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Research Article

Needlestick and Sharp Injuries and Hepatitis B Vaccination among Healthcare Workers: A Cross Sectional Study in Six District Hospitals in Yaounde (Cameroon)

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Abstract

Introduction: Accidental exposure to blood and body fluids (AEB) in the workplace account for 40 % of contamination by hepatitis B virus (HBV) and 2-3% by HIV among Healthcare Workers (HCW). Developing countries are most affected. The present study sought to determine the prevalence of percutaneous injury and hepatitis B vaccination coverage among HCW. **Methods:** A cross-sectional study was carried out from January to April 2022 in six district hospitals in Yaounde using a self-administered questionnaire. Out of the 279 HCW who were solicited, 217 returned completed questionnaires. **Results:** More than half (54%) of HCW reported an AEB in the last 12 months. The prevalence of AEB varied among hospitals with the Nkolndongo DH reporting the highest prevalence (52%). Only one-third (34%) of HCW were fully vaccinated while 53% were unvaccinated. The lowest compliance with vaccination was observed among hygiene personnel (10%). The high cost of the vaccine was the main reported reason for non-compliance (39%). **Conclusion:** There is an urgent need to set up a monitoring system for the implementation of infection control and prevention in District Hospitals. Awareness on the burden of exposure to blood and body fluids, including prevention options should be raised among healthcare workers. Managers of health facilities should set up measures to improve access to HB vaccine.

Keywords: Needlestick injury; Viral hepatitis B; Vaccination; Healthcare worker; District Hospitals; Cameroon

Introduction

Worldwide, healthcare workers experience needlestick, sharp cuts and splashes with biological fluids while providing health care [1,2]. Three million HCWs are exposed each year resulting in approximately 170 000 HIV, two million viral hepatitis B (HBV), and 0.9 million viral Hepatitis C (HCV) infections [3,4]. Percutaneous exposures caused by needles and sharps items that are contaminated with body fluids, constitute the fourth cause of medical errors [5,6].

While developed countries have set up institutional frameworks to monitor and address issues related NSI, less economically advanced countries are challenged with poor resources allocation for the prevention of healthcare associated

infections, including post exposure prophylaxis [7]. Further, developing countries face higher prevalences of AIDS, HBV infections, thus a greater risk of infection transmission [6]. Two thirds of HCW in Africa experience at least one exposure to body fluids during their career [7].

Occupational exposure to blood is associated with work environment factors including stress, workload, availability of health and security information and training; clinical service (surgical ward); professional experience; availability of Personal Protective Equipment (PPI) and supplies [8-11].

Healthcare workers related conditions such as age, gender, professional status, hepatitis B vaccination status, needle recapping practices influence the occurrence of accidental exposure to body fluids [8,12]. Besides, poor adherence to infection control and prevention measures such as handwashing and systematic use of PPI during care also drive exposure. Moreover, poor patient compliance during care, such as the jerky movement during blood sampling is associated to occupational exposure [9,10].

The risk of infection transmission from blood varies with epidemiological and contextual factors. Epidemiological factors include infection prevalence at the community level. Among contextual factors, the depth of the injury, nature of the accident (prick, cut, projection), absence of PPI (googles, gloves), healthcare worker vaccination status, nature of the fluid associated to the exposure, the serological and clinical status of the source patient [4,13].

Healthcare workers are four times at greater risk of contracting the healthcare associated infection [14]. The burden is even higher in sub-Saharan African countries that bear a high prevalence of blood borne infections [7,15].

Within the health system, district level health services provide implementing partners with governance and technical support through training, mentoring, monitoring and supervising of satellite facilities for the delivery of quality healthcare, including the prevention of care associated infections [16]. The present investigation was designed to assess the level of implementation of infection prevention guidelines and the burden of injuries related to poor compliance. Observations on care associated injuries and weaknesses in vaccination coverage provide guidance for strengthening district healthcare institutions in the safe delivery of services.

Methods

Study design

We conducted an institution based cross-sectional study in the six (6) district hospitals of Yaounde from January to April, 2022.

Setting

Yaounde, Cameroon's capital is host to a population of 3.2 million. It is the country's second largest city [17]. The Cameroonian health system is organized around health districts as operational level of implementation. A district hospital is the first level of reference in the health pyramid and is responsible for providing primary health care [18]. The Yaounde DHs (Biyem - Assi, Cite - Verte, Djoungolo, Efoulan, Mvog - Ada and Nkolndongo) cumulate nearly 400 health personnel, 330 beds and 153 543 consultations in 2020 [19].

Participant

The study participants were workers whose activities included contact with patients and potential exposure to body fluids. They were doctors, nurses, midwives, nursing assistants, laboratory technicians and cleaners.

Sample size

An exhaustive sampling method was adopted in each clinical department, including all consenting personnel.

Data collection

The study instrument was a structured self-administered questionnaire consisting of 17 items covering sections related to socio-professional characteristics, experience of exposure to body fluids and hepatitis B vaccination status.

Data processing and analysis: All filled questionnaires were cross-checked, entered and analyzed using IBM SPSS Statistics (Statistical Package for Social Sciences) 2019 Version 26.0.0.0 software. The Chi-square (X2) test or Fisher's exact test for proportions were used to compare proportions. Multivariate logistic regression was used to assess the strength of the association between variables. A p-value < 0.05 was considered statistically significant.

Results

Out of the 279 HCW contacted, 217 returned the completed questionnaire, representing a 78% response rate. Most of our study participants were female (81%). Participants aged 25-39 years were the most represented (73.7%). They were mostly nurses (32.3%) and laboratory technicians (21.2%). (Table 1).

Characteristic	Count (n)	Frequency (%)	Total (100 %)	p - value
Gender				
Female	51	29.0	176	0.849[1]
Male	13	31.7	41	
Age (year)				
18-24	3	17.6	17	
25-34	31	37.3	83	0.329[1]
35-44	20	26.0	77	
45-49	7	29.2	24	
50 and +	3	18.8	16	
Marital status				
Single	30	30.6	98	0.428[1]
Married	34	28.6	119	
Professional status				
Assistant nurse	4	22.2	18	
Student	4	33.3	12	
Nurse	30	42.9	70	0.329[1]
Doctor	10	27	37	
Hygiene technician	2	10	18	
Midwife/Birth attendant	3	21.4	14	
Laboratory/Dental Technician	11	23.9	46	
[1]Chi[2] test, [2]Fisher exact test				

Table 1: Socio-demographic characteristics of participants in the assessment of Accidental Exposure to Body fluids (AEB) in Yaounde District Hospitals (DH), April 2022 (n=217).

Experience of needlestick injury

More than half of our participants (54%) had experience at least one AEB in the last 12 months. Most exposures resulted from percutaneous stings (29.5%) and splashes (46.5%) (Table 2). The Nkolndongo DH had the highest prevalence (51.6%) while the Cite-Verte DH had the lowest (12.8%). The Nkolndongo DH (67.7%) had the highest proportions of HCW with no routine training on infection control and prevention (Table 3).

Type of exposure	Exposure ≤ 12 months			
	Count (n)	Frequency (%)	95 % CI limits	
			Lower	Upper
Percutaneous injury	64	29.5	23.5	36.0
Splash	101	46.5	39.8	53.4
	Exposure over the career			
Percutaneous injury	149	68.7	62.0	74.8
Splash		Not measured		

Table 2: Accidental exposure to body fluids among healthcare workers in Yaounde District Hospitals, April 2022 (n = 217).

Health facility	No training on IC	p-value[1]	Percutaneous injury≤12 months				p-value[1]
	n (%)		n (%)	95 % CI limits		Total	
				Lower	Upper		
Biyem - Assi	19 (52.8)		8(22.2)	10.1	51.0	39	
Cite – Verte	22 (56.4)		5 (12.8)	4.3	27.4	43	
Djoungolo	28 (65.1)	0.337	14 (32.6)	19.1	48.5	38	
Efoulan	29 (76.3)		11 (28.9)	15.4	45.9	30	**0.016**
Mvog – Ada	18 (60)		10 (33.3)	17.3	52.8	31	
Nkolndongo	21 (67.7)		16 (51.6)	33.1	69.8	36	
Total	137 (63.1)		64 (29.5)	23.5	36.0	217	
[1]Chi[2] test, IC: Infection Control							

Table 3: Experience of exposure to blood and training on infection control within Yaounde District Hospitals, April 2022.

There was no significant difference in exposure between sex (p-value=0.849). Health personnel affected by AEB were mainly nurses (42.9%), students (33.3%) and laboratory technicians/dentists (23.9%). These differences were not statistically significant (p-value=0.084) (Table 4). The surgery department recorded the most cases of exposure to blood (47.1%) (Table 5).

