

Assessing the prevalence of hepatitis B virus infection among health care workers in a referral hospital in Kisantu, Congo DR: a pilot study

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Abstract: We aimed to determine hepatitis B virus (HBV) prevalence and risk factors for health care workers (HCWs) to contract HBV infection in a referral hospital in the Democratic Republic of Congo. From October 2015 to August 2016, we recruited 97 HCWs (55 males and 42 females, aged 41.2 ± 10 yr) from Kisantu St. Luke's Hospital, a Congolese referral hospital located in the province of Kongo Central. Serum samples were assayed for HBV markers using ELISA. A questionnaire was used to record the HCWs' demographics, medical histories, and risk factors. The overall prevalence of exposure to HBV infection [HBsAg+, and/or hepatitis B core antibody (anti-HBc)+] was 56.7% (55/97). HBsAg positivity was found in 18.6% (18/97) of the HCWs whereas 29.9% (29/97) were anti-HBc positive. Approximately 8.2% (8/97) of the HCWs tested positive for both HBsAg and anti-HBc. Being a physician [odds ratio (OR)=2.8 (95% CI: 1.34–12.23)], a laboratory technician [OR=3.35 (95% CI: 1.35–5.21)], and having multiple sex partners [OR=3.05 (95% CI: 1.13–9.09)] were found to be factors associated with HBV infection. Exposure to HBV is common among HCWs at Kisantu St. Luke's Hospital. Isolated HBsAg was also prevalent among them. There is a high risk that HBV could be spread to others. Therefore, there is an urgent need for HBV screening, treatment, and vaccination policies.

Key words: Congo DR; Kisantu, Health care workers, Hepatitis B virus, Prevalence

Despite advances in hepatitis B virus (HBV) prevention and treatment, it remains a high-volume medical condition worldwide¹. HBV infection occurs everywhere, nonetheless, its prevalence is especially high in two World Health Organization (WHO) regions, namely the African and the Western Pacific Regions¹. These two WHO regions accounted for 60% of the 257 million affected individu-

als in 2015¹. Hepatitis B is one of the most devastating infectious diseases endemic in the Democratic Republic of Congo (Congo DR)². Notably, little attention has been paid to hepatitis related issues³. Hepatitis virus screening is not yet implemented routinely in the country, and the lack of adequate care and treatment programs make prevention of HBV infection an important topic. Nation-wide surveys are lacking, however, available evidence indicates that the prevalence of HBV surface antigen (HBsAg) carrier ranges between 4.9%² and 5.9%⁴. This prevalence poses challenges not only to health care workers (HCWs)

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who are at risk of being infected through sharp objects and/or body fluids⁵), but also to patients because of the potential risk of transmission from HCW to patients⁶. This observation supports the necessity for HBV vaccination of individuals working in health care settings⁷. In Congo DR, the current prevalence of hepatitis B infection among HCWs is unknown. In addition, we could not find studies that have focused on HBV among HCWs in Congo DR to date. Most infected Congolese HCWs with HBV are unaware of their positive status because of limited access to affordable HBV screening tests and the low regard for viral hepatitis as compared to HIV⁸. We aimed to carry out a pilot study to determine HBV prevalence, and risk factors for HCWs to contract HBV infection in a referral hospital. This pilot study provides insights in planning future studies, so as to help enhance advocacy for HCWs' vaccination against HBV in Congo DR.

The study followed the Helsinki Declaration and was approved by the Research Ethics Committee of the School of Public Health of Kinshasa University (reference number: ESP/CE/106/2015).

From October 1st, 2015 through August 2016, we used a cross-sectional design to carry out a hospital-based study at Kisantu St. Luke's Hospital (Hopital Saint Luc de Kisantu, HSLK), Kisantu, Kongo Central, Congo DR. Located in the western part of Congo DR, HSLK is a referral hospital and Kongo University teaching hospital. In 2015, HSLK employed 134 HCWs serving approximately 140,180 people with its 300 bed-capacity.

