

# Hepatitis B Virus Knowledge and Vaccination Status among Health-care Workers in Calabar, Nigeria

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## Abstract

**Background and Objectives:** The World Health Organization estimates that 2 million health-care workers (HCWs) are at risk of occupational exposure to hepatitis B virus (HBV), with the majority (90%) of such infections arising in sub-Saharan Africa. This study aimed to determine HBV knowledge and vaccination uptake among HCWs. **Materials and Method:** This was a cross sectional analytical study conducted among 392 HCWs from two major health institutions in Calabar i.e. the University of Calabar Teaching Hospital (UCTH) and the General Hospital Calabar (GHC), Cross river State. Multi-staged sampling method comprising of two stages was used to recruit participants into the study. The study population comprised of doctors, nurses, laboratory scientists/technologist, and other categories of HCWs such as pharmacists, ward orderlies, and mortuary attendants. A semi-structured self-administered questionnaire was used to obtain data on the socio-demographic characteristics of HCWs, the knowledge of HCWs regarding HBV and vaccine. The analysis of data was done using the Statistical Package for Social Sciences version 20. **Study Design:** This was a cross-sectional, study of HCWs in Calabar. **Sampling Method:** Multi-staged sampling method was used to select participants from two major health institutions in Calabar, i.e., the University of Calabar Teaching Hospital (UCTH) and the General Hospital Calabar (GHC). Thereafter, through balloting, simple random sampling technique was used to recruit the participants. **Study Population:** Three hundred and ninety-two HCWs were recruited from UCTH and GHC under the following categories: doctors, nurses, laboratory scientists/technologist, and other categories of HCWs such as pharmacists, ward orderlies, and mortuary attendants. **Data Management:** A semi-structured self-administered questionnaire was used to obtain data on the socio-demographic characteristics of HCWs, the knowledge of HCWs regarding HBV and vaccine. The analysis of data was done using the Statistical Package for Social Sciences version 20. **Results:** Overall, 67.9% of the respondents were found to have adequate knowledge of HBV vaccination and infection. Less than half (43.4%) of HCWs admitted receiving three doses (i.e., full coverage) of the vaccine. Difficulty in accessing the vaccine (48, 23.4%) was identified as the major reason given for suboptimal vaccination. **Conclusion:** The knowledge of HBV infection and vaccination is quite modest among HCWs in Calabar. Despite this observation, the vaccination status among HCWs is unsatisfactory. The implication of the findings of our study for health policy and practice is to prevent further occupational exposure of HCWs to HBV infection through mandatory vaccination.

**Keywords:** Health-care workers, hepatitis B vaccination, hepatitis B virus

## INTRODUCTION

The World Health Organisation (WHO) estimates that a quarter of the world's population has been infected with hepatitis B virus (HBV), with 240 million of them being chronic carriers of the disease.<sup>[1]</sup> The burden of HBV infectivity is notably higher in sub-Saharan Africa, East Asia and the Amazon Basin of South America.<sup>[1,2]</sup> These marked variations when compared with data arising from North America and Europe have been attributed to differences in host socio-demographic factors as well as environmental/behavioural factors.<sup>[1,2]</sup>

Over half a million people in the world die annually from complications arising from chronic HBV infection.<sup>[1]</sup> Overall, HBV accounts for significant rates of hepatocellular cancer

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and cirrhosis especially in low- and middle-income settings.<sup>[1]</sup> In Calabar, one study revealed that HBV accounted for high cases (62.3%) of chronic liver disease.<sup>[3]</sup> This trend is similar to other regions of the country.<sup>[4-7]</sup>

HBV is a highly infectious blood-borne virus.<sup>[8]</sup> The pathogen spreads predominantly through breached skin or mucosa by infected blood, saliva, menstrual, vaginal, and seminal fluids.<sup>[1,8]</sup> It can also be transmitted accidentally through inoculation of minute amounts of contaminated blood or fluid during medical, surgical and dental procedures, or from sharp objects such as razor blades.<sup>[9]</sup>

Health-care workers are particularly vulnerable to occupational exposure to blood-borne pathogens.<sup>[10]</sup> Compared to the other blood-borne viruses, HBV is more infectious, with a 30% risk of infection following exposure by a single needle stick injury compared to 3% for hepatitis C virus and 0.3% for human immunodeficiency virus.<sup>[9]</sup> Globally, approximately 66,000 health care workers (HCWs) are infected with HBV yearly through injuries from sharps; with 261 deaths reported as a consequence.<sup>[9]</sup> Therefore, the prevention of HBV infection among HCWs is pertinent for occupational health and safety.

