

Needle Stick Injuries, Sharp Injuries and other Occupational Exposures to Blood and Body Fluids among Health Care Workers in a general hospital in Sarajevo, Bosnia and Herzegovina

Abstract:

Background: Health Professional exposures of health care workers (HCW) to potentially infective blood and body fluids presents a serious health threat, including hepatitis B, hepatitis C and HIV transmission. This study was conducted to assess the risk for and reporting of needle stick injuries, sharp injuries and other occupational exposures of health care workers in a large healthcare center in Sarajevo. **Methods:** This cross-sectional survey was conducted in May 2013. The study target population included all hospital health care workers who had a high potential for exposure. The estimated sample size was 48 physicians, 132 nurses/technicians and 30 auxiliary personnel. **Result:** During their career, 124 (63.3%) HCW reported exposures to blood and body fluids. In total, needle stick injuries (66.1%) were the most common source of exposure, followed by contact with intact skin (12.1%) and cut with sharp object (11.3%). Only 43 (35.5%) reported any of these exposures to health authorities during their career. The odds of exposure to needle stick injuries and other occupational exposures to blood and bodily fluids were significantly higher among medical nurses/technicians (AOR=4.98, 95%CI=1.52-16,1) and auxiliary (AOR=4.30, 95% CI=1.07-17.34) personnel when compared to physicians. HCW in the operation room, intervention ambulance and laboratory (AOR=3.73, 95%CI=1.43-9.72) had higher odds of exposure than workers in the ambulatory departments. **Conclusions:** Needle stick Injuries, Sharp Injuries and other Occupational Exposures to Blood and Body Fluids among health care workers are underestimated hazard. Especially, for HCW who work in operation room/interventional ambulance. There is a need for preventive programs for HCW and further work on the establishment of an effective surveillance system.

Key Words: HCW; Hepatitis; Hazard

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Introduction

Professional exposures of health care workers to potentially infective blood and body fluids presents a serious health threat, including hepatitis B, hepatitis C and HIV transmission. Needle stick injuries are among the most common methods for occupational transmission [1,2]. Following a specific exposure, the risk of infection depends on many things, including the pathogen involved, the type of exposure, the amount of blood involved, and the amount of virus in the patient's blood at the time of exposure [3]. Because many of these characteristics are difficult to identify or control, the most effective method for reducing infection is to prevent the exposure.

This study was conducted to assess the risk for and reporting of needle stick injuries, sharp injuries and other occupational exposures of health care workers (HCW) in a large healthcare

center in Sarajevo, the capital and largest city in Bosnia and Herzegovina. In some countries, occupational exposures are routinely reported, but in Bosnia and Herzegovina there is no surveillance programme for occupational exposures to blood borne viruses. Although the Federation of Bosnia and Herzegovina (FB&H) has published rules for reporting injuries and exposures to bodily fluids for reducing nosocomial infections, these reporting systems have not yet been implemented [4]. Without surveillance, the incidence of healthcare exposures and infections in Bosnia and Herzegovina are unknown.

Incidence trends for blood-borne infections indicate that the country should have increasing concern over protection for HCW. In the FB&H, HIV infection morbidity rates increased from 0.30 per 100.000 population in 2008 to 0.86 per 100.000 in 2011 and to 0.73 per 100.000 in 2012. Although this rate is lower than

rates neighboring countries (in 2012: 1.7/100,000 in Croatia , 1.7/100,000 in Serbia, 2.2/100,000 in Slovenia, 2.1/100,000 in Montenegro), the rates in FB&H are increasing at a faster rate [6]. In 2012, FB&H's Hepatitis B morbidity rate was 5.05 per 100.000 and the Hepatitis C morbidity rate was 4.40 per 100.000 [5]. In 2011 28 European Union/European Economic Area Member States reported a Hepatitis B virus infection rate of 3.5 cases per 100.000 population, and 26 Member States reported Hepatitis C incidence of 7.9 cases per 100.000 [7]. The high Hepatitis B and C rate are a cause for concern, as the FB&H have infection rates close to the higher ends of the range.

This study describes the prevalence and characteristics for needle stick injuries and reporting patterns in a large hospital. This information will be helpful as policies and practices to report and prevent needle stick injuries and related exposures move forward.

