

(RESEARCH ARTICLE)



## Prevalence of HBsAg among patients attending a tertiary hospital in Port Harcourt, Nigeria

Ifeoma Tochi Cookey<sup>1</sup>, Kenneth Chukwuma Odenigbo<sup>1</sup>, Blessing Jachinma Okonko<sup>2</sup> and Iheanyi Omezuruike Okonko<sup>1,\*</sup>

<sup>1</sup> Department of Microbiology, Virus Research Unit, University of Port Harcourt, Choba, Nigeria.

<sup>2</sup> Department of Applied Microbiology, Virology & Immunology Research Unit, Ebonyi State University, Abakaliki, Nigeria.

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### Abstract

Nigeria has one of the greatest disease burdens from chronic viral hepatitis. Hepatitis B virus (HBV) infection is an important public health problem worldwide, more than two million people. Globally, around 96% of viral hepatitis deaths are attributable to HBV and Hepatitis C virus (HCV) but the prevalence of these infections is poorly characterized. Thus, this study aimed to investigate seroepidemiological aspects of HBV infection and its associated factors among patients attending a tertiary hospital in Port Harcourt, Nigeria. Serum samples from 92 participants were screened for a serological marker of HBV infection (HBsAg) by Monolisa HBsAg ULTRA enzyme-linked immunosorbent assay (ELISA) kit (manufactured by BIO RAD Laboratories, California, United States) following the manufacturer's guidelines. Of the 92 patients tested, 10 (10.9%) were positive while 82 (89.1%) were negative. Among them (10/92), the majority were females (11.0%, 8/73) than males (10.5%, 2/19); the highest prevalence rate of an HBsAg occurred in the age group of 21-30 years (17.6%, 3/17). A higher prevalence of HBV (13.2%, 9/68) occurred in the married than singles (4.2%, 1/24). This study showed a high seroprevalence (10.9%), which indicates a rise in the prevalence of HBV in the study area. The findings of this study confirm the findings of other studies that HBV is endemic in Nigeria. These findings views females and males as fairly equivalent in the risk of HBV infection. As the prevalence of young adults were higher than older adults, this is considered cogent as younger adults are implicated as risk factors for HBV infection. This study adds important granularity to our understanding of the hepatitis epidemic. Large cross-sectional studies are needed to better characterize HBV prevalence, but mass screening may not be warranted.

**Keywords:** HBsAg; HBV; Patients; Prevalence; Tertiary hospital; Nigeria

### 1. Introduction

Hepatitis B virus (HBV) infection is an important public health problem worldwide, more than two million people (one-third of the world's population have been infected with HBV, and between 350 and 400 people have chronic liver infection with the presence of hepatitis B surface antigen (HBsAg), (Andre, 2010; Alter et al., 2003; Kao et al., 2012).

Globally, around 96% of viral hepatitis deaths are attributable to Hepatitis B virus (HBV) and Hepatitis C virus (HCV) (Cooke et al., 2019; Flower et al., 2022) but the prevalence of these infections is poorly characterized (Flower et al., 2022). The World Health Organization (WHO, 2021) estimates that 1/3 of the global population has serological evidence of HBV infection. Of these, 296 million are chronic carriers, with 820,000 deaths from liver complications related to chronic infection per year (WHO, 2021). Among individuals chronically infected with HBV, over 70 million are Africans, resulting in the disease being widely regarded as Africa's silent killer (Muanya, 2022), 75% live in Asia, and 25% die

\* Corresponding author: Iheanyi Omezuruike Okonko PhD

Department of Microbiology, Virus Research Unit, University of Port Harcourt, Choba, Rivers State, Nigeria.

from liver complications resulting from infection (Sato et al., 2014; Cooke et al., 2019; Flower et al., 2022; Demarchi et al., 2022).

Nigeria has one of the greatest disease burdens from chronic viral hepatitis. The United Nations estimates that Nigeria's population in 2021 is 211.4 million (World Population Dashboard Nigeria, 2021; Ajuwon et al., 2021). Experts have raised the alarm on rising cases of hepatitis B virus (HBV) and hepatitis C virus (HCV) in Nigeria, with 8.1 per cent and 1.1 per cent prevalence respectively, making it one of the highest impacted countries by hepatitis on the continent with an estimated 19 million people living with the disease (Muanya, 2022). Other countries such as Brazil and Japan are considered countries of low endemicity for HBV infection, with a prevalence of HBsAg less than 2% and 1%, respectively (Rani et al., 2009; Razavi, 2020; Demarchi et al., 2022). Comprehensive prevalence data are essential to support its elimination as a public health threat. Hepatