



Injection Safety among Primary Health Care Workers in Jazan Region, Saudi Arabia

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Abstract

Background: Occupational exposure to percutaneous injuries is a substantial source of infections with blood-borne pathogens among health-care workers. Few studies evaluated injection safety practices in Saudi Arabia.

Objective: To examine the structure and process of injection safety at primary health care level in Jazan health district, to evaluate knowledge, attitudes, and practices of primary health care physicians and nurses towards injection safety, and to determine the incidence of needle stick injuries among health care workers in Jazan region, Saudi Arabia.

Methods: A cross-sectional study was conducted in Jazan primary health care centers (PHCCs), Saudi Arabia from September 2011 to March 2012. Data were collected using an observational checklist and data collection sheet. Jazan city health district was chosen at random from the 14 health sectors in Jazan region. All the 33 (10 urban, and 23 rural) PHCCs of Jazan city were included in this study to get the predetermined sample size of health care workers. 200 health care workers (HCWs) were recruited (29% physicians, and 71% nurses).

Results: Syringes in the PHCCs were disposable (100%), individually packed (92%), and available at all volumes (98%). Methods of safe disposal of needles and sharps were also operated through contracting with professional companies in 84.8% of instances. Urban PHCCs had more posts for injection safety promotion than rural centers ($p=0.02$). Continuous Medical Education (CME) programs on infection control were present in only 60% of PHCCs. At least 95% of HCWs in Jazan believed that sharp objects should be kept in a puncture-proof container, kept in a closed container, or disposed by a professional company. More than 80% of HCWs washed their hands by soap and water and cleaned them by alcohol before giving injection, and also got the three doses of hepatitis B vaccine. The rate of needle stick injury in the past year was 14%, without a significant difference between nurses and physicians ($p=0.8$).

Conclusion: Jazan PHCCs have reasonable facilities that prevent needle-stick injuries. We need to design and implement more educational programs on safety injection, and increase promotion of safety injection posters, especially in rural PHCCs.

Keywords: Injections; Safety; Syringes; Health care provider; Saudi Arabia

Introduction

Each year about 16 million injections are given in developing and transitional countries. The vast majority

(95%) are given for curative care. In some cases, as many as nine out of 10 patients presenting to a primary health care provider, receive an injection, of which over 70% are unnecessary or could be given in

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TAKE-HOME MESSAGE

- Each year about 16 million injections are given in developing and transitional countries.
- In developed countries, adoption of safe injection practices has reduced the risk of needle-stick injuries.
- We found that Jazan primary health care centers have reasonable facilities that prevent needle-stick injuries. The system of disposing of needles and sharps works in a well-controlled fashion by presence of puncture-proof containers and contracting with a professional company for disposal of sharps.
- The level of knowledge of the studied health care workers was high. The rate of needle-stick injury in the past year was low.

an oral formulation.¹

A safe injection does not harm the recipient, does not expose the provider to any avoidable risks, and does not result in waste that is dangerous for the community.² Research studies reported that 50% of unsafe injections, which is defined as the reuse of syringe or needle between patients without sterilization, are found in 14 of 19 countries representing five developing WHO world regions.³

Occupational exposure to percutaneous injuries is a substantial source of infections with blood-borne pathogens among health care workers (HCWs) and can cause substantial health consequences and psychological stress for them. Unsafe injections can result in transmission of a wide variety of pathogens, including viruses, bacteria, fungi, and parasites.⁴ They can also cause non-infectious adverse events such as abscesses and toxic reactions. The risks of unsafe injection practices have been well documented for the three primary blood-borne pathogens—human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV).¹

In 2002, the World Health Organization (WHO) reported that two of 35 million HCWs experienced percutaneous exposure to infectious diseases each year. It is further noted that 37.6% of hepatitis B, 39% of hepatitis C, and 4.4% of HIV/AIDS in HCWs around the world are due to needle-stick injuries (NSIs),⁵ which are accounted for respectively, a burden of 9, 177, and 679 disability-adjusted life years (DALY) between 2000 and 2030.⁶

