIV transmission after exposure to blood and body fluids increases respectively, by 6%–30%, 0.5%, and 0.3%, with increasing viral load of the source patient and the amount of blood exposure.<sup>3</sup> More than three million HCWs worldwide are exposed to HBV, HCV or HIV each year as a result of needle-stick and sharps injuries (NSSIs).<sup>5</sup>

Reporting of NSSIs is important for the treatment and prevention. For the injured person, NSSI reporting prompts evaluation for post-exposure prophylaxis, allows early detection of seroconversion and helps to decrease anxiety. Furthermore, injury reporting allows identification of hazardous devices or procedures and so serves to diminish the risk of future injuries.<sup>6</sup>

The epidemiological aspects of needle-stick injuries in the Kingdom of Saudi Arabia (KSA) has so far been described at localized health care institutions.<sup>7-13</sup> We

conducted this study to benchmark different risk factors associated with needle-stick incidents among health care workers in the Ministry of Health (MOH) hospitals in the KSA compared to the US hospitals participating in Exposure Prevention Information Network (EPINet™). To the best of our knowledge, this is the first report from the MOH, KSA at national level using aggregate reported needle-stick incidents from 52 hospitals participating in EPINet™ program during the year 2012.

## Materials and Methods

All reported cases of percutaneous injuries (PIs) in 52 MOH hospitals in KSA using EPINet™ ver 1.5 program reports during 2012 were compared to the US EPINet™ reports in 2011. The US reports included PIs occurred in nine teaching hospitals and 23 non-teaching hospitals.

According to the MOH policy, HCWs sustaining PIs are instructed to inform their supervisors and report the incident to the infection control staff in their facility. The infection control staff recorded the information about the incident using EPINet™ ver 1.5. PIs report form is uniform and includes job category, where and when the injury occurred, type of device and original purpose of the sharp item, whether the sharp item was contaminated, and if the source patient was known, who was the original user of the sharp item, and the place and severity of the injury.

## Data Collection

EPINet™ is a software package created for recording and analyzing occupational exposures to blood-borne viruses. The focus

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For more information on the injection safety among primary health care workers in Jazan region, Saudi Arabia see <http://www.theijoem.com/ijoem/index.php/ijoem/article/view/441>



**Table 1:** Rate of needle-stick injuries per 100 daily occupied beds in MOH hospitals of Saudi Arabia in 2012 and US teaching and non-teaching hospitals using EPINet™ in 2011

Parameter	Saudi MOH hospitals	US teaching hospitals	US non-teaching hospitals
Number of participating hospitals	52	9	23
Average daily census	12 402	2542	1096
Number of needle-stick injuries	397	527	181
Rate of needle-stick injuries per 100 occupied hospital beds	3.2	20.7	16.5

of the software is to monitor sharps injuries, body fluid splashes and the consequences of such exposures. EPINet™ has the capacity to record detailed information about the exposure including the device involved and the procedure and then provide detailed feedback on which areas are at the highest risk from exposures. Subsequently, this information used to find methods for reducing the frequency of occupational exposures to blood-borne viruses.<sup>5,14</sup>

### Statistical Analysis

Possible risk factors of needle-stick and sharp object incidents among HCWs during year 2012 included in the EPINet™ ver

1.5 software were analyzed using SPSS® for Windows® ver 13. Then, risk analysis was performed to find significant epidemiologic characteristics of percutaneous injuries at MOH hospitals.

### Ethics

To ensure privacy, dignity, and integrity of the participants, names of the HCWs were kept confidential. We collected data without any names. Every injured HCW was informed of the details of the study before their information were used for the analyses. No one refused to share. Institutional Ethical Committee clearance for accessing HCWs records was taken.

### Results

The rates of needle-stick injuries in studied Saudi hospitals and US hospitals are shown in Table 1. The rate of needle-stick injuries per 100 occupied hospital beds in Saudi MOH hospitals was significantly ( $p < 0.001$ ) lower than that in US hospitals (Table 2). The rate of PIs among Saudi hospital nurses (59.4%) was significantly ( $p = 0.004$ ) higher than that reported from US hospitals. Saudi hospital surgery attendants had a significantly ( $p = 0.01$ ) lower rate of PIs (1.3%) than their US counterparts (7.6%). The rate of PIs reported from Saudi hospital operating/recovery rooms

### TAKE-HOME MESSAGE

- Exposure to blood and body fluids occurs across a variety of occupations.
- The pathogens of primary concern are the human immunodeficiency virus, hepatitis B virus, and hepatitis C virus.
- The rate of percutaneous injuries in Saudi Arabia was significantly lower than the rates in both teaching and non-teaching hospitals in the USA.
- Nurses were the most affected job category.
- Disposable syringes were the most common cause of PIs.