All HCWs (n=134) working in all departments were invited to participate in this study. The principal investigator approached them through the heads of departments. We did not use any predefined sampling strategy that would provide an epidemiologically valid representation of the HCWs at HSLK. The major inclusion criteria were being a registered HCW at HSLK and being present during the survey. The participation was voluntary and participants received a detailed overview of the survey prior to obtaining informed consent. After consent was obtained, the HCWs were invited to fill out a questionnaire and return it to the principal investigator within a month. The questionnaire gathered information on socio-demographics (including sex, age, marital status and work experience in the health sector), medical history (including blood transfusion history, liver disease history, HBV vaccination, consumption of intravenous/nasal illicit drugs, scarification, tattooing, piercing, surgery and occupational exposure to needlestick injury) and sexual behaviors. In addition, we collected blood for measurement of serologic

markers of hepatitis B [HBsAg and hepatitis B core antibody (anti-HBc)]. Ten milliliters of blood was drawn from each HCW by a clinical laboratory technician from HSLK. Collected blood was centrifuged at 1,300 g for 10 min at 4°C to isolate serum. Isolated serum samples were aliquoted and stored temporarily at -70°C for 24 h. Then, samples were shipped to the virology department of Kinshasa University (Kinshasa, Congo DR) for analyses. HBsAg (Dialab-HBsAg ELISA Kit, Austria) and total anti-HBc (Dialab-HBc Ab ELISA Kit, Austria) were detected using enzyme-linked immunosorbent assay kits and results were expressed as positive or negative for HBsAg and anti-HBc.

Evidence of HBV exposure was considered as the presence of serum HBsAg and/or anti-HBc.

Test results were individually sent to the HCWs. Those who were positive for HBsAg were advised to consult research hepatologists [Masaka Blandine Lungosi (the first author), Nlombi Charles Mbendi (the third author), and Nsukini Sebastien Mbendi (the eighth author)].

The Statistical Package for the Social Sciences (SPSS) software version 21 (Chicago, IL, USA) was used for the analyses. Stata 14 software (StataCorp LP, College Station, TX, USA) was used for graphical illustration. Proportions and means were used to summarize categorical and continuous variables, respectively. Fisher's exact tests and student's *t*-test were used to compare differences between proportions and means, respectively. Logistic regression models were used for bivariate and multivariable analyses to determine odd ratios and 95% confidence intervals of the factors associated with HBV infection. The models were adjusted for age and gender.

Ninety-seven (72.4%) of 134 eligible HCWs participated in the study (Table 1). Of them, none had been vaccinated against HBV, and most of them (92.8%; 90/97) had a history of occupational exposure to blood during the last 12 months. HCWs in this study were likely to have multiple sex partners (n=67; 69.8%) and not use a condom during sexual intercourse. HBsAg alone was isolated in 18.6% (18/97) of the HCWs and the detection rate was similar across genders; it was 9.3% (9/97) in male HCWs. The positivity rate for anti-HBc was 29.9% (29/97). About 8.2% (8/97) of the HCWs tested positive for both HBsAg and anti-HBc (Fig. 1). Most of the HCWs (56.7%) had been exposed to HBV. The mean age of infected HCWs was lower compared to that in the non-infected. We also noted that most of the physicians and laboratory technicians had been exposed to HBV (Table 1).

As shown in Table 2, exposure to HBV was related to

Table 1. Participants' characteristics by hepatitis B virus (HBV) infection status

Variables	All participants (n=97)	Evidence of HBV exposure (n=55)	No evidence of contact with HBV (n=42)	p-value¶
Age (yr)	41.2 ± 10.1	39.0 ± 9.5	42.1 ± 10.2	0.004
≤40	49 (50.5)	32 (58.2)	17 (40.5)	
>40	48 (49.5)	23 (41.8)	25 (59.5)	
Sex				0.169
Male	55 (56.7)	34 (61.8)	21 (50.0)	
Female	42 (43.3)	21 (38.2)	21 (50.0)	
Marital status				0.192
Married	68 (70.1)	41 (74.5)	27 (64.3)	
Unmarried	29 (29.9)	14 (25.5)	15 (35.7)	
Work experience (yr)				0.129
<30	88 (90.7)	52 (94.5)	36 (85.7)	
≥30	9 (9.3)	3 (5.5)	6 (14.3)	
Profession				
Physician	9 (9.3)	7 (12.7)	2 (4.8)	0.016
Nurse	63 (64.9)	37 (67.3)	26 (61.9)	0.368
Laboratory technician	12 (12.4)	8 (14.5)	4 (9.5)	0.033
Other health workers*	13 (13.4)	3 (5.5)	10 (23.8)	0.010
Medical history				
Icterus	6 (6.2)	4 (7.3)	2 (4.8)	0.474
Transfusion	11 (11.3)	5 (9.1)	6 (14.3)	0.315
HBV infection	1 (1.0)	1 (1.8)	0 (0.0)	0.567
Surgery	51 (52.6)	25 (45.5)	26 (61.9)	0.080
Abortion	15 (36.6)	7 (33.3)	8 (40.0)	0.453
Scarification	18 (18.6)	6 (10.9)	12 (28.6)	0.026
Piercing	1 (2.4)	1 (4.8)	0 (0.0)	0.500
Multiple sexual partners	67 (69.8)	34 (61.8)	33 (80.5)	0.039
Use of condom				0.241
Never	68 (70.1)	36 (65.5)	32 (76.2)	
Sometimes	26 (26.8)	17 (30.9)	9 (21.4)	
Always	2 (2.1)	2 (3.6)	0 (0.0)	
Illicit drug inhalation	1 (1.0)	0 (0.0)	1 (2.4)	0.433
Alcohol consumption	71 (74.0)	39 (72.2)	32 (76.2)	0.421
Needlestick injury	90 (92.8)	50 (90.9)	40 (95.2)	0.344
Family history of icterus	11 (11.3)	7 (12.7)	4 (9.5)	0.437
Family history of hepatitis B	5 (5.2)	3 (5.5)	2 (4.8)	0.627