In developed countries, adoption of safe injection practices has reduced the risk of NSIs.³ The situation in developing countries is still further behind the developed nations, where there is an increase in the incidence of NSIs, improper disposal of syringes and needles, and low level of awareness and immunization of HCWs for the blood-borne diseases.⁷⁻⁹

Few studies evaluated injection safety practices in Saudi Arabia,⁵ while literature search revealed that the issue has not been studied in Jazan region, southwestern Saudi Arabia. This paper intended to examine the structure and process of injection safety at primary health care level in Jazan, comparing urban and rural primary health care centers (PHCCs), evaluate knowledge, attitudes, and practices of primary health care physicians and nurses towards injection safety, and to determine the incidence of NSIs among HCWs in Jazan region.

Materials and Methods

Study Design, Participants and Setting

This cross-sectional study targeted health professionals working in PHCCs in Jazan region. Jazan is one of the 13 regions of the Kingdom of Saudi Arabia and located on the tropical Red Sea coast in southwestern Saudi Arabia. The region covers an area of 11 671 km², including some 5000 villages and towns. Attached to it are 100 islands,

For more information on needle-stick injury among health care workers in hemodialysis units in Nigeria see www.theijoem.com/ijoem/index.php/ijoem/article/view/228



including the largest island of Farasan. Jazan region runs along the Red Sea coast for almost 300 km. It is a highly populated state with a total population of 1.5 million. The study was conducted, supervised and approved by the Family and Community Medicine Department, Faculty of Medicine, Jazan University, from September 2011 to March 2012.

Sample Size and Design

A representative sample of 200 HCWs was estimated, depending on 95% confidence interval, error not more than 5%, and non-response rate of 10%. An estimate of 15% of level of NSI was utilized⁵ for the sample size calculation. One of 14 Jazan health sectors in Jazan region was chosen at random by simple random sampling to recruit our sample. Jazan city health sector, which has 33 PHCCs (10 urban and 23 rural), was the one we selected, and it was enough to get the required sample. The inclusion criteria of a PHCC to be in the study was that to be a governmental one under full supervision of the health directorate; PHCCs were excluded if they had not enough health care force, *eg*, a physician, a nurse, and a lab technician to perform the basic health care services. All the 33 governmental Jazan PHCCs are under the full supervision of the health directorate and have a complete set of staff. Probability proportional to size sampling (PPS) was used to determine the number of HCWs in the PHCCs.

Instrument and Data Collection

A data collection sheet was constructed by reviewing relevant literature and previously used standardized instruments and protocols.⁵ The instrument consisted of 40 questions, most of which were closed-ended with pre-coded responses. The questions were divided into four sections: 1) socio-demographic backgrounds, 2) safety injection profile in the PHCCs, 3) safety knowledge, attitude and practices of

HCWs, and 4) beliefs about injection safety. The sheet was pretested using 25 sheets. The process of pretesting was useful for assessing respondent's responses, wording of questions, and length of the sheet. Furthermore, an observational checklist about facilities available in the PHCC for injection safety was utilized for collecting other data. It included items about the facilities and precautions for injection safety, *eg*, availability of labeled puncture-proof yellow containers, and sterilized packed syringes, or the presence of a specific company for collecting harmful waste.

Statistical Analysis

Data were analyzed using SPSS® for Windows® ver 20 (SPSS Inc, Chicago, IL, USA). Data analyses involved descriptive statistics as well as inferential statistics. Descriptive statistics included simple tabulation, frequencies, proportion for categorical variables including cross-tabulations. Differences in proportions were compared using χ^2 test. Mann-Whitney U test was used for comparing two non-normally distributed variables. A p value <0.05 was considered statistically significant.

Ethical Clearance

The study proposal and instruments were approved by the Faculty of Medicine. Voluntary written informed consents were taken from all HCWs enrolled in the study. Before data collection, permission was also obtained from the directorate of health in Jazan region. The data was anonymized to protect participants, as no names were required.

