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Occupational exposures to blood and body fluids (BBF): Assessment of knowledge, attitude and practice among health care workers in general hospitals in Lebanon

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ABSTRACT

Healthcare workers (HCWs) who are employed in traditional health care workplaces face a serious danger that may threaten their life; it is their exposure to blood and body fluids (BBF). In Lebanon, the introduction of a hospital accreditation system has put a particular emphasis on staff safety, and on the evaluation of professional practice (EPP) programs. Methods: A cross-sectional survey was conducted amongst 277 HCWs working in 4 general hospitals in South Lebanon. Objective: 1) describe the prevalence and the risk factors for occupational exposure to BBF among HCWs; 2) evaluate knowledge, attitude, and practices of HCW concerning bloodborne pathogens and adherence to universal safety precautions. Results: The mean age of the respondents was 32.14 years (SD = 10.33), 57.4% were females. 43.3% of HCWs expressed that they use gloves all the time for every activeity of care. 67.1% were aware that needles should not be recapped after use; registered nurses and nursing students were more aware than physicians and nursing assistants (nurse) in this subject. 30% of HCWs declared having had at least one occupational exposure to BBF; 62.7% of all accidental exposure was reported to the department responsible for managing exposures. Percutaneous injuries were the most frequently reported. Vaccination coverage was 88.4% for hepatitis B, and 48.4% against influenza. The source patient was tested in 43.4% of reported BBF exposures. Accidental exposure to BBF was more frequent in older people (OR = 3.42; p = 0.03) and the more experienced. Subjects working in intensive care unit ward reported more exposure to BBF (OR = 3; p = 0.04). Participants incurring exposure to BBF resorted to different measures after the injury suggesting a lack of a uniform policy for post-exposure prophylaxis. Conclusion: Exposure to BBF represents an important and frequently preventable occupational hazard for HCWs in Lebanon that requires continuous EPP of HCWs, and a comprehensive approach for prevention and management.

Keywords: Occupational Exposure to Blood and Body Fluids; Evaluation of the Professional Practice; Knowledge, Attitude, and Practices (KAP); Controlled Language; Healthcare Workers

1. INTRODUCTION

Healthcare workers (HCWs) who are employed in traditional health care workplaces face a serious danger that may threaten their life; it is their exposure to blood and body fluids (BBF). Indeed, accidental exposure may lead to infections by bloodborne pathogens, (BBPs) particularly hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Data in the literature indicate that the average risk of seroconversion after a single percutaneous exposure to an infected blood is approximately 2% for HCV, 6% - 60% for HBV, and 0.1% - 0.3% for HIV [1]. Over 90% of these infections take place in low-income countries [2,3].

These injuries have many effects: the direct and indirect costs of the post-exposure medical treatment and the disability and absenteeism of the injured HCW [4]. However, this exposure can have a further influence on

the quality of life of the injured HCW, and can cause great worry, anxiety, and fear for himself and his family and colleagues [5], as well as feelings of stigma and low self-confidence [6].

Occupational transmission of bloodborne infections may occur through parenteral, mucous membranes, and non intact skin exposure. The greatest risk for transdermal transmission is via a skin penetration injury sustained with a sharp hollow-bore needle that recently have been removed from a blood-contaminated source [7], or through contact of the eye, nose, mouth, or skin with a patient's blood.

International health organizations [1,8-10] have published guidelines for the management of occupational blood exposure. These recommendations have become the standard of care for occupational exposure to BBF. Improvement in the diagnosis of infectious diseases transmitted by blood and body fluids, and growing concerns of the risks of work activities have led to the creation of surveillance teams in healthcare centers [11].

Very little data and limited surveillance regarding health care-related occupational exposures and the use of post-exposure prophylaxis (PEP) exist in Lebanon [12,13] and the Arabic countries [14,15]. In Lebanon, in 2001, the rates of exposure to BBF were found to be 9% for medical student, 8% for attending physicians, and 5% for nurses [13].

In Lebanon, the introduction of a hospital accreditation system by the Ministry of Public Health in collaboration with the French Higher Health Authority is aiming to create incentives for continuous quality improvement, and evaluate both the safety and the quality of healthcare provision by developing an external evaluation system [16,17]. In the original standards, emphasis was put on organizational aspects and staff qualification and skills. Written protocols were required [16]. They mostly were written in French, or English. A particular emphasis was put on patient and staff safety [16,18], and an evaluation of professional practice (EPP) programs including reporting and surveillance of health risks among patients, and healthcare workers was implemented [19,20].