Characteristic	Count (n)	Frequency (%)	Total (100 %)	*p* - value
Gender				
Female	51	29.0	176	0.849(1)
Male	13	31.7	41	
Age (year)				
18 – 24	3	17.6	17	
25 - 34	31	37.3	83	0.329(2)
35 - 44	20	26.0	77	
45 - 49	7	29.2	24	
50 and +	3	18.8	16	
Marital status				
Single	30	30.6	98	0.428(1)
Married	34	28.6	119	
Professional status				
Assistant nurse	4	22.2	18	
Student	4	33.3	12	
Nurse	30	42.9	70	0.329(1)
Doctor	10	27	37	
Hygiene technician	2	10	18	
Midwife/Birth attendant	3	21.4	14	
Laboratory/Dental Technician	11	23.9	46	
(1): Chi[2] test, (2): Fisher exact test				

Table 4: Experience of exposure according to participants' sociodemographic characteristics in Yaounde District Hospitals, April 2022 (n = 217)

Unit	Count (n)	Frequency (%)	Total (100 %)	p - value
Surgery	16	47.1	34	0.084[1]
Hygiene and sanitation	2	10	20	
Laboratory service	13	25.5	51	
Obstetrics & Gynaecology	10	32.3	31	
Internal medicine	13	35.1	37	
Stomatology	3	19.7	18	
Paediatrics	7	26.9	26	
Professional experience (year)				
0 – 3	20	38.5	52	0.384[2]
4 – 6	11	30.6	36	
7 – 10	18	24.7	73	
11 and +	15	26.8	56	
[1]Fisher exact test; [2]Chi[2] test				

Table 5: Experience of exposure according to socio-professional characteristics in Yaounde District Hospitals April 2022 (n=217).

Our investigation did not identify any existing infection control committee in all visited health facilities. Moreover, no participant was aware of the necessity of this health care related organism in the functioning of the health facility.

Hepatitis B vaccination

More than half of our participants were unvaccinated (53%) while one third were fully vaccinated (34%) (Figure 1).

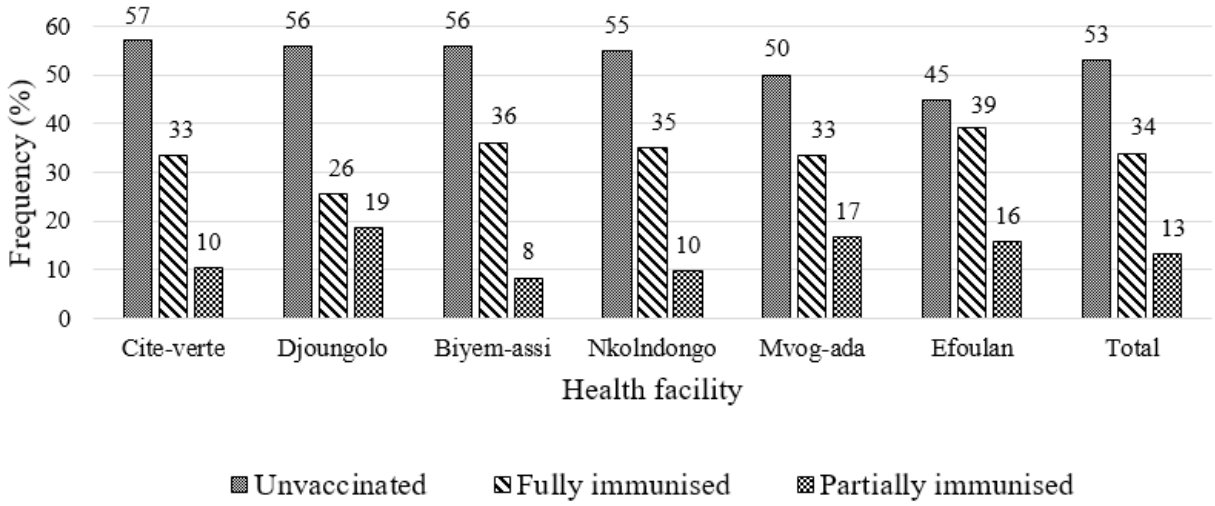

Figure 1: Compliance with hepatitis B vaccination among healthcare workers in Yaounde District Hospitals, April 2022 (n=217).