HBV vaccine has been widely available for more than three decades.<sup>[9]</sup> It is effective, safe, and has a protective efficiency of 90%–95%.<sup>[9]</sup> The WHO recommends that HCWs are vaccinated against HBV to stem the spread of the infection at the workplace.<sup>[1]</sup> Despite the recommendations given by the WHO, HBV vaccination coverage among HCWs remains suboptimal or low (18%–39%), especially in low- and middle-income countries compared to 67%–79% in high-income earning countries.<sup>[9,10]</sup>

A three-dose regimen of HBV vaccine is required to achieve adequate protection against HBV.<sup>[11]</sup> In addition, >100 miu/mL antibody to hepatitis B surface antigen (anti-HBs) titres are expected after successful vaccination. Anti-HBs titers below 100 miu/mL indicates a poor response (i.e., nonresponder) to the vaccine and requires a booster dose 6–8 weeks after the last dose of the primary course of vaccination.<sup>[11]</sup> Further anti-HBs titers will be required another 6–8 weeks after the booster dose to check the response.<sup>[11]</sup>

The risk of occupational exposure to HBV among HCWs in Nigeria persists especially when considering the high seroprevalence rate in the country. Studies conducted among selected HCWs in Nigeria revealed low HBV vaccination coverage ranging between 20% and 50%.<sup>[12]</sup> Bearing this in mind, complications arising from chronic HBV infection as well as the risk of an infected HCW transmitting HBV lends credence to the need of having HCWs in Calabar vaccinated against HBV. To the best of our knowledge, there is no published report regarding HBV vaccination coverage among HCWs in Calabar. This study, therefore, aims to assess hepatitis B knowledge and vaccination status among HCWs in Calabar.

## MATERIALS AND METHODS

### Location of the study

The study was conducted in two major health facilities situated in the South-South region of Nigeria namely; the University of Calabar Teaching Hospital (UCTH), a major tertiary health institution and referral centre and General Hospital Calabar (GHC) a major secondary health institution in Calabar, Cross River State (CRS).

### Study design

The study was a cross-sectional analytical study.

### Study population and eligibility criteria

Participants in this study were HCWs from selected health facilities in Calabar. The category of HCWs recruited into the study comprised of doctors, nurses, laboratory scientists/technologist, and other categories of HCWs such as pharmacists, ward orderlies, and mortuary attendants.

Students who were on postings to any of the accredited health-care facilities and nonmedical personnel were excluded from the study.

### Sample size determination

The minimum sample size was based on a previously published estimate of 65% of HCWs completing a 3 months' course of HBV vaccination and based on a population size of over 10,000 health-care workers, a standard deviation of 1.96 and a degree of accuracy set at 0.04.<sup>[13]</sup> The determined minimum sample size of 385 was therefore calculated. The participants were broadly categorized as; medical doctors, nurses, laboratory scientist/technologists, and other HCWs such as pharmacists, mortuary attendants, health assistants, etc.

### Sampling technique

Probability sampling method was used to recruit participants into this study. The number allocated to each category of HCW (medical doctors, nurses, laboratory scientist/technologists, and others; pharmacists, mortuary attendants, health assistants, etc.) was determined using proportionate allocation. The number allocated to each category of HCW was determined proportionately using the following formula:  $n/N \times 385$ , where  $n$  represented the number of HCW, i.e., category in a facility and  $N$  is the total number of HCWs in that facility, multiplied by the sample size of HCWs for the study. For each category of HCW, simple random sampling by balloting was used to recruit the number of participants per category.

### Data collection

#### Questionnaire

A semi-structured self-administered questionnaire was used to collect data from consenting HCWs. The questionnaire had three sections; Section A contained socio-demographic characteristics of HCWs, Section B sought out the knowledge of HCWs regarding hepatitis B vaccine while section C sought the knowledge of HBV infection among HCWs.