Results

A total of 180 out of 200 subjects was included in this study (a response rate of 90%). Table 1 presents some background characteristics about the study partici-

Table 1: Demographic and professional characteristics of the HCWs studied

Category	n (%)			p value
	Physicians (n=58)	Nurses (n=122)	Total (n=180)	
Sex				
Male	41 (71)	30 (26.4)	71 (39.4)	0.001
Female	17 (29)	92 (75.4)	109 (60.6)	
Nationality				
Saudi	17 (29)	75 (61.5)	92 (51.1)	0.001
Other	41 (71)	47 (38.5)	88 (48.9)	
Post-graduate qualifications				
Yes	28 (48)	66 (54.1)	94 (52.2)	0.57
No	30 (52)	56 (45.9)	86 (47.8)	
CME* on infection control				
Yes	35 (60)	73 (59.8)	108 (60.0)	0.92
No	23 (40)	49 (40.2)	72 (40.0)	
CME on injection safety				
Yes	23 (40)	66 (54.1)	89 (49.4)	0.10
No	35 (60)	56 (45.9)	91 (50.6)	
CME on waste disposal				
Yes	21 (36)	60 (49.1)	81 (45.0)	0.14
No	37 (64)	62 (50.9)	99 (55.0)	

*CME: Continuous medical education

pants. Most of the studied physicians were male (70.7%), while most of the studied nurses were female (75.4%) ($p < 0.001$). The majority of nurses (61.5%) were Saudi, while most of the physicians (70.7%) were non-Saudi ($p < 0.001$). At least 45% of both physicians and nurses received a type of continuous medical education (Table 1). There were no significant differences between physicians and nurses in terms of

post-graduate qualifications, continuous medical education on infection control, injection safety and waste disposal.

Table 2 shows age and work experience of the study participants in Jazan PHCCs. Physicians were older than nurses ($p < 0.001$), while there was no significant differences between their years of experience, and working periods either in Saudi Arabia or in this PHCC (Table 2).

Table 3 presents injection safety profile in the PHCCs in Jazan governorate. The frequency of PHCCs where the facilities for safe injection were available and the methods of needles and sharps disposal are also presented in Table 3. There was no significant difference between urban and rural PHCCs in terms of injection safety profile, except for ads posted that promote injection safety and full sharp containers that stored in a locked area ($p < 0.05$).

Table 4 illustrates safety knowledge, attitude and practices of HCWs. There was no significant difference between physicians and nurses in terms of safety

Table 2: Age, and work experience of primary HCWs (in years)

Parameter	Median (IQR)		p value
	Physicians (n=58)	Nurses (n=122)	
Age	33.5 (28.7)	26.6 (25.3)	0.001
Time since qualifications	9.7 (18.4)	6.4 (16.2)	0.09
Working period in Saudi Arabia	6.1 (11.2)	6.3 (13.5)	0.91
Working in this PHCC	5.2 (9.3)	4.8 (8.6)	0.36

Table 3: Safety injection profile in the PHCCs in Jazan governorate

Item	n (%)			p value
	Urban (n=10)	Rural (n=23)	Total (n=33)	
All syringes are disposable and packed	9 (90)	22 (96)	31 (94)	0.87
All syringes volumes are available	10 (100)	22 (96)	32 (97)	0.66
There are Ministry of Health-labeled puncture-proof yellow containers	10 (100)	21 (91)	31 (94)	0.87
There are plastic bags in trash cans to collect syringes in addition to the puncture-proof one	5 (50)	14 (61)	19 (58)	0.62
There are other open bags to collect needles and syringes	5 (50)	6 (26)	11 (33)	0.35
There are disinfectants used with the yellow containers	6 (60)	7 (30)	13 (39)	0.23
Full sharp containers are stored in a locked area	10 (100)	14 (61)	24 (73)	0.02
There is a professional company for disposal of syringes	9 (90)	19 (83)	28 (85)	0.99
They use domestic waste for disposal of syringes	4 (40)	5 (25)	9 (27)	0.51
Loose disposable needles and syringes inside the center	1 (10)	4 (17)	5 (15)	0.99
There are ads posted that promote injection safety	7 (70)	5 (22)	12 (36)	0.02
There is a health and safety person responsible for managing needle-stick injuries	3 (30)	4 (17)	7 (21)	0.73