The focus of this study is 1) to describe the prevalence and the risk factors for occupational exposure to BBF among HCWs in private and public hospitals in south Lebanon; 2) to evaluate knowledge, attitude, and practices of HCW concerning blood-borne pathogens (e.g. HIV, HBV and HCV) and adherence to universal safety precautions, and 3) to create baseline data for future improvement.

2. METHODS

2.1. Data Collection

From December 2011 to July 2012, a cross-sectional survey was conducted amongst HCWs working in 4 general hospitals (1 public and 3 private hospitals) in South Lebanon. The students specializing in nursing are trained in these hospitals as part of their degree in nursing.

The targeted population comprised registered nurses (RN) and nursing assistants (Nurse) currently involved in collecting blood samples and administering injections in all wards of the hospital. The physicians (interns, residents, specialists), and nursing students were also included in this study. Students in this group were required to implement policies and procedures of hospitals regarding hygiene practices during their clinical placements on a regular basis.

The survey aimed to reach all departments at each hospital and was performed for all of shift workers. The exclusion criteria were the HCWs working in laboratory and radiology departments as they form a different exposure category and hence need a separate study. Exposures involving non-visibly bloody solutions, and non-visibly BBFs (such as tears, urine, sputum, and feces) were considered to have a negligible risk of infection transmission, in addition to exposures involving clean needles.

Expecting the frequency of exposure to BBF during last year to be around 25%, [15] alpha as 5% and margin of error at 5%, the sample size worked out to be 273 [21].

The data collection process involved presenting an anonymous, self-reporting questionnaire, based on available studies, the international guidelines [1,2,8-10,22]. The questionnaire was pre-tested and used for data collection. The questionnaires were administered after obtaining HCW's consent.

Socio demographic characteristics (age, gender, occupation, department of HCW) and information regarding working experience as HCW were recorded. In addition, respondents were asked about the frequency of exposure to patients' BBF that they had in the year preceding the study.

The assessment of the knowledge, attitude, and practices (KAP) of Lebanese HCWs regarding the use of protective measures, proper waste disposal after use, immunizations (against hepatitis B virus, diphtheria-tetanus-polio (DTP), and influenza), and prompt management of exposures including the use of post-exposure prophylaxis (PEP) were done through the questionnaire. HCWs were asked about the type of exposure (needle, laceration or splash), activity during exposure, seroconversion among exposed HCWs, and serological status of source patients in cases of exposure accidents.

2.2. Statistical Analysis

Statistical analysis was performed using SPSS version 16.0. Data are presented as mean ± standard deviation (SD), and percentage when appropriate. Analysis included

the use chi-square for dichotomous variables.

A Multivariate analysis was conducted to predict factors influencing the occupational exposure to BBF. The analysis was performed by ordinal logistic regression of the dichotomized (yes/no) accidental exposure to BBF variable taking into account the age, gender, occupation, years of experience, work location, vaccination and others preventive measures. Results (expβ) are presented as Odds ratios.

All reported p-values are 2-tailed and significance was established at $p \leq 0.01$.

3. RESULTS

3.1. Participants' Characteristics

From 300 HCW selected, the participants consisted of 277 (92.3%) individuals distributed among four groups: physicians (15.5%), RN (62.8%), nurses (13.4%), and students specializing in nursing (8.3%). All participants were between 16 and 64-year-old (mean age = 32.14; SD = 10.33; median = 29 years), and 57.4% were females. The information regarding participants' work experience shows that 41.2% had been professionally active for less than 5 years. The mean duration of work experience was 8.26 years (SD = 7.64; range: 0 - 40 years). The older persons had more experience (r = 0.86). The HCWs worked in all departments of each hospital (**Table 1**).

Table 1. Study participants' characteristics.