The overall knowledge about HBV infection among HCWs was assessed by asking respondents 42 questions that covered different aspects such as vaccination requirements/effectiveness, HBV infection, transmission, and prevention.

Each question was assigned a score of 1 for a correct response and 0 for an incorrect response giving an aggregate score range of 0–42 from the lowest to the highest aggregate score. The aggregate score by each respondent was then converted to percentage score (by dividing with 42 and multiplying 100). Aggregate score of 70% and above was considered adequate while an aggregate score below 70% was considered inadequate.

### Data analysis

The analysis of data was done using the Statistical Package for Social Sciences version 20 (PASW statistics 20). Manufactured by IBM, Chicago IL, USA. Simple descriptive and inferential statistics were carried out. Qualitative/categorical variables were compared using the Chi-square test. A  $P < 0.05$  was considered statistically significant. Multivariate analysis was performed using logistic regression to evaluate socio-demographic variables and other variables that were independently associated with HBV/vaccination knowledge as well as HBV vaccine status. Adjusted odd ratio and 95% confidence interval (CI) in the regression analysis were reported. An association was considered statistically significant if the 95% CI excluded the null value of 1.

### Consent

An informed consent was obtained from all participants included in this study. The ethical committee of the UCTH gave approval for the study (UCTH/HREC/33/619).

### RESULTS

A total of 392 HCWs who are employees of the UCTH and GHC were recruited into the study with ages ranging between 19 and 64 years and the mean age being  $38.66 \pm 9.50$  years [Table 1]. Most of the respondents were within the age group of 25–34 years (30.4%) followed by the age group of 35–44 years (29.1%), 45–54 years (21.4%), 55–64 years (4.8%), and 15–24 years (4.3%), respectively. More of the HCWs were females (66.6%) while 33.4% were males. The majority of them had tertiary education (91.1%), while others had secondary (5.6%) and primary education (2.0%). The majority of the respondents (64.3%) were married, followed by those that were single (31.4%). Others were widowed (2.0%) or separated (1.3%). Most of the HCWs were from the southern senatorial district in CRS (73.2%), while the rest were from central (16.3%) and northern (3.8%) senatorial districts. Only 2.3% of the HCWs (2.3%) were not from CRS. The predominant religion practiced by the respondents was Christianity (95.7%) while the rest practiced Islam (0.8%) and other (0.5%) religions.

### Hepatitis B vaccination status among health-care workers

Out of the 392 HCWs interviewed about their vaccination status, 385 (98.2%) of them responded but 7 (1.8%) did not. Among the 385 HCWs, who responded to questions about their vaccination

**Table 1: Sociodemographic and work related characteristics of interviewed health-care workers in University of Calabar Teaching Hospital and General Hospital Calabar (n=392)**

Variables	Mean±SD	Frequency (%)
Age group		
15-24	38.66±9.50	17 (4.3)
25-34		119 (30.4)
35-44		114 (29.1)
45-54		84 (21.4)
55-64		19 (4.8)
No response		39 (9.9)
Sex		
Male		131 (33.4)
Female		261 (66.6)
Level of education		
Primary		8 (2.0)
Secondary		22 (5.6)
Tertiary		357 (91.1)
No response		5 (1.3)
Category of health care workers		
Doctors		128 (32.7)
Nurses		151 (38.5)
Laboratory scientist/technologist		33 (8.4)
Others*		80 (20.4)
Marital status		
Single		123 (31.4)
Married		252 (64.3)
Separated		5 (1.3)
Widowed		8 (2.0)
No response		4 (1.0)
Place of origin		
Northern CRS		15 (3.8)
Central CRS		64 (16.3)
Southern CRS		287 (73.2)
Outside CRS		9 (2.3)
No response		17 (4.3)
Religion		
Christianity		375 (95.7)
Islam		3 (0.8)
Other religions e.g., Traditional		2 (0.5)
No response		12 (3.1)

\*Others: Pharmacists, ward orderlies, mortuary attendants, etc., CRS: Cross river state

status, 242 (62.9%) had received at least one dose of HBV vaccination while the remaining 143 (37.1%) had never been vaccinated before as shown Figure 1. In the same vein, among the 242 HCWs that were vaccinated against HBV, only 43.2% of them have been fully vaccinated (i.e., received 3 doses of vaccine) while the rest of them only received either 2 doses (24.8%) or just 1 dose (31.8%) of HBV vaccine as shown in Figure 2.