**Table 2:** Comparison of the characteristics of percutaneous injuries reported in Saudi MOH hospitals in 2012 and US hospitals in 2011

Characteristics	Saudi MOH hospitals n (%)	US hospitals n (%)	p value
<b>Job category</b>			
Doctor	61 (15.9)	161(22.8)	0.3
Nurse	227 (59.4)	296 (41.9)	0.004
Respiratory therapist	1 (0.3)	21 (3.0)	0.3
Surgery attendant	5 (1.3)	54 (7.6)	0.01
Phlebotomist/venipuncture/IV team	1 (0.3)	25 (3.5)	0.3
Clinical laboratory worker	2 (0.5)	3 (0.4)	0.3
Housekeeper	18 (4.7)	15 (2.1)	0.2
<b>Place of the injury</b>			
Patient room/ward	133 (34.6)	234 (33.2)	0.8
Emergency department	70 (18.2)	61 (8.7)	0.03
Intensive/critical care unit	29 (7.6)	31 (4.4)	0.2
Operating room/recovery	69 (17.9)	236 (33.5)	0.01
Outpatient clinic/office	15 (3.90)	28 (4)	0.7
<b>The injured worker the original user of the sharp item</b>			
Yes	292 (74.9)	453 (66.6)	0.12
No/Unknown	98 (25.1)	227 (33.4)	
<b>The original purpose of the sharp item</b>			
Injections, intramuscular/subcutaneous	95 (25.2)	212 (30.5)	0.4
Other injections, into IV injection site or port	15 (3.9)	7 (1.0)	0.2
To draw a venous blood sample	56 (14.9)	61 (8.8)	0.2
To draw an arterial blood sample	10 (2.7)	22 (3.2)	0.6
To obtain a body fluid or tissue sample	5 (1.3)	14 (2.0)	0.5
Finger stick/heel stick	12 (3.2)	10 (1.4)	0.3
Suturing	66 (17.5)	130 (18.7)	0.3
Cutting	15 (3.9)	60 (8.6)	0.2
To place an arterial/central line	3 (0.8)	12 (1.7)	0.6

*Continued*

**Table 2:** Comparison of the characteristics of percutaneous injuries reported in Saudi MOH hospitals in 2012 and US hospitals in 2011

Characteristics	Saudi MOH hospitals n (%)	US hospitals n (%)	p value
Type of activity associated with the injury			
Before use of an item	8 (2.2)	18 (2.6)	0.6
During use of an item	133 (36.5)	283 (40.7)	0.6
Between steps of a multi-step procedure	26 (7.2)	82 (11.8)	0.2
While recapping a used needle	31 (5.6)	19 (2.7)	0.3
Others, after use, before disposal	50 (13.9)	108 (15.5)	0.7
While putting the item into the disposal container	18 (4.9)	22 (3.2)	0.5
Restraining patient	4 (1.10)	3 (0.4)	0.3
Device left on the floor, table, bed, or other inappropriate places	18 (4.9)	36 (5.2)	0.7
Type of device associated with the injury			
Syringe, disposable	118 (47.2)	250 (37.4)	0.2
IV catheter	14 (5.6)	26 (3.9)	0.5
Suture needle	33 (13.2)	124 (18.6)	0.2
Scalpel, reusable	1 (0.4)	27 (4.0)	0.1
Scalpel, disposable	4 (1.6)	20 (3.0)	0.3
Injured item with a safety device feature			
Yes	31 (13.2)	287 (44.3)	0.04
No	204 (86.8)	361 (55.7)	
Glove use during incidents			
Single pair of gloves	255 (68.0)	465 (68.9)	0.8
Double pair of gloves	39 (10.4)	124 (18.4)	0.1
No gloves	81 (21.6)	86 (12.7)	0.06

(17.9%) was also significantly ( $p=0.01$ ) lower than that reported from the US hospitals (33.5%). Emergency room of Saudi hospitals had a significantly ( $p=0.03$ )

higher rate of PIs (18.2%) compared to US hospital emergency departments (8.7%). The rate of PIs in Saudi HCWs while using no safety device (86.8%) was significantly

( $p=0.04$ ) higher than that reported in US hospital workers (55.7%).