Variables	n (%)
Gender	
Male	118 (42.6)
Female	159 (57.4)
Age in years	
15 - 19	14 (5.1)
20 - 29	128 (46.2)
30 - 39	68 (24.5)
≥40	67 (24.2)
Years of experience	
<5 years	114 (41.2)
5 - 9 years	74 (26.7)
10 - 19	52 (18.8)
≥20 years	37 (13.4)
Occupation	
Physician	43 (15.5)
Registered Nurse	174 (62.8)
Nursing assistants (Nurse)	37 (13.4)
Nursing student	23 (8.3)
Work locations	
Operating room	23 (8.3)
Intensive care unit	44 (15.9)
Obstetrics/Delivery ward	20 (7.2)
Medical-Surgical	78 (28.2)
Pediatrics	51 (18.4)
Emergency	38 (13.7)
Dialysis	23 (8.3)
Total	**277 (100)**

n: number of individual.

3.2. Knowledge, Attitude and Practice of Exposure Prevention Measures (Table 2)

- **Use of gloves**

Only 43.3% of HCWs reported that they use gloves all the time for every activity of care. The attitude of HCWs concerning the use of gloves during procedures changed according to the activity. The percentage of adherence was 82.8% for intravenous (IV) insertions, 65.4% for phlebotomies, and dropped respectively to 60% and 46.6% during intramuscular (IM) and subcutaneous (SC) injections.

- **Recapping of used needles, and use of sharp containers**

Concerning recapping of needles, 67.1% were aware that needles should not be recapped after use and among them 13.4% practiced this method all the time with a statistically significant difference according to the job category of HCW. The RNs and students were more aware than the physicians and nurses (74.7%, and 65.2% vs. 51%; $p < 0.001$). 67% of HCWs declared that needles should not be removed with hands before disposal. 63.9% knew that the ideal method of disposal of sharp waste (e.g. needles, scalpels) was to put it in a container located as close as feasible to the area of care, immediately after use, and put this activity into their regular practice.

- **Vaccination against hepatitis B, diphtheria-tetanus-polio (DTP), and influenza**

Vaccination coverage for obligatory vaccinations was 88.4% for hepatitis B, and 57.8% against diphtheria-tetanus-polio (DTP). HCWs were vaccinated against DTP during childhood, without receiving the booster dose. For recommended vaccinations like influenza, the coverage was 48.4%, 9% declared that vaccination against influenza was not needed. Vaccination coverage is different between HCW categories: 34.8% of nursing students declared that they were not vaccinated against hepatitis B, and 52.2% not vaccinated against DTP ($p \leq 0.0001$).

3.3. Accidental Exposure to BBF

Among 277 HCWs, 83 (30%) declared at least one occupational exposure to BBF.

The mean age of exposed HCW was 32.2 years (SD = 10.4 years), 52.2% were females. 57.8% were RNs. Nearly half (49.4%) of them have one accidental exposure and 39.8% had 2 - 5 exposures (**Table 3**).

Needlestick injury was the type of incident most frequently reported by healthcare staff (75.9%). The RNs, nurses, and nursing students were more exposed to needle stick injuries than physicians (89.6%, 71.4%, and

Table 2. Frequency of use of protective measures by HCW (Chi-square test results).

Measure	Total n (%)	Physician n (%)	RN n (%)	Nurse n (%)	Nursing student n (%)	p value
Wearing gloves during all activities of care (n = 277)						
Yes	120 (43.3)	19 (44.9)	98 (56.3)	14 (40.5)	10 (43.5)	0.98
No	157 (56.7)	24 (55.8)	76 (43.7)	22 (59.5)	13 (56.5)	
Wearing gloves for IM injection (n = 270)						
Always	162 (60.0)	18 (48.6)	110 (63.2)	22 (61.1)	12 (52.2)	0.18
Sometimes	82 (30.4)	13 (35.1)	51 (29.3)	08 (22.2)	10 (43.5)	
No	26 (9.6)	06 (16.2)	13 (7.5)	06 (16.7)	01 (04.3)	
Wearing gloves for IV insertion (n = 250)						
Always	207 (82.8)	29 (90.6)	143 (84.6)	23 (65.7)	12 (85.7)	**0.02**
Sometimes	36 (14.4)	01 (3.1)	24 (14.2)	10 (28.6)	01 (7.1)	
No	07 (2.8)	02 (6.2)	02 (1.2)	02 (5.7)	01 (7.1)	
Wearing gloves for SC (n = 268)						
Always	125 (46.6)	16 (43.2)	81 (47.1)	15 (41.7)	13 (56.5)	
Sometimes	102 (38.1)	13 (35.1)	65 (37.8)	15 (41.7)	09 (39.1)	0.70
No	41 (15.3)	08 (21.6)	26 (15.1)	06 (16.7)	01 (04.3)	
Wearing gloves for phlebotomy (n = 257)						
Always	168 (65.4)	13 (50.0)	108 (62.8)	27 (75.0)	20 (87.0)	**0.02**
Sometimes	81 (31.5)	12 (46.2)	60 (34.9)	06 (16.7)	03 (13.0)	
No	08 (03.1)	01 (03.8)	04 (02.3)	03 (08.3)	0 (0.0)	
Recapping needles (n = 277)						
Always	37 (13.4)	16 (37.2)	13 (7.5)	06 (16.2)	02 (8.7)	**p ≤ 0.0001**
Sometimes	54 (19.5)	05 (11.6)	31 (17.8)	12 (32.4)	06 (26.1)	
No	186 (67.1)	22 (51.2)	130 (74.7)	19 (51.4)	15 (65.2)	
Remove needles with hand before disposal (n = 277)						
Always	35 (12.6)	12 (27.9)	16 (9.2)	06 (16.2)	01 (04.3)	**0.003**
Sometimes	56 (20.2)	11 (25.6)	31 (17.8)	11 (29.7)	03 (13.0)	
No	186 (67.1)	20 (46.5)	127 (73.0)	20 (54.1)	19 (82.6)	
Sharp containers near the area of care (n = 277)						
Always	177 (63.9)	24 (55.8)	119 (68.4)	20 (54.1)	14 (60.9)	**p ≤ 0.0001**
Sometimes	76 (27.4)	07 (16.3)	48 (27.6)	13 (35.1)	08 (34.8)	
No	24 (08.7)	12 (27.9)	07 (04.0)	04 (10.8)	01 (4.3)	
Hepatitis B vaccination (n = 277)						
Yes	245 (88.4)	38 (88.4)	160 (92.0)	35 (94.6)	12 (52.2)	**p ≤ 0.0001**
No	26 (09.4)	04 (09.3)	12 (6.9)	02 (05.4)	08 (34.8)	
Not needed	06 (02.2)	01 (02.3)	02 (1.1)	0 (0.0)	03 (13.0)	
DTP vaccination (n = 277)						
Yes	160 (57.8)	32 (74.4)	103 (59.2)	19 (51.4)	06 (26.1)	**0.003**
No	97 (35.0)	08 (18.6)	61 (35.1)	16 (43.2)	12 (52.2)	
Not needed	20 (07.2)	03 (07.0)	10 (5.7)	2 (05.4)	05 (21.7)	
Influenza vaccination (n = 277)						
Yes	134 (48.4)	33 (76.7)	76 (43.7)	21 (56.8)	04 (17.4)	**p ≤ 0.0001**
No	118 (42.6)	07 (16.3)	85 (48.9)	13 (35.1)	13 (56.5)	
Not needed	25 (09.0)	03 (07.0)	13 (07.5)	3 (08.1)	06 (26.1)	

n: number of individuals; HCWs: Health care workers; RN: registered nurse; Nurse: Nursing assistant; IV: intravenous, IM: intramuscular; SC: subcutaneous; DTP: Diphtheria-tetanus-polio.

66.7% respectively vs 33.6%; $p < 0.001$). In contrast the physicians were more exposed to the cut injuries (50%) (**Figure 1**).

Percutaneous injuries occurring during sharps use accounted for 85.3% of all needle injuries. Intravenous injections (administration of medication, phlebotomy and drawing blood for "hemoglucotest"), and intramuscular or subcutaneous injections were the activities showing the highest frequency (42.0%), and (33.7%) respectively (**Table 3**).

About two thirds (62.7%) of all accidental exposure to BBF was reported to the department responsible for managing exposures (e.g., occupational health, infection control, emergency rooms). This proportion did not vary

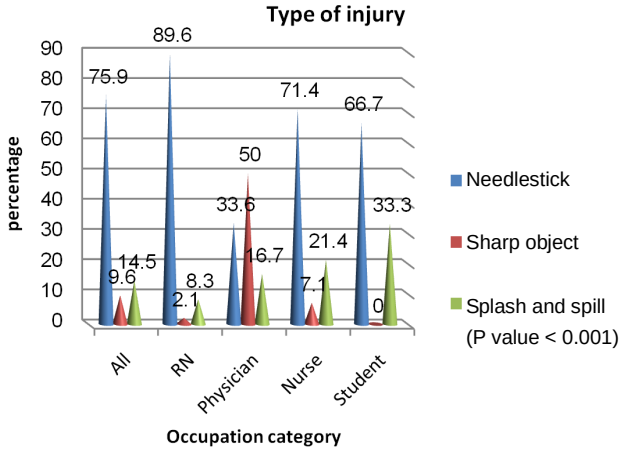
Table 3. Details of accidental exposure to blood and body fluids (BBF) amongst Health care workers (HCWs).