### Knowledge of hepatitis B virus infection among health-care workers

The mean aggregate knowledge score among the study participants was found to be  $30.46 \pm 6.04$  which is

**Table 2: Health-care workers knowledge of hepatitis B virus vaccination and infection (n=392)**

HBV knowledge	Frequency, n (%)
Inadequate	126 (32.1)
Adequate	266 (67.9)
Total	392 (100.0)

HBV: Hepatitis B virus

approximately equivalent to 72.5%. Given that an aggregate score of 70% and above was considered adequate while an aggregate score below 70% was considered inadequate, 67.9% of the respondents were found to have adequate knowledge about HBV vaccination and infection while 32.1% of them were found to have inadequate knowledge as shown in Table 2.

### Barriers to assessing optimal hepatitis B virus vaccination among health-care workers

As shown in Figure 3, out of a total of 205 (52.3%) HCWs that responded to questions on why they could not achieve optimal vaccination status, 38.3% reported difficulty in accessing vaccination services, 28.3% said it was due to lack of information while 22.4% claimed it was because of time constraint. Other reasons given by the rest of the respondents were high cost of getting vaccinated (7.3%), fear of vaccine safety (2.9%), and other reasons (0.5%).

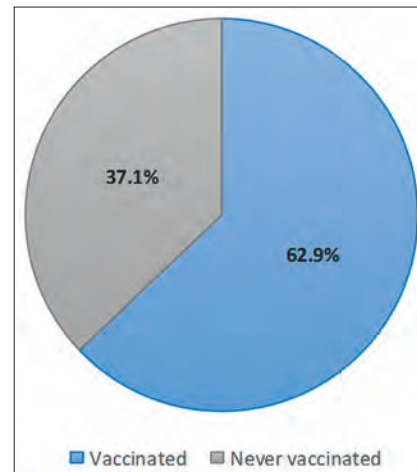
### History of occupational exposure among health care workers

Out of the 390 HCWs that responded to the question regarding occupational exposure at the workplace, 264 (67.7%) admitted to occupational exposure, whereas 126 (32.3%) had no such experience, [Figure 4]. Using Chi-square test of association as shown in Table 3, doctors had the highest rate of occupational exposure at the workplace and this association was found to be statistically significant ( $P \leq 0.005$ ).

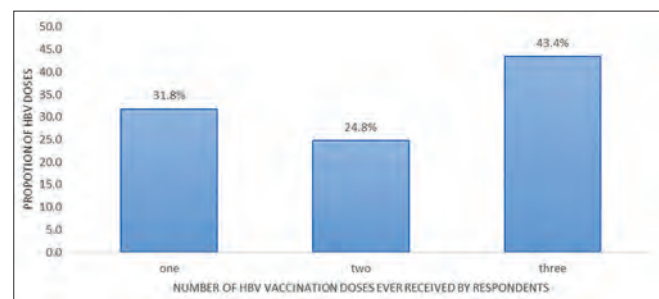
### Factors affecting optimal hepatitis B virus vaccination status among health-care workers

The relationship between optimal vaccination status and important socio-demographic factors (age group, sex, level of education, category of HCWs, place of origin, and marital status) as well as knowledge of HBV was explored using Chi-square test of association. As shown in Table 4, a significant association was found between age group ( $P = 0.028$ ), educational level ( $P = 0.003$ ), place of origin ( $P = 0.005$ ), category of health worker ( $P = 0.005$ ), knowledge of HBV, and HBV vaccination status ( $P = 0.005$ ). However, sex ( $P = 0.204$ ) and marital status ( $P = 0.270$ ) were not significantly associated with HBV vaccination status.