## Discussion

This study included 52 MOH hospitals in Saudi Arabia and 32 US hospitals that were using EPINet™ ver 1.5. The number of reported PIs during 2012 in Saudi Arabia was 397 that translated to a rate per 100 occupied beds of 3.2 at the studied MOH hospitals. This rate was significantly ( $p<0.001$ ) lower than the rates in both teaching and non-teaching hospitals in the US (20.7% and 16.5%, respectively). This may be due to under-reporting of such incidents in MOH hospitals in KSA, which represent a serious threat to development of an accurate estimate of incidence rates. There are several possible reasons for under-reporting of PIs in KSA including perception of low risk of infection, lack of time, and fear of consequences.<sup>15-19</sup> Therefore, great efforts should be made in Saudi Arabia to enhance the health education among HCWs.<sup>20</sup>

In our study, nurses were the most affected job category by PIs, which coincides with many other studies (Table 2).<sup>7,8,21</sup> Nurses are working most of the time in close contact with patients performing different procedures (IV access procedures, blood sampling, different types of injections, *etc*) and are thus more vulnerable. Furthermore, it seems that nurses have more compliance with reporting instructions as supported by other studies.<sup>22,23</sup>

Physicians were the second group of HCWs affected by PIs; they do fewer procedures exposing them to PIs and may also. It may also be attributed to their under-reporting behavior, a finding that coincides with that of the US EPINet™ hospitals and other reports.<sup>23,24</sup> The higher rate of PIs among housekeepers in Saudi MOH hospitals compared to the US hospitals explained by the very rapid turnover of

these workers, as they are of different nationalities with low level of education due to the language barrier.

Most PIs happened in patients' wards in Saudi MOH hospitals (34.6%). This is similar to another study<sup>11</sup> that reported that the patient room where the place of the largest proportion of overall NSSIs followed by the operating room. Another study<sup>7</sup> also found that during a four-year period, wards consistently were the most common places of occurrence of NSSIs, while another report<sup>24</sup> indicated that areas of the hospital with the highest activities, such as operating room and intensive care units, had the highest number of sharp injuries. In studied US hospitals, the operating/recovery room was the most common place where PIs reported. It would be due to strict policies of safety engineering devices used in the non-operating settings. Sharp injuries pertained to each clinical specialty differed across various studies that attributed to the type of sharp devices used and the variation in clinical practices among different health care settings.<sup>1</sup>

The higher rate of PIs acquired by HCWs when they were the original users of the sharp item in our study compared to those working in a similar condition in US EPINet™ hospitals may reflect the need for more education and training of HCWs on the best practice for preventing PIs.

There was a high rate of PIs occurred during injection procedures of different types—intramuscular, subcutaneous, or injection into IV injection site or port. This finding was similar to that of studied US hospitals, which might be due to the fact that these activities are the most frequent procedures done during patient care.

Most PIs occurred during use of the item in both studied Saudi MOH hospitals and US hospitals (36.8% and 40.7%, respectively) most probably due to malpractice. This finding warrants for revision of policies regarding safety devices use.

For more information on the psychosocial factors at work and blood-borne exposure among nurses see <http://www.theijoem.com/ijoem/index.php/ijoem/article/view/361>



Similar to previous studies,<sup>1,10,25</sup> inappropriate use of disposable syringe was the most common cause of PIs in both Saudi MOH hospitals and US hospitals (47.2% and 37.4%, respectively). This would probably because disposable syringe is the most commonly used device during patient care.

Most of the reported PIs in Saudi hospitals were caused by using a device without a safety feature (87%); this was significantly ( $p=0.04$ ) different from that reported from US hospitals. This finding is in keeping with another report,<sup>1</sup> which stress the importance of the MOH efforts to provide safety devices to all Saudi MOH facilities.

In conclusion, NSSIs represent a major occupational challenge to HCWs. Important risk factors for such injuries include being a nurse, working in patient room, using a disposable syringe with a needle, and using devices without safety features. Educational program addressing such issues together with observation of sharp handling and use practices, and proper engineering control measures are important interventions to control such incidents.

**Conflicts of Interest:** None declared.

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For more information on the knowledge, attitude and practice of dentists towards prophylaxis after exposure to blood and body fluids see <http://www.theijoem.com/ijoem/index.php/ijoem/article/view/379>



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