Table 4: Safety knowledge, attitude and practices of HCWs

Item	n (%)			p value
	Physicians (n=57)	Nurses (n=122)	Total (n=179)	
Knowledge and Attitude				
Sharp objects should be kept in a puncture-proof container	53 (93)	117 (95.9)	170 (95.0)	0.74
Sharp objects should be kept in a closed container	56 (98)	122 (100.0)	178 (99.4)	0.67
Sharp objects should be disposed of by a professional company	54 (95)	120 (98.4)	174 (97.2)	0.36
Patients prefer injection	39 (67)	65 (54.6)	104 (58.1)	0.15
Practices				
Washing hands with soap and running water before injection	44 (77)	114 (93.4)	158 (88.3)	0.004
Cleaning hands with alcohol before injection	47 (83)	106 (86.9)	153 (85.5)	0.58
Always using a new pair of gloves for every injection	43 (75)	100 (82.0)	143 (80.0)	0.41
Had at least three doses of hepatitis B vaccine	48 (83)	108 (88.5)	156 (87.2)	0.42
Had a needle-stick injury in the past year	7 (12)	18 (14.8)	25 (14.0)	0.80

Note: There is one missed case in physician due to confidentiality problem. We excluded the technician group because their main job is not the injection.

knowledge, attitude and practices, except in hand washing before injection, which was more prevalent in nurses than physicians ($p=0.004$), and getting injured during removal of needles before disposal, which was more common in physicians than nurses ($p=0.02$). The incidence of NSI among primary HCWs during the past year was 13.9% (95% CI: 8.8%–19.0%; $n=25$: 7 physicians and 18 nurses), with no significant difference between physicians and nurses ($p=0.8$). Among the 25 respondents who had experienced NSI or sharps injury, 7 (28%) were recapping needle at the time of the injuries, 6 (24%) were handling needle or sharps devices on tray, 5 (20%) were suturing, 4 (16%) were pass-

ing or transferring needle, and only 2 (8%) were injured during each of transit disposal needle or sharp devices and disassembling needle or sharp devices.

Discussion

Safety Injection Profile

This study evaluated safe injection facilities in Jazan health directorate, and indicated a well operating system of infection control. Our results showed that all syringes in the studied PHCCs were disposable and individually packed, and that all syringes' volumes were available in 97% of PHCCs. The findings suggested better

injection safety parameters than other developing countries; only 34.5% of PHCCs in India¹⁰ and 42.9% in Pakistan¹¹ had individually packed disposable syringes of all volumes. In Swaziland, they change needles on the same syringe in 31% of health care facilities, reuse syringes and needles in 8%, and recap needles after use in 31% of the facilities¹². Countries of South-East Asian, Eastern Mediterranean, and Western of Pacific WHO regions showed higher percentages of syringe reuse without sterilization—75%, 70%, and 30%, respectively.¹³ The unsafe injection practices are still common in other parts of the world—77% of health service providers in Gujarat, India, had unsafe injection practices including the use of a boiling pan for sterilization, recapping of needles, and exposure to body fluids.⁹ This clarifies the efforts conducted by the health authorities in the Kingdom of Saudi Arabia to provide the infrastructure that help in reducing the NSIs, which is a big problem in different parts of the world.