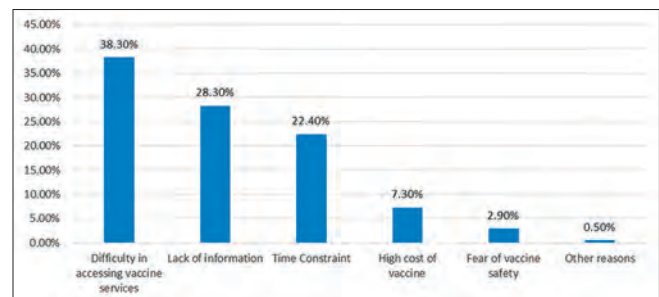
A binary logistic regression was thereafter then performed to assess the association of the significant socio-demographic factors and knowledge of HBV on optimal vaccination status. As shown in Table 5, only two of the independent



**Figure 1:** Proportion of health care workers vaccinated against HBV (n = 385)



**Figure 2:** Number of HBV vaccination doses ever received by health care workers that were vaccinated (n = 242)



**Figure 3:** Barriers to assessing optimal HBV vaccination among health care workers (n = 205)

variables (category of HCWs and knowledge of HBV) made a unique contribution to the model out of the five independent variables. It was shown that the odds of reporting optimal vaccination status among doctors were 4.7 times the odd of having optimal vaccination among other HCWs, respectively. Furthermore, it was shown that the odds of reporting optimal vaccination status among HCWs with adequate HBV knowledge was 2.2 times more compared to the odd of reporting same among HCWs with inadequate HBV knowledge.

**Table 3: History of occupational exposure among health-care workers (n=390)**

Category of health care workers	History of occupational exposure			$\chi^2$	P
	Yes=264, n (%)	No=126, n (%)	Total=390, n (%)		
Doctors	108 (40.9)	20 (15.9)	128 (32.8)	25.033	<0.005
Nurses	92 (34.8)	57 (45.2)	149 (38.2)		
Laboratory scientist/technologist	19 (7.2)	14 (11.1)	33 (8.5)		
Others*	45 (17.0)	35 (27.8)	80 (20.5)		

\*Others: Pharmacists, ward orderlies, mortuary attendants, etc.

**Table 4: Relationship between sociodemographic factors and level of hepatitis B virus knowledge and hepatitis B virus vaccination status among health care workers in Calabar**

Sociodemographic factors	Vaccination status		$\chi^2$	P
	Suboptimal (%)	Optimal (%)		
Age group			10.87	0.028*
15-24	15 (88.2)	2 (11.8)		
25-34	77 (64.7)	42 (35.3)		
35-44	81 (71.1)	33 (28.9)		
45-54	70 (83.3)	14 (16.7)		
55-64	14 (73.7)	5 (26.3)		
Sex			0.89	0.204**
Male	92 (70.2)	39 (29.8)		
Female	195 (74.7)	66 (25.3)		
Education			11.95	0.003*
Primary	8 (100.0)	0 (0.0)		
Secondary	22 (100.0)	0 (0.0)		
Tertiary	253 (70.9)	104 (29.1)		
Marital status			3.92	0.270
Single	86 (69.9)	37 (30.1)		
Married	187 (74.2)	65 (25.8)		
Separated	5 (100.0)	0 (0.0)		
Widowed	6 (75.0)	2 (25.0)		
Place of origin			12.68	0.005*
Northern CRS	15 (100.0)	0 (0.0)		
Central CRS	48 (75.0)	16 (25.0)		
Southern CRS	210 (73.2)	77 (26.8)		
Outside CRS	4 (44.4)	5 (55.6)		
Category of health-care workers			37.59	<0.005*
Doctor	70 (54.7)	58 (45.3)		
Nurses	121 (80.1)	30 (19.9)		
Laboratory scientist/technologist	24 (72.7)	9 (27.3)		
Others <sup>o</sup>	72 (90.0)	8 (10.0)		
HBV knowledge			14.79	<0.005*
Inadequate	108 (85.7)	18 (14.3)		
Adequate	179 (67.3)	87 (32.7)		