¶p-values are comparing participants with "evidence of HBV exposure" to those with "no evidence of contact with HBV".

*Other health workers included workers at the sterilization unit, laundry service and housekeepers.

age. In the age and sex adjusted models, being a physician [odds ratio (OR)=2.8 (95% CI: 1.34–12.23)], a laboratory technician [OR=3.35 (95% CI: 1.35–5.21)], and having multiple sexual partnerships [OR=3.05 (95% CI: 1.13–9.09)] were associated with HBV infection.

This is the first study to assess the prevalence of HBV infection among HCWs in Congo DR. It provides a snapshot of the prevalence of HBV infection at HSLK. We found a high burden of HBV infection among HCWs, with an overall prevalence of HBsAg of 27.0% (HBsAg alone detected

in 18.6%) and an exposure to HBV of 56.7% (Fig. 1). We also found associations between HBV infection and being a physician, laboratory technician and having multiple sex partners. It was striking to observe that the percentage of detected HBsAg was high but none of the HCWs had a history of HBV vaccine uptake. This absence of HBV vaccination could be due to the lack of affordable HBV vaccines and vaccination policies. It is unfortunate because this high HBV prevalence can have dire consequences for both HCWs and patients. There may be an increased

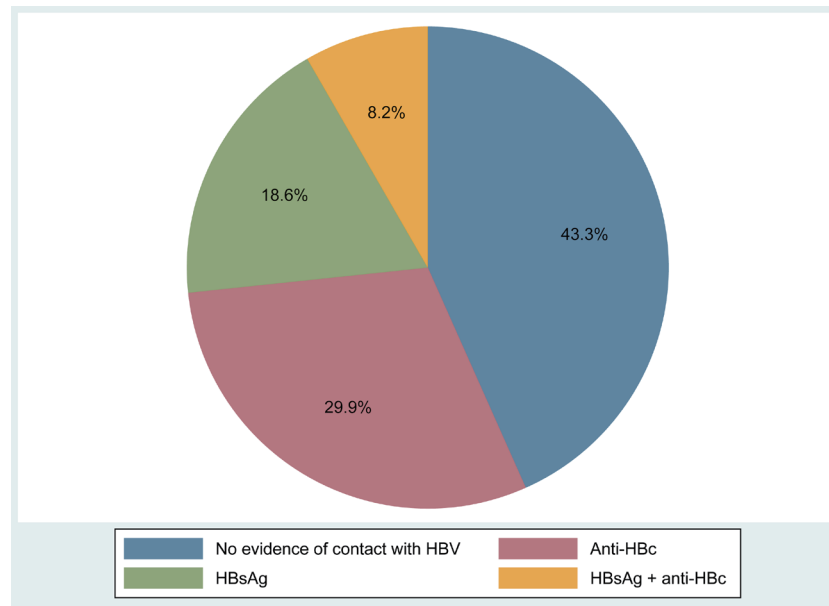


Fig. 1. Prevalence of serum hepatitis B virus (HBV) markers among healthcare workers (HCWs) at Kisantu St. Luke's Hospital (n=97). Among HCWs, evidence of HBV exposure, surface antigen of HBV (HBsAg), and hepatitis B core antibody (anti-HBc) were detected in 56.7% (55/97), 18.6% (18/97), and 29.9% (29/97), respectively. In addition, 8 (8.2%) HCWs tested positive for both HBsAg and anti-HBc.