Parameters	n (%)
Exposure during last year	
Yes	83 (30.0%)
No	194 (70.0%)
# of exposure during last year	
Once	41 (49.4)
2 - 5 times	33 (39.8)
5 - 10 times	4 (04.8%)
>10 times	5 (06.0)
Gender	
Male	38 (45.8%)
Female	45 (52.2%)
Occupation	
Physician	12 (14.5%)
Registered Nurse	48 (57.8%)
Nurse	14 (16.9%)
Nursing student	09 (10.8%)
Type of injury	
Needle stick	63 (75.9%)
Sharp object	08 (09.6%)[1]
Splash and spill	12 (14.5%)
Work locations	
Operating room	06 (7.2%)
Intensive care	20 (24.1%)
Obstetrics/Delivery suite	04 (04.8%)
Medical-Surgical	24 (28.9%)
Pediatrics	11 (13.3%)
Emergency	12 (14.5%)
Dialysis	06 (7.2%)
Procedure under which exposure occurred	
IM/SC injection	28 (33.7%)
IV injection/phlebotomy/"hemoglucotest"	34 (42.0%)
Cutting/Suturing	08 (9.6%)
Recapping used needles	03 (3.6%)
Venous blood withdrawal	07 (8.4%)
Body fluids[1]	03 (3.6%)
Hepatitis B vaccination	
No	11 (13.3%)
Yes	70 (84.3%)
Not needed	02 (2.4%)
Total	**83 (100)**

n: number of individual; SD: Standard deviation; Nurse: Nursing assistant; IM: intramuscular; SC: subcutaneous; IV: intravenous, [1]2 (2.4%) cases were associated with blood.

by occupation: RN (56.2%), Nurses (78.6%), and physician and nursing students (66.7%) (p value = 0.47). 37.3% of HCWs reported that in case of injury or splash of BBF, they washed thoroughly with soap and water, and disinfected with pyrovinyliodine, and bled by squeezing in case of injury. 19.3% reported that they adopted the procedures implemented in their hospitals' without specification of the content.

The source patient was tested in 43.4% of reported BBF exposures. Only 1.2% of all exposures involved a source patient testing positive for one blood borne viruses. No one reported seroconversion among exposed HCWs (**Table 4**).



RN: Registered Nurse; Nurse: Nursing assistants, Student: Nursing student; (Chi-square = 32.4; p < 0.0001).

Figure 1. Type of injury according to occupation.

3.4. Factors Influencing the Accidental Exposure to BBF

Logistic regression analysis showed that the accidental exposure to BBF was more frequent in older HCWs (OR = 3.42; p = 0.03), and the more experienced. Subjects working in intensive care unit ward reported more exposure to BBF (OR = 3; p = 0.04). Indeed, avoiding to recap used needles (OR = −2.36; p = 0.04), and avoiding to remove needles with hand before disposal (OR = −2.61; p = 0.02), and sharp containers located as close as feasible to the area in which the items are used (OR = −2.12; p = 0.04) were significant preventive predictors of the accidental exposure to BBF (**Table 5**).

4. DISCUSSION AND CONCLUSIONS

This current study shows that exposure of HCWs to BBPs remains a problem in Lebanon.

The proportion of HCW who declared accidental exposure to BBF in our study was 30% and only two thirds of them reported their exposure to the department responsible for managing exposures. Almost similar results were reported in other studies [3,15,23,24]. We found that nursing personnel are the most commonly affected group. This is in agreement with other studies [11,23,25], but it differs from that reported by other authors who found the highest frequency of injury among physicians (55.1%), compared to nurses (22.0%) [13,24]. Several reasons may explain nurses' higher rates of exposure. Indeed, nursing personnel are expected to do the routine blood draws, and IV insertion procedures [11]. In our study, the most exposed to BBF were the older and more experienced HCWs. This in contrast with data reported by others [15,26] where among injured persons, more than of 50% were young staff, and in the group with experience of less than 5 years. Increasing years of experi-

Table 4. Management of occupational exposures to BBF by HCWs (Chi-square test results).