Methods

Bosnia and Herzegovina consists two distinct political entities: the Federation of Bosnia and Herzegovina (FB&H) and the Republika Srpska (RS), and Brcko District. These entities have separate government functions and policies. This study was conducted in Sarajevo, the capital and the largest city in Bosnia and Herzegovina, under the jurisdiction and policies of the FB&H.

This cross-sectional survey was conducted in May 2013, in the General Hospital, "Prim. Dr. Abdulah Nakaš" in Sarajevo. According to the official annual health statistics for the Federation of Bosnia and Herzegovina, in 2011 there were 17,257 full-time employees in the healthcare industry. A total of 375 healthcare workers, excluding auxiliary personnel, work at the General Hospital in Sarajevo [8].

The study target population included all hospital health care workers who had a high potential for exposure. The clinical departments of Surgery, Internal medicine, Obstetrics and Gynecology, Neuropsychiatry, Physical Medicine and Rehabilitation, and the Ambulatory Clinics were included in the sample. The study sample size was estimated by specifying an alpha error of 0.05, an estimated prevalence of needle stick injuries of 30%, and a response rate of 90%, and estimates were made for physicians and nurses/technicians separately [9]. The estimated sample size was 48 physicians and 132 nurses/technicians. In order to examine risks for auxiliary personnel, whose employment numbers were not known, 30 additional surveys were collected.

The sample was determined by creating random clusters of 15 healthcare workers in each department, and clusters for inclusion were then randomly chosen within each department.

Data was obtained through an anonymous self-report questionnaire that was adopted from similar surveys in the Region and the World, found in Medline Database and Google and a CDC design [10]. Respondents provided information about

their occupation and job duties, demographics, their experiences with needle stick injuries, and whether or not they reported each needle stick injury. The study protocol was reviewed and approved by the Hospital Ethics Committee. The data was processed with the Statistical Package for Social Sciences version 17. Data were expressed in frequencies, mean, and standard deviation. For comparing categorical and ordinal variables, chi-square, Mann-Whitney U and Fisher exact tests were used. Characteristics of healthcare workers were compared based on whether or not they had been exposed to body fluids. The frequency and types of exposures were compared by type of healthcare provider. Multiple logistic models were used to examine associations with two outcomes: whether or not the worker reported a needle stick injury; and among workers who had, whether or not they reported the injury. Covariates for both models included age, gender, occupation, work unit, years of work experience, and perceived level of the workplace safety climate.

Results

A total of 210 health care workers (HCW) were approached, and 203 agreed to participate in the survey (responded rate 96.7%). Participants were mostly medical nurses/technicians 125 (61.6%), followed by physicians 49 (24.1%) and auxiliary personnel 29 (14.3%).

During their career 124 (63.3%) HCW reported exposures to blood and body fluids (Table 1). Age, gender, job category, length of work experience, and vaccination status for Hepatitis B were not significantly associated with reporting of exposure. A slightly higher proportion of HCW in the surgical and emergency units reported exposures when compared with those working in other departments ($p=0.055$). Most participants (70.1%) had more than 10 years of working experience. Only 12.6% had completed the hepatitis B vaccination course. Most of HCW defined the current state of safety as sufficiently adequate: excellent and satisfactory (72.6%) regardless of exposure experience.

Characteristics of the most recent exposure were collected (Table 2). In total, needle stick injuries (NSI) (66.1%) were the most common source of exposure, followed by contact with intact skin (12.1%) and cut with sharp object (11.3%). Fingers were the most frequent location of exposures (72.4%), followed by palms (15.4%). Most of the exposures occurred during the day shift (77.2%). Activities most frequently associated with exposure were surgery (26.0%), during phlebotomy (17.9%), and during storage of the needle in a container (11.4%). Exposures during surgery were the most common among physicians (73.1%), exposures during phlebotomy (25.3%) and during surgery (17.7%) were the most frequent among medical nurses/technicians. The patient's serology status for infectious agents was unknown to the HCW in 82.3% of cases, and was unknown to anyone for 42.0%.

Table 1. Characteristics of HCW and comparisons between exposed and not exposed to blood and body fluids

Characteristics	Total (n=196)*	Exposed ever (n=124)	Not exposed (n=72)	p-value
Age (years)	42,7 ± 11,8	42,3 ± 12,2	42,9 ± 11,5	0,559
Sex				0,558
Male	51 (26,0)	34 (27,4)	17 (23,6)	
Female	145 (74,0)	90 (72,6)	55 (76,4)	
Job category				0,586
Doctor of medicine – specialist	49 (25,0)	28 (22,6)	21 (29,2)	
Medical nurse/technician (UD, HS and laboratory personnel)	119 (60,7)	78 (62,9)	41 (56,9)	
Auxilliary personnel	28 (14,3)	18 (14,5)	10 (13,9)	
Work Unit				0,055 **
General Ward	135 (70,3)	78 (65,0)	57 (79,2)	
Operatingroom/ Interventional ambulance	49 (25,5)	35 (29,2)	14 (19,4)	
Laboratory	8 (4,2)	7 (5,8)	1 (1,4)	
Working experience				0,494
<5	26 (13,9)	15 (12,7)	11 (15,9)	
5-10	30 (16,0)	20 (16,9)	10 (14,5)	
>10	131 (70,1)	83 (70,3)	48 (69,6)	
Vaccinational status for Hepatitis B				0,188 ***
3 Doses HBV	24 (12,6)	19 (15,7)	5 (7,2)	
Less than 3 doses HBV	19 (10,0)	14 (11,6)	5 (7,2)	
Didn't vaccinated at all	83 (43,7)	50 (41,3)	33 (47,8)	
Don't remember	63 (33,2)	37 (30,6)	26 (37,7)	
Other	1 (0,5)	1 (0,8)	0	
Safety Climate				0,498 ****
Excellent	46 (28,8)	30 (31,3)	16 (25,0)	
Satisfactory	70 (43,8)	37 (38,5)	33 (51,6)	
Not enough	21 (13,1)	14 (14,6)	7 (10,9)	
Weak	9 (5,6)	6 (6,3)	3 (4,7)	
I don't know	14 (8,8)	9 (9,4)	5 (7,8)	

*All HCW did not answer all questions

**work in operation room/interventional ambulance and in laboratory are unified for analysis

***3 doses HBV compared to other answers

**** excellent/satisfactory compared to not enough/weak

Among the 124 HCW who experienced exposures in their career, 93 (47.4%) had more than one (Table 3). Multiple exposures were not associated with occupation. In the last year, 70 (35.7%) had at least one exposure, and among them 38 (19.4%) had more than one. Auxilliary personnel reported significantly fewer exposures over their career than physicians or nurses/technicians.

Among 121 participants (there were 3 missing responses) who reported exposures and responded to questions about reporting, only 43 (35.5%) reported any of these exposures during their career. Only 20.9% of those with exposures in the last year reported the exposure (Table 3). Auxiliary personnel were significantly more likely to report their exposure than physicians or nurses/technicians. The reasons for not reporting exposures to blood and body fluids were „Too busy“ in 26 (33.3%) cases, „I Had been stuck too many times“ in 21 (26.9%) cases, „I thought I

Table 2. Characteristics of the last exposures

Characteristics	N (%) (n=124)	Physicians (n=28)	Nurses/ Technicians (n=78)	Auxillary personnel (n=18)
Type of exposures				
Needle stick injury	82 (66,1)	19 (67,9)	49 (62,8)	14 (77,8)
Cut with sharp object	14 (11,3)	3 (10,7)	8 (10,3)	3 (16,7)
Contact with intact skin	15 (12,1)	3 (10,7)	11 (14,1)	1 (5,6)
Contact with damaged skin	2 (1,6)	0	2 (2,6)	0
Contamination of mucosis (eyes, mouth)	10 (8,1)	3 (10,7)	7 (9,0)	0
Other	1 (0,8)	0	1 (1,3)	0
Location of exposure				
Palms	19 (15,4)	4 (15,4)	10 (12,7)	5 (27,8)
Fingers	89 (72,4)	19 (73,1)	59 (74,7)	11 (61,1)
Legs	3 (2,4)	0	2 (2,5)	1 (5,6)
Eyes	6 (4,9)	2 (7,7)	4 (5,1)	0
Other	6 (4,9)	1 (3,8)	4 (5,1)	1 (5,6)
Shift				
Day	90 (77,6)	18 (72,0)	57 (76,0)	15 (93,8)
Night	26 (22,4)	7 (28,0)	18 (24,0)	1 (6,3)
Activity during exposure				
Before medical treatment	5 (4,1)	2 (7,7)	3 (3,8)	0
During phlebotomy	22 (17,9)	2 (7,7)	20 (25,3)	0
During the injection	11 (8,9)	0	11 (13,9)	0
During surgery	33 (26,8)	19 (73,1)	14 (17,7)	0
During re-capping	10 (8,1)	0	10 (12,7)	0
During the storage (in container etc.)	14 (11,4)	1 (3,8)	6 (7,6)	7 (38,9)
After storage (in container, garbage etc)	9 (7,3)	0	3 (3,8)	6 (33,3)
During cleaning	10 (8,1)	0	5 (6,3)	5 (27,8)
Other	9 (7,3)	2 (7,7)	7 (8,9)	0
Patient serology status				
Unknown	48 (40,3)	6 (23,1)	29 (36,7)	13 (92,9)
Known, but I did'n know his/her status	50 (42,0)	15 (57,7)	35 (44,3)	0
Known, he/she was not infected (negative markers)	18 (5,1)	4 (15,4)	13 (16,5)	1 (7,1)
Known, hepatitis B positive	3 (2,5)	1 (3,8)	2 (2,5)	0
Known, hepatitis C positive				
Known, HIV positive				

would not contract a disease“ in 9 (11.5%) cases, „Unaware of reporting requirement or mechanism to report“ 6 (7.7%), „My colleagues suggested that I should not be worried“ in 4 (5.1%), „Object was never used by patient“ in 4 (5.1%), and „Other“ 8 (10.3%) (reasons were mostly based on their own assessment of risk).

The odds of exposure to needle stick injuries and other occupational exposures to blood and bodily fluids were significantly higher among medical nurses / technicians (AOR=4.98, 95%CI=1.52-16,1) and auxiliary (AOR=4.30, 95% CI=1.07-17.34) personnel when compared to physicians. HCW in the operation room, intervention ambulance and laboratory

(AOR=3.73, 95%CI=1.43-9.72) had higher odds of exposure than workers in the ambulatory departments (Table 4). Age, gender, work experience, and perception of the safety climate were not associated with exposure. There were no significant correlates regarding the reporting of needle stick injuries and other occupational exposures to blood and bodily fluids (Table 5).

Table 3. Number of exposures and reported number of exposures ever and in the last year among HCW

	Total (n=196)	Physicians (n=49)	Nurses/ Technicians (n=119)	Auxiliary personnel (n=28)	p
Number of exposures in career?					
None	72 (36,7)	21 (42,9)	41 (34,5)	10 (35,7)	0,1404
Once	31 (15,8)	2 (4,1)	23 (19,3)	6 (21,4)	
More than once	93 (47,4)	26 (53,1)	55 (46,2)	12 (42,9)	
Number of exposures in the last year?					
None	126 (64,3)	26 (53,1)	76 (63,9)	24 (85,7)	0,0377
Once	32 (16,3)	12 (24,5)	20 (16,8)	0	
More than once	38 (19,4)	11 (22,4)	23 (19,3)	4 (14,3)	
	Total (121)**	Physicians (n=26)	Nurses/ Technicians (n=77)	Auxiliary personnel (n=18)	p
Number of reported exposures in career?					
Yes	43 (35,5)	4 (15,4)	28 (36,4)	11 (61,1)	0.008
Yes	78 (64,5)	22 (84,6)	49 (63,6)	7 (38,9)	
No					
	Total (67)	Physicians (n=22)	Nurses/ Technicians (n=41)	Auxiliary personnel (n=4)	p
Number of reported exposures in the last year?					
Yes	14 (20,9)	3 (13,6)	9 (22,0)	2 (50,0)	0,190*
Yes	53 (79,1)	19 (86,4)	32 (78,0)	2 (50,0)	
No					

*Fisher exact test

**Three of the 124 who reported incidents did not respond to these questions.

Discussion

Epidemiologic data on sharps injury events, including the circumstances associated with occupational transmission of bloodborne viruses, are essential for targeting and evaluating interventions at the local and national levels (11). The CDC estimates that each year 385,000 needlesticks and other sharps-related injuries are sustained by hospital-based healthcare personnel in the United States; an average of 1,000 sharps injuries per day (11). Prior to the implementation of the

Table 4. Logistic regression model predicting exposure to needle stick injuries and other occupational exposures to blood and bodily fluids

Covariates	Crude		Adjusted	
	OR	95% CI	OR	95% CI
Age				
20-29	Ref.	-----	Ref.	-----
30-39	1,17	0.45 - 3.06	1,22	0.28 - 5.35
40-49	0,62	0.25 - 1.55	0,48	0.08 - 3.10
50+	1,03	0.43 - 2.50	0,89	0.12 - 6.41
Gender				
Male	Ref.	-----	Ref.	-----
Female	0,87	0.45 - 1.69	0,43	0.15 - 1.19
Profession				
Medical doctor	Ref.	-----	Ref.	-----
Medical nurse/technician	1,46	0.74 - 2.88	4.98*	1.52 - 16.31
Auxiliary	1,13	0.45 - 2.83	4.30*	1.07 - 17.34
Activity at work place				
Work in ambulance/department	Ref.	-----	Ref.	-----
Work in OR, intervention ambulance, or lab	2.12*	1.08 - 4.17	3.73*	1.43 - 9.72
Work experience				
< 5 years	0,78	0.34 - 1.78	0,29	0.06 - 1.43
5-10 years	1,17	0.51 - 2.70	0,60	0.14 - 2.53
> 10 years	Ref.	-----	Ref.	-----
State of security/safety at workplace				
Excellent	Ref.	-----	Ref.	-----
Satisfactory	0,67	0.32 - 1.40	0,48	0.20 - 1.13
Not enough	1,24	0.43 - 3.62	0,82	0.24 - 2.79
Weak	1,16	0.26 - 5.22	1,25	0.24 - 6.50
Don't know	1,05	0.30 - 3.60	0,72	0.17 - 3.11

Needlestick Safety and Prevention Act in the United States in 2000, approximately 35% to 40% of hospital workers reported exposures (12). In this study, we found that 63.3% of healthcare workers reported exposures during their career and 35.7% reported exposures over the last year, which is similar to the pre-law prevalence in the US.

Reported prevalence of exposures ranges markedly in different studies throughout the world. In Egypt, more than two-thirds of HCWs (67.9%) had sustained at least 1 needlestick

injury in the previous 12 months (13). In three of the teaching hospitals of Tehran University of Medical Sciences in Iran, 34.9% of HCWs reported a history of one exposure, 7.7% reported two exposures and 0.9% reported three or more exposures in the last year (14). In the three emergency departments of these same hospitals, all of the specialist physicians (100%) had a history of occupational exposure. The percentages of occupational exposure in the other participants were 74.3% for residents, 61.1% for laboratory technicians, 51.9% for nurses, and 51.0% for interns (15). The incidence of NSI during one year prior to the survey among housekeeping workers in hospitals of Shiraz, Iran, was 22.8 % (16).

Table 5. Logistic regression model predicting the reporting of needle stick injuries and other occupational exposures to blood and bodily fluids

	Crude		Adjusted	
	OR	95% CI	OR	95% CI
Covariates				
Age				
20-29	Ref.	-----	Ref.	-----
30-39	0,86	0.27 - 2.75	1,92	0.14 - 27.29
40-49	0,66	0.19 - 2.27	2,38	0.12 - 49.13
50+	0,44	0.14 - 1.41	0,82	0.03 - 19.42
Gender				
Male	Ref.	-----	Ref.	-----
Female	1,72	0.69 - 4.28	1,20	0.17 - 8.48
Profession				
Medical doctor	Ref.	-----	Ref.	-----
Medical nurse/technician	3,14	0.98 - 10.05	1,19	0.11 - 13.03
Auxillary	8,64	2.08 - 35.96	7,18	0.51 - 101.17
Activity at work place				
Work in ambulance/department	Ref.	-----	Ref.	-----
Work in OR, intervention ambulance, or lab	0,22	0.08 - 0.58	0,30	0.07 - 1.41
Work experience				
< 5 years	2,07	0.70 - 6.12	3,54	0.27 - 46.24
5-10 years	0,80	0.26 - 2.47	0,85	0.10 - 7.40
> 10 years	Ref.	-----	Ref.	-----
State of security/safety at workplace				
Excellent	Ref.	-----	Ref.	-----
Satisfactory	2,37	0.83 - 6.72	4,08	1.01 - 16.43
Not enough	1,88	0.49 - 7.15	3,12	0.58 - 16.71
Weak	1,25	0.19 - 8.23	1,70	0.18 - 16.22
Don't know	1,25	0.25 - 6.25	0,38	0.03 - 4.41

Our study showed that exposure to needle stick injuries and other occupational exposures to blood and bodily fluids were significantly higher among medical nurses/technicians and auxillary personnel. A higher incidence in nurses was found in studies from Iran (15), Croatia (17), Greece (18) and Egypt. However, one study in Serbia found was no significant difference indevelopment of accidents between nurses/technicians and doctors. At least one accident was reported by 78 (66.7%) HCWs (19).

We found that needle stick injuries (66.1%) were the most common exposures, followed by contact with intact skin (12.1%) and cuts with a sharp object (11.3%). Research conducted in 2010 by experts from the Institute of Public Health of the FB&H and the Institute of Public Health of the Republic Srpska examined stigma and discrimination in relation to HIV and AIDS among health care workers in public and private health care. This study asked several questions related to accidents in the work place and disposal of medical waste. The most frequently cited risky situations were contact with the patient's blood or other body fluids through the damaged skin (35.1%), followed by needlestick injuries (30.6%), splashing into the eye or other mucous membranes (26.1%), and injury with non-needle sharp objects (24.1%) (9). In this study, exposures during surgery occurred in 26.0% of the cases, during and after the storage in 18,0%, and during phlebotomy in 17.9%. This survey indicates that there is concern over exposures, but HCW are not always aware of the riskiest situations.

The operating room is the second most common environment in which sharps injuries occur, accounting for 27% of injuries overall (CDC, unpublished data). Aggregate data from nine hospitals in the USA on injuries among operating room staff reflect the importance of suture needles, which in this study accounted for 43% of the injuries (11).

Many approaches to reducing needlestick injuries have been implemented. A CDC workbook proposed alternatives to using needles (11). The Needlestick Safety and Prevention Act implemented in the United States in 2000 required the use of safety-engineered devices and worker input into which devices to use, required review of exposure control plans annually, and required logs and reporting for exposures (12). This legislation led to a 38% decrease in exposures. A survey in Germany indicated that 34% of all needlestick injuries could have been avoided by the introduction of safety devices, 29.2% might have

been avoided, while 36.7% likely could not have been avoided (20).

One important barrier to the success of prevention programs is the low proportion of exposures that are reported. Only 35.4% of exposed healthcare workers reported these exposures over their career, and only 20.9% of those exposed in the last year reported. The most frequent reasons for not reporting were being too busy, having been stuck many times, and feeling that there was not much risk. Low levels of reporting have been found in many studies. In survey in the USA, healthcare personnel indicated that 50% or more did not report their occupational percutaneous injuries (11). A similar survey in Alexandria found that 74.7% of HCW did not report the injury to the employee health service. Physicians were less likely to report a needlestick injury than other health care professionals; for example, 87.5% of staff physicians did not report compared with 70.3% of nurses and 79.0% of support staff (13). Information on reported injuries and injury hazards is necessary for prevention planning and healthcare personnel must understand reporting procedures and be motivated to report exposures (11).

Our result indicated that only 12.6% HCW had completed the hepatitis B vaccination course. This was very low compared to survey results from Croatia (98.0%), Teheran (84.5%), Serbia (71.4%) and Pakistan (74.1%) (6,7,21.) Simultaneous efforts to increase vaccination rates among HCW and to prevent exposures are warranted.

Conclusion

In conclusion, needle stick injuries, sharp injuries and other occupational exposures to blood and body fluids among health care workers are an underestimated hazard, especially for HCW who work in the operating room and interventional ambulance. Translation of prevention programs for HCW that have been successful in other countries, including establishment of an effective surveillance system, is a promising approach for preventing exposures.

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