Table 2. Factors associated with exposure to hepatitis B virus (HBV) infection (n=97)

Variables	Unadjusted		Adjusted	
	<i>p</i> -value	OR (95% CI)	<i>p</i> -value	OR (95% CI)
Sex				
Male		1		1
Female	0.731	1.17 (0.47–2.89)	0.967	0.98 (0.37–2.53) [‡]
Age (yr)				
<40		1		-
≥40	0.006	2.46 (1.90–4.63)	-	-
Profession				
Other		1		1
Nurse	0.583	1.26 (0.55–2.93)	--	--
Physician	0.020	2.92 (1.57–4.84)	0.044	2.80 (1.34–12.23)*
Laboratory technician	0.046	2.62 (1.45–5.78)	0.026	3.35 (1.35–5.21)*
Scarification				
No		1		1
Yes	0.032	0.31 (0.10–0.90)	0.013	0.40 (0.77–0.82)*
Multiple sex partners				
No		1		1
Yes	0.002	2.55 (1.82–6.67)	0.007	3.05 (1.13–9.09)*

[‡]Adjusted for age.

*Adjusted for age and sex.

OR: odds ratio; CI: confidence interval.

risk of hepatocellular carcinoma even when HBsAg is no longer detectable in the blood because HBV is susceptible to reactivation, especially in those with coinfection with HIV⁹). In addition, there is a potential risk of a patient acquiring an infection from HCWs. On the basis of these observations, we recommend a pre-vaccination screening approach of HCWs to detect those who might benefit from treatment or vaccination when it will be feasible in the country. One potential interpretation of our data indicating a high prevalence of HBV exposure in this population is that some of these HCWs could have been infected before working in the healthcare sector; i.e. during perinatal period or childhood. This is different from the USA where exposure to HBV mostly occurs in adulthood due to sexual intercourse¹⁰. Alternatively, this high exposure to HBV and especially the high prevalence of HBsAg may suggest a possible ongoing risk of occupational exposure as accidents of exposure to blood were found to be relatively common (92.8%) among HSLK's HCWs. This may not be unexpected as the Congolese healthcare system is currently facing several challenges. For example, a study conducted in Congo DR in 2009 found high rates of percutaneous injury among HCWs along with poor working conditions¹¹. In reference to profession, it was expected that exposure to HBV infection would be higher among nurses compared to physician because the latter is likely to have adequate knowledge about HBV transmission⁸. In addition, occupational percutaneous injury is more common among nurses in Congo DR as compared to physicians¹¹. However, this was not found possibly due to the relatively small sample size of this study or the existence of additional routes of infection for physicians that may not be related to their occupation such as having multiple sex partners. A third interpretation for the high burden pertains to sexual intercourse. The reasons for this argument include the high exposure to HBV in HCWs who reported having multiple sex partners and unprotected sex.

The prevalence of HBV markers found in this study is somewhat similar or slightly higher to that found in previous studies that reported a higher burden of HBV infection among HCWs in Sub-Saharan Africa. For example, one study carried out in Niger in 2009 reported a prevalence of HBsAg of 15.3% among HCWs (versus 18.6% in this study)¹², with the authors being doubtful of the priority of HBV vaccination in HCWs. Along this line, another study carried out in Senegal reported that 17.8% of HCWs tested positive for HBsAg (versus 18.6% in this study)¹³. Furthermore, a study carried out in Uganda reported that 60.1% (versus 56.7% in this study) of the HCWs had

evidence of HBV exposure, with 5.1% (versus 0% in this study) of the HCWs having a history of HBV vaccination¹⁴. Ola and colleagues found that the prevalence of HBV infection was 65.9% in Nigerian HCWs¹⁵. However, another recent study conducted in South Africa that had looked at occult HBV infections in HCWs found a relatively low prevalence of HBV markers (HBsAg=2.9% and HBV DNA=8.6%), with 70.9% of the HCWs having a history of HBV vaccination¹⁶. Although the routes of infection in these studies may be different, all these results suggest the need to protect HCWs in sub-Saharan Africa.

In this pilot study, only a few covariates were considered for the multivariable analysis. Hence, we may have missed identifying some risk factors associated with exposures to HBV at HSLK. In addition, not all markers of HBV infection could be measured because of the limited budget. Therefore, we were neither able to distinguish acute from chronic HBV infections, nor HCWs who were immune against HBV, or those who were still susceptible to HBV infection. Ideally, these limitations will be addressed in future research following resolution of logistic challenges.

Exposure to HBV is common among HCWs at Kisantu St. Luke's Hospital. There is a potential risk of spreading the virus to others. Therefore, there is an urgent need for HBV screening, treatment, and vaccination policies. This observation offers an insight to the epidemiology of HBV infection among Congolese HCWs. Our next step is to estimate the number of HCWs HBV carriers in Kongo Central, Congo DR.

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None.

Conflict of Interest

We have no conflict of interest regarding this study.

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