Parameters	All	Physician	Registered Nurse	Nurse	Nursing students	P value
Report to the higher authorities						
Yes	52 (62.7%)	08 (66.7%)	27 (56.2%)	11 (78.6%)	06 (66.7%)	0.47
No	31 (37.3%)	04 (33.3%)	21 (43.8%)	03 (21.4)	03 (33.3%)	
Practice adopted						
Wash injury site with water and soap/disinfected with pyrovinyl-iodine, and bled by squeezing in case of injury.	31 (37.3%)	04 (33.3%)	17 (35.4%)	03 (21.4%)	07 (77.8%)	**0.02**
Report, and do some tests	35 (42.2%)	06 (50.0%)	22 (45.8%)	05 (35.7%)	02 (22.2%)	
Report, redo some tests after 3 months[1]	01 (1.2%)	01 (8.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
As policy and procedure	16 (19.3%)	01 (8.3%)	9 (18.8%)	06 (42.9%)	0 (0.0%)	

Notes and abbreviations: BBF: blood and body fluids; HCWs: Health care workers; Nurse: Nursing assistant; [1]The source patient testing positive for one blood borne viruses.

Table 5. Relationship between sociodemographic characteristics, protective measures, and exposure to BBF using multivariate analysis (logistic regression: Logit) (n = 277).

Parameters	β	95% Confidence Interval (Lower Bound-Upper Bound)	p value	Exp (β)
Age in years				
<20 y	0.68	−1.31 - 2.68		1.97
20 - 29	0.94	−0.12 - 2.00	0.50	2.56
30 - 39	1.23	0.13 - 2.33	0.08	**3.42**
≥ 40 y	1		**0.03**	1
Gender (Female vs male)	0.11	−0.052 - 0.74	0.726	2.07
Occupation				
Nurse	−0.16	−1.44 - 1.12	0.81	−1.17
Registered Nurse	−0.50	−1.73 - 0.74	0.43	−1.65
Nursing student	0.25	−1.57 - 2.07	0.79	1.28
Physician	1			1
Work locations				
Medical-surgical ward	−0.03	−0.97 - 0.92	0.96	−1.03
Emergency room	0.62	−0.51 - 1.74	0.283	1.86
Intensive care	1.10	0.06 - 2.14	**0.04**	**3.00**
Dialysis/Operating room/Obstetrics/Delivery ward	−0.004	−0.99 - 0.98	0.99	−1.00
Pediatrics	1			
Wearing gloves (yes vs no)[1]	−0.40	−1.01 - 0.22	0.203	1.49
Recapping used needles				
No	−0.86	−1.66 - −0.05	**0.04**	**−2.36**
Always	−0.51	−1.53 - 0.51	0.33	**1.67**
Sometimes	1			
Sharp containers near the area of care				
No	−0.06	−1.19 - 1.08	0.92	
Always	−0.75	−1.46 - −0.03	**0.04**	−1.06
Sometimes	1			**−2.12**
Remove needles with hand before disposal				
No	−0.96	−1.77 - −0.14	**0.02**	**−2.61**
Always	0.02	−0.97 - 1.01.	0.97	**1.02**
Sometimes	1			
Vaccination against hepatitis B				
Yes	0.08	−1.89 - 2.05	0.94	1.08
No	0.236	−1.81 - 2.28	0.82	1.43
Not needed	1			

Notes and abbreviations: R-Square = 21.5%; Chi-Square of the total model = 45.482; p = 0.001; Intercept = −0.13. Values are represented as Odds ratios (OR) were derived from logistic regression model that controlled for age, gender, and occupation. [1]Wearing gloves for all activities (recoded into 2 categories yes vs no).

ence may be a negative predictor of adherence to recommended practices by healthcare personnel as reported by Siegel *et al.* [27]. HCWs working in the ICU reported the largest proportion of exposures, and could be likely from the numerous interventions and devices used in these specialized settings [25].

Percutaneous exposures were the most frequently reported. This may be explained by the large number of tasks performed involving sharp material (intramuscular or intravenous administration of medication, drawing blood test…) [11,23,25], and /or the underreporting in activities where there is no percutaneous exposure (e.g. splash of BBF) [11].