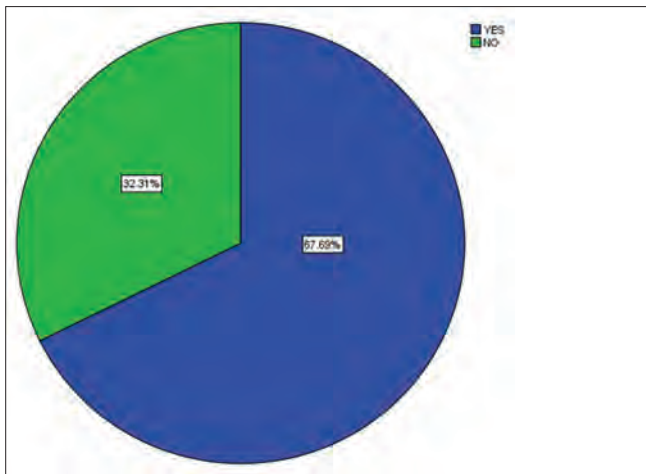
<sup>o</sup>Others: Pharmacists, ward orderlies, mortuary attendants, etc., \*Significant P, \*\*Fisher's exact test. HBV: Hepatitis B virus, CRS: Cross river state

## DISCUSSION

### Knowledge of viral hepatitis B virus

In this cross-sectional analytical hospital-based study on HBV vaccination status among HCWs in Calabar, we found that nearly half of the participants were fully vaccinated, while more than one-third of them have never been vaccinated. In addition, there was modest knowledge regarding HBV vaccination among HCWs. The study participants also

demonstrated variable reasons for not being vaccinated, with doctors being more likely to report optimal vaccination status and having adequate knowledge of HBV infection. Reports have shown a positive linear correlation between the knowledge of a particular disease condition and health-seeking behaviour among individuals.<sup>[14]</sup> Lack of knowledge and negative attitudes are the main reason for not obtaining HBV vaccination in one report.<sup>[11]</sup> The overall knowledge about HBV infection is quite modest (67.9%) among HCWs in Calabar.



**Figure 4:** Figure 4: History of Occupational exposure among health care workers (n = 390)

**Table 5: Relationship between sociodemographic factors and knowledge of hepatitis B virus and optimal hepatitis B virus vaccination status among health-care workers in Calabar**

Variable	Adjusted OR	95% CI	P
Category of health care workers			
Doctors	4.71	1.63-13.59	0.004*
Nurses	1.80	0.60-5.37	0.293
Laboratory scientist/technologist	3.23	0.92-11.38	0.069
Others <sup>o</sup>	1.00		
HBV knowledge			
Inadequate	1.00		
Adequate	2.23	1.10-4.51	0.026*

<sup>o</sup>Others: Pharmacists, ward orderlies, mortuary attendants etc.,

\*Significant P. CI: Confidence interval, OR: Odds ratio, HBV: Hepatitis B virus

Within the category of HCWs, doctors significantly ( $P = 0.001$ ) demonstrated more knowledge regarding HBV infection/transmission and prevention when compared to other HCWs. They also widely agreed that the virus can be transmitted sexually, vertically (i.e., mother to child transmission), through percutaneous injury as well as blood transfusion. This was also reflected in a similar study carried out at Ile-Ife by Adekanle *et al.*<sup>[13]</sup> Our findings probably reflect the existence of increasingly more in-depth educational programmes and academic meetings on viral hepatitis at the workplace or arising from continuing medical education courses.<sup>[13]</sup> In addition, increased public awareness of the infection presents the doctor with more healthy individuals seeking HBsAg screening for preemployment purposes, premarital and medical fitness examinations.<sup>[13]</sup> Furthermore, doctors also regularly treat patients that present to the hospital with complications of chronic HBV infection.<sup>[13]</sup> More so, this study reflected, that the odds of a HCW who had adequate knowledge of HBV infection, reporting optimal vaccination was 2.2 times greater

than those with inadequate HBV knowledge. This implies that appropriate knowledge regarding HBV in a HCW can impact their health-seeking attitude positively as stated earlier.