Disposal of Sharps and Needles

The study examined activities of collection and disposal of needles and sharps, and showed that 94% of PHCCs in Jazan had labelled puncture-proof yellow containers, and that 85% of the PHCCs contracted with professional companies for disposal of needles and sharp wastes. In Abha, 100% of PHCCs used labelled puncture-proof yellow containers and contracted with professional companies for disposal of needles and sharps.⁵ While in Swaziland, only three-quarters of health care facilities place used syringes and needles in safe containers,¹² other traditional methods of waste disposal are still used in Jazan PHCCs, where they use other plastic bags beside the puncture-proof ones (58.0%), use disinfectants with the yellow containers (39.4%), and get rid of syringes and other sharps at domestic waste (27.3%). This further indicates the need of some im-

provements in the infection control system at Jazan PHCCs. In Jazan, some PHCCs use disinfectants with the yellow containers, while its use still questionable in reducing the infections transmitted by NSI. Comparing the urban and rural PHCCs, results showed that in urban PHCCs, full sharp containers were stored in a locked area and had ads posted that promote injection safety than rural PHCCs ($p=0.02$), which indicates the need for more closer supervision of rural PHCCs for disposal of sharps and needless.

Knowledge, Attitude and Practices

Jazan HCWs had a high level of knowledge; at least 95% of HCWs believed that sharp objects should be kept in a puncture-proof container, kept in a closed container, or disposed by a professional company. This level of knowledge is higher than that reported in Abha, where the knowledge ranged from 84.7% to 91.8%.⁵ Our study sample also had good practices to prevent NSIs; in Jazan, 60% of HCWs received continuous medical education on infection control, which was higher than that in Rawalpindi, Pakistan, where only 21.6% of HCWs were aware of the universal precaution guidelines.¹⁴ At least 80% of HCWs in Jazan washed their hands with soap and water and cleaned them with alcohol before giving injection. Furthermore, they had received the three doses of HBV vaccine. The vaccination coverage is comparable to what was found in a Malaysian hospital,¹ but it is higher than other reports—23% of primary HCWs in Bangladesh,⁷ 16% in Egypt,¹⁵ 37% in Pakistan,¹⁶ and only 4% in Mexico City². We found that nurses washed their hands with soap and running water before giving injection more frequently than physicians (93.4% *vs* 77.2%, $p=0.004$). The percentage of using a new pair of gloves for every injection was 80.0% in Jazan, much higher than other parts of Saudi Arabia. The percentage was

For more information on use of hub cutters and the volume of sharp waste and occurrence of needle-stick injuries in Ghana see www.theijoem.com/ijoem/index.php/ijoem/article/view/303



27% in Sharourah,¹⁷ and only 11% in Mexico City².

Incidence of NSIs, and Associated Circumstances

We found an incidence rate of NSI of 14%. There was no significant difference between physicians (12.1%) and nurses (14.8%). These rates were comparable to reports from other parts of Saudi Arabia. The rate was almost 16% in Abha (14.9 % among physicians and 16.5 % among nurses).⁵ The rate of NSI was higher in other parts of the developing countries; it was 76.9% in Alexandria, Egypt,¹⁸ where nurses carried the highest risk of NSIs (62.3%) compared with other HCWs such as physicians (11.0%) and support staff (14.2%). The rate was slightly higher among HCWs in a Malaysian hospital, where it was 23.5%;¹ the incidence among both nurses and medical lab technicians was almost 28%. The rate was 11.4% among community nurses, and 34.8% in a tertiary care hospital in India.¹⁹ The lower percentage observed in Jazan might be due to good application of infection control practices. Recapping needles or sharp objects were the most common events occurred when getting the NSI (28%). This is also comparable with what was found among HCWs in a Malaysian hospital (27.2%)¹ and in Sharourah, Saudi Arabia (29%)¹⁷.

Our study was the first research to investigate the issue of injection safety in Jazan region. However, some limitations should be mentioned. First, the study was based on a cross-sectional design, thus, we can confirm associations not causality. Furthermore, the study sample might not be well representative for all Jazan PHCCs.

In conclusion, we found that Jazan PHCCs have reasonable facilities that prevent NSIs. The system of disposing of needles and sharps works in a well-controlled fashion by presence of puncture-proof containers and contracting with a profes-

sional company for disposal of sharps. The level of knowledge of the studied HCWs was high. The rate of NSI in the past year was low. PHCCs need to design and implement more educational programs on safety injection, and increase the number of safety injection posters, especially for rural PHCCs.

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References

1. Rampal G, Rampal L, Zakaria R, *et al.* Needle stick and sharps injuries and factors associated among health care workers in a Malaysian hospital. *European Journal of Social Sciences* 2010;**13**:354-62.
2. Thompson B, Moro PL, Hancy K, *et al.* Needlestick injuries among sanitation workers in Mexico City. *Rev Panam Salud Publica* 2010;**27**:467-8.
3. Simonsen L, Kane A, Lloyd J, *et al.* Unsafe injections in the developing world and transmission of bloodborne pathogens: a review. *Bull World Health Organ* 1999;**77**:789-800.
4. Salehi AS, Garner P. Occupational injury history and universal precautions awareness: a survey in Kabul hospital staff. *BMC Infect Dis* 2010;**10**:19.
5. Mahfouz AA, Abdelmoneim I, Khan MY, *et al.* Injection safety at primary health care level in southwestern Saudi Arabia. *Eastern Mediterr Health J* 2009;**15**:443-50.
6. Hauri AM, Armstrong GL, Hutin YJ. The global burden of disease attributable to contaminated

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- injections given in health care settings. *Int J STD AIDS* 2004;**15**:7-16.
7. Chowdhury AK, Roy T, Faroque AB, *et al.* A comprehensive situation assessment of injection practices in primary health care hospitals in Bangladesh. *BMC Public Health* 2011;**11**:779.
 8. Murhekar MV, Rao RC, Ghosal SR, Sehgal SC. Assessment of injection-related practices in a tribal community of Andaman and Nicobar Islands, India. *Public Health* 2005;**119**:655-8.
 9. Pandit NB, Choudhary SK. Unsafe injection practices in Gujarat, India. *Singapore Med J* 2008;**49**:936-9.
 10. Rajasekaran M, Sivagnanam G, Thirumalaikolundusubramanian P, *et al.* Injection practices in southern part of India. *Public Health* 2003;**117**:208-13.
 11. Raglow GJ, Luby SP, Nabi N. Therapeutic injections in Pakistan: from the patients' perspective. *Trop Med Int Health* 2001;**6**:69-75.
 12. Daly AD, Nxumalo MP, Biellik RJ. An assessment of safe injection practices in health facilities in Swaziland. *S Afr Med J* 2004;**94**:194-7.
 13. Hutin YJ, Hauri AM, Armstrong GL. Use of injections in healthcare settings worldwide, 2000: literature review and regional estimates. *BMJ* 2003;**327**:1075.
 14. Siddique K, Mirza S, Tauqir S, *et al.* Knowledge attitude and practices regarding needle stick injuries amongst healthcare providers. *Pakistan Journal of Surgery* 2008;**24**:243-8.
 15. Talaat M, Kandeel A, El-Shoubary W, *et al.* Occupational exposure to needlestick injuries and hepatitis B vaccination coverage among health care workers in Egypt. *Am J Infect Control* 2003;**31**:469-74.
 16. Mengal HU, Howteerakul N, Suwannapong N, Rajatanun T. Factors relating to acceptance of hepatitis B virus vaccination by nursing students in a tertiary hospital, Pakistan. *J Health Popul Nutr* 2008;**26**:46-53.
 17. Alam M. Knowledge, attitude and practices among health care workers on needle-stick injuries. *Ann Saudi Med* 2002;**22**:396-9.
 18. Hanafi MI, Mohamed AM, Kassem MS, Shawki M. Needlestick injuries among health care workers of University of Alexandria Hospitals. *East Mediterr Health J* 2011;**17**:26-35.
 19. Salelkar S, Motghare DD, Kulkarni MS, Vaz FS. Study of needle stick injuries among health care workers at a tertiary care hospital. *Indian J Public Health* 2010;**54**:18-20.

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