Participants demonstrated their negative attitude towards accidental exposure to BBF prevention. The behavior of recapping needles persists despite the well-documented dangers and international recommendations against this practice [1,9,22]. In addition, there are deficits in knowledge, and practice of simple protective measures such as wearing gloves, not removing needles with hand before disposal, and using disposal containers. While Aiken *et al.* [28], suggest that providing HCW with safer devices is warranted despite the higher costs of such devices and the seeming opposition of a sizable percentage of hospital managers to paying for them, Miceli *et al*. [29] found that the availability of resources and post exposure programs do not guarantee appropriate HCW behavior to adhere to protective measures, PEP and follow up in hospitals. The non-utilization of protective measures is indeed related to the "feeling that they are not needed" [13]. In this context, hospital administrators and the infection control teams should build safety consciousness and prompt staff to adopt participation in a "culture of safety", wherein everyone commits to personal responsibility for safety [13].

As reported by others [10,24,30] the nursing and medical staffs were generally well covered by hepatitis B vaccination. However, the rate of vaccinated students against hepatitis B was low (52.2%). Concerning recommended vaccinations e.g. influenza, policy should be reinforced and the vaccination status for these vaccines should be better documented in all occupations [10,31].

Practice among HCWs about post occupational exposure to blood and body fluids is inadequate. Knowing the infectious-disease status of the source patient, as well as understanding the risks of transmission, might make HCWs more adherent to infectious-diseases prescriptions [29,32,33]. Testing for Hepatitis B surface antigen, HCV, and HIV is recommended at the time of injury. This is useful primarily as baseline evaluation [7]. The administration of the post-exposure prophylaxis is recommended for HCW who has been occupationally exposed to HBV (vaccine/immunoglobulin) and HIV (antiretroviral drugs) [9]. In the HCWs that have not been vaccinated, hepatitis B vaccination is recommended for any exposure regardless of the source person's HBV status [9]. The HCW must allow the wound to bleed freely [1].

Immediately reporting blood exposure is very important [1]. In our study, like several studies, many exposures were not reported [24,30,34].

In our study a point of concern was nil or inappropriate post-exposure management; participants incurring exposure to BBF resorted to different measures after the injury suggesting a lack of a uniform policy for post-exposure prophylaxis. The higher Authority of Health in France recommends "Reco2clics" which provides a format for recommendations for good practice in 2 clicks [35].

Our study has some limitations. It is a cross-sectional study design; it is unable to determine causal relationships [36]. In addition, self limitations in reporting were likely to occur [37]. No one reported a seroconversion (considered as taboos as others communicable disease) after exposure to BBF. While the sample size was adequate for this analysis, it is insufficient to allow for a more detailed analysis across different hospitals' departments. This study was also limited to South Lebanon because of a lack of resources [37].

Whereas the access to registry of occupational exposure to BBF in the Infection Control Office of hospitals is mostly not allowed for researchers, self-reported morbidity is a useful measure because it allows public health researchers to obtain data from a random population sample and not only from those who need medical assistance [37]. This survey is based on the analysis of multi-professional practices with reference to international recommendations. It is an essential element of the risk management since it may identify the immediate causes and latent occurrence of the adverse events occurring to HCWs, and prevent the recurrence of such events by implementing preventive measures [19].

In conclusion, achieving accreditation in hospitals in Lebanon does not guarantee that care is optimal, as reported by Ammar *et al*. [16]. The exposure to BBF represents an important and frequently preventable occupational hazard for HCWs that requires a comprehensive approach to prevention and management [25]. Knowledge about blood borne pathogens and universal precautions has been identified as a prerequisite for change in behavior and could be beneficial for protection of HCWs. We recommend more education for the HCWs to increase knowledge of good practice in this regard [2,18,38]. A hospital's occupational post exposure management program should encourage prompt reporting, evaluation, and counseling, and should provide prophylactic drugs and follow-up [29].

Finally, the continuous evaluation of the professional practice of HCWs, and the development of protocols

using a Controlled Language [35,39], without ambiguity, and written in Arabic may create an inherent culture of quality improvement, furnish evidence that policies and protocols are appropriate and are actually put into practice, and may provide a fast knowledge, and timely implementation of the management of occupational exposure to BBF.

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