### Knowledge of hepatitis B virus vaccine

Testing for HBsAg, anti-HBs, and anti-HBc (IgG) is not routinely done in most Nigerian hospitals, including UCTH and GHC. In this study, the screening of these parameters was beyond the scope of this study. However, we considered that obtaining knowledge of HBV vaccination would be pertinent based on the concept of nonresponders as well as occult HBV infection as it relates to HBV vaccine immunology. In our study, though not statistically significant ( $P \geq 0.05$ ) most HCWs had below-average knowledge regarding HBV vaccine/vaccination. This was similarly seen in Kesieme *et al.*'s report among operating room personnel.<sup>[11]</sup> In an Ethiopian study, a knowledge gap regarding HBV vaccination was also demonstrated by the researchers.<sup>[15]</sup> It is recommended that at-risk individuals should be vaccinated once they are negative for HBsAg, anti-HBs, and anti-HBc (IgG) to exclude occult HBV infection. In addition, postimmunization testing for anti-HBs titers should be conducted to check for nonresponders.<sup>[1,16]</sup> In our study, the knowledge gap demonstrated by respondents regarding HBV vaccine/vaccination may explain the lack of adherence to standardized HBV vaccination guidelines for HCWs. The knowledge deficit could also pose a major public health concern following the dearth of vaccination protocols in our health institutions. This comes to the fore with the concept of nonresponders being at risk of acquiring HBV infection.<sup>[16]</sup> Furthermore, the scenario of a HCW having occult HBV infection may result in an inadequate immune response (i.e., lack of or low anti-HBs titers) following HBV vaccination.<sup>[17,18]</sup> This may pose a potential risk of HBV transmission at the workplace with the possible development of HBV-related liver disease.<sup>[17,18]</sup>

### Hepatitis vaccination coverage

This report showed that the odds of reporting optimal HBV vaccination were greater among Doctors (4.7) and Laboratory scientist/technicians (3.2) than other categories of HCWs. Nonetheless, the vaccination status among HCWs generally in Calabar was below average, with 43.4% of HCWs admitting to completing their HBV vaccination course. In an earlier study done in Lagos, 48.5% of HCWs had up to 3 doses of HBV vaccine, though fewer HCWs admitted having either one or two doses of the vaccine.<sup>[2]</sup> In Ogoina *et al.*'s report conducted over half a decade ago, HBV vaccination uptake was marginally lower (36.2%).<sup>[12]</sup> Hepatitis B vaccination uptake was reported to be even lower in other African and Middle Eastern countries.<sup>[9,10]</sup> Whereas in the United States of America, up to two-thirds of HCWs have been fully vaccinated against HBV, with future projections aiming for 98% coverage.<sup>[11]</sup> The above findings suggest suboptimal HBV vaccination among HCWs in the country in the past decade despite improved knowledge of the infection. This study further alludes that occupational injury at our workplace, most especially among doctors ( $P \leq 0.005$ ) is still a major challenge. This same observation was made in an earlier report by Ansa *et al.* nearly two decades ago.<sup>[19]</sup>

## Barriers to assessing optimal hepatitis B virus vaccination among health workers

Difficulty in accessing vaccination services (79, 38%) as well as lack of information regarding the vaccine (58, 28%) and time constraints (46, 22%) was some of the reasons given by respondents for their suboptimal vaccination status. These factors were also reported in other studies.<sup>[9,11]</sup>

Azodo *et al.* in their study, additionally noted lack of opportunity and fear of side effects as their major reasons for nonvaccination among HCWs and medical students in Enugu.<sup>[20]</sup> The acceptance of vaccination has been shown to improve with adequate knowledge of HBV as well as improved confidence in vaccine efficacy and safety among hospital personnel.<sup>[20]</sup> The below-average knowledge demonstrated by HCWs in our study regarding HBV vaccine could further explain low vaccination uptake.

## CONCLUSION

This study demonstrated suboptimal HBV vaccination among HCWs in the two major hospitals in Calabar. Additionally, most HCWs admitted having a history of occupational injury especially among medical doctors. It is imperative that health professionals in Nigeria are mandated to be vaccinated against HBV appropriately to prevent occupational exposure to HBV as well as transmission of the infection at the workplace. Relevant government agencies should be engaged/funded to ensure the smooth supply of HBV vaccine in health facilities to stem the shortfall in the supply of the vaccine. In addition, with the inadequate knowledge demonstrated among HCWs regarding HBV vaccination protocols (i.e., knowledge regarding the number of the vaccine doses, serologic testing for the presence of HBsAg, anti-HBc as well as postimmunization assay of anti-HBs titers) stricter health guidelines in our hospitals should be implemented. Furthermore, HCWs need regular updates through hospital seminars, ground rounds, and other continuing medical education programs to improve their knowledge of HBV as this will enable better health-seeking attitudes.

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## Conflicts of interest

There are no conflicts of interest.

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