Most hygiene personnel (90%) and paramedics (66.2%) were not fully vaccinated. Nearly two-third of participants (64.8%) who had percutaneous exposure to blood were not fully immunized against HBV (Table 6).

Socio-professional category	HBV vaccination status n (%)			Total	p - value
	Unvaccinated	Partially	Fully		
Medical	15 (44.1)	3 (8.8)	16 (47.1)	34 (100)	
Paramedic	84 (51.5)	24 (14.7)	55 (33.7)	163 (100)	**0.041**[1]
Hygiene	16 (80.0)	2 (10.0)	2 (10.0)	20 (100)	
Percutaneous exposure					
Yes	80 (52.3)	8 (12.5)	21 (32.8)	153 (100)	0.943[2]
No	35 (54.7)	21 (13.7)	52 (34)	64 (100)	
[1]Fisher exact test; [2]Chi[2] test					

Table 6: Hepatitis B vaccination status, socio-professional category and percutaneous exposure among healthcare workers in Yaounde District Hospitals, April 2022 (n=217)

Single participants were less likely to be vaccinated than their counterparts (p-value=0.041) (Table 7). The high cost of vaccine was the most reported reason (39%) for non-compliance with hepatitis B vaccination (Figure 2).

Determinants	aOR	95 % CI limits		p - value
		Lower	Upper	
Male/Female	1.25	0.62	2.54	
Single/Married	1.82	1.03	3.23	**0.041**
Year of study: <12 ans/≥12 ans	1.40	0.63	3.14	
Others/Physician	2.23	1.00	4.98	0.050
Civil servant/Contract worker	1.14	0.63	2.07	
Training on infection control and prevention: No/Yes	1.05	0.59	1.87	
aOR: adjusted Odds Ratio				

Table 7: Multivariate analysis of factors associated with non-compliance to hepatitis B vaccination among healthcare workers in Yaounde District Hospitals, April (n=217).

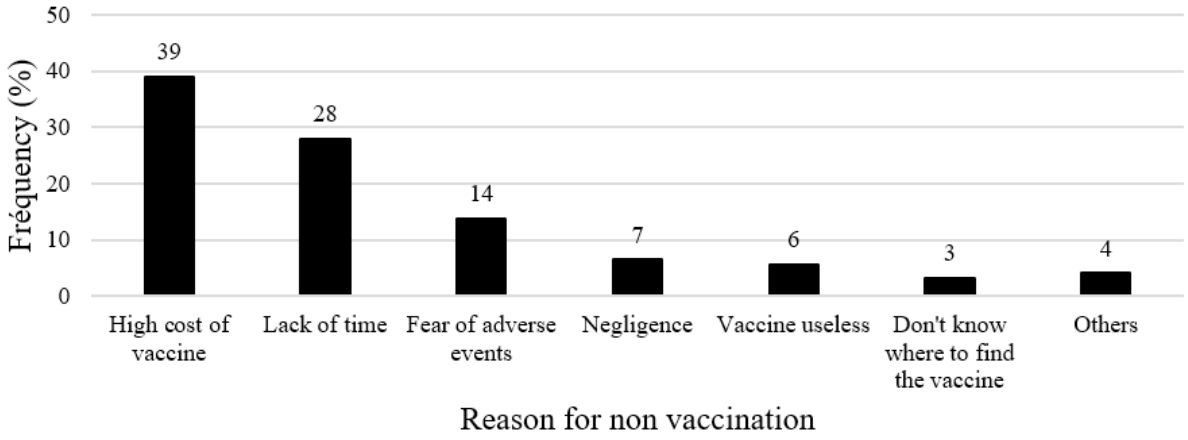

Figure 2: Reasons for non-vaccination against hepatitis B virus in Yaounde District Hospitals, April 2022 (n=115).

Discussion

The present study outlined the fact that more than half of HCW had experienced an AEB during the last 12 months. This prevalence was relatively lower than that obtained at the Yaounde University Teaching Hospital (YUTH) [20]. The fact that almost one third of our participants had experienced percutaneous exposure corroborates findings in elsewhere in Africa [22, 25-26].

The variability of the prevalence of percutaneous exposure among health facilities of the same level of care suggests may be due to different levels of implementation of infection prevention guidelines. Further, it indicates that corrective measures and resources allocation should take into account facility-specific data.

HCW aged 25-49 years were most exposed to body fluid. This age group is also the most affected by HIV and hepatitis B. There is an urgent need for health facilities to implement post exposure prophylaxis measures and scale up vaccination to protect this productive workforce [22].

Nearly half of healthcare workers who experienced AEB were those who undertake more procedures with needles or other instruments, often under emergency conditions. This result corroborates global observations [23], and country specific findings in Ethiopia [9] and Indonesia [24]. Lower levels of exposure were reported in China [25] and Kenya [26]. Inter-institutional difference in exposure was correlated with the lack of training. On this point, Nkolndongo DH which presented the highest prevalence of AEB was among health facilities with highest proportion of HCW reported no previous training on infection prevention and control.

The proportion of workers fully immunized against hepatitis B was less than 50% and varied across hospitals. Poor vaccination coverage is associated with a higher risk and burden of this preventable disease [27]. The proportion of fully vaccinated HCW reported in the present investigation was higher than that obtained at the Bamenda DH (13.9%) [28] and lower than those reported in Kenya [26] and Serbia [29].

The present study did not identify any existing infection control committee (ICC) in healthcare establishments. ICCs play a key role in infection control in hospital settings. Health care associated infection are major burdens for patients, society and health care workforce. The emergence of life-threatening infections such as severe acute respiratory syndrome and re-emerging infectious diseases have highlighted the need for efficient infection control programmes in health care settings [30]. Building the capacity of HCW so that they can safely implement infection prevention and control (IPC) measures is warranted. Components covered in IPC programme include -standard and additional precautions, identification of hazard and minimizing risks, single use device and reprocessing of instruments, management of body fluid, post-exposure prophylaxis [31,32]. When properly implemented, IPC restricts the spread of infection in hospital settings [31]. There is a need to implement such initiatives in our district healthcare settings so as to tackle the spread of infection in a context of high prevalence of needle stick and sharp injuries. To achieve that, effective leadership with necessary competencies is needed to implement and steer infection control committees within the country health facilities [33].

The proportion of fully vaccinated staff was higher among medical staff compared to other occupational groups. This corroborates findings in other settings [29,34]. The financial accessibility of the vaccine, the perception of risks could account for the poor coverage. In this regard, establishing mandatory pre-engagement vaccination against hepatitis B for health workers could be an option.

More than a third of healthcare personnel cited the high cost of the vaccine as the main reason for non-compliance to HBV vaccination. Similar results were found at the Bamenda DH [28] and elsewhere in Africa [35]. Single health workers had a greater risk of being non-compliant to vaccination against HBV compared to married workers. Gender, level of study, grade and having manuals on biosafety at work were associated with compliance to vaccination against HBV elsewhere [29,36,37].

Nearly two thirds of participants who had experienced percutaneous exposure were not fully immunized against HBV. This situation is worrying as the seroprevalence of HBV in Cameroon is high (11.2%) [39]. A sister study in the Yaounde Teaching Hospital found that one third of percutaneous exposure victims were not vaccinated against hepatitis B [20]. These exposures could lead to a significant proportion of seroconversions among HCW, a missed opportunity for an effective vaccine that could be made available, thus reducing the induced financial burden on the health system. The cost of Hepatitis B vaccination for HCW could be borne by the employing health institution.

Conclusion

Healthcare workers of Yaounde DH reported a high prevalence of needlestick and sharp injuries. Vaccination coverage among HCW was low, indicating high vulnerability to blood borne preventable infections, inclusive of HBV. There is a need to strengthen district health facilities for upscaling implementation of standard guidelines for the prevention of infections. The cost hepatitis B vaccination could be borne by health institutions. Infection prevention committees should be implemented and strengthened to monitor infection prevention policies, guidelines and procedures. Adequate policies should be implemented for health workers pre-engagement compliance with recommended vaccines, including Hepatitis B.

Declaration

Ethical Approval Statement: The protocol was approved by the Human Health Research Ethical Review Committee for the Centre Region (CRERSH - Ce); Ethical Clearance number: CE N° 2245/ CRERSHC/2021.

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Contributors

FZLC: investigation, methodology, data curation and analysis, resources, visualization, writing original draft (review and editing). IT: conceptualization, methodology, data analysis, validation, role distribution/writing (original draft); writing (review and editing), EEL: writing (review and editing). HGK: writing (review and editing), F-XM-K: writing (review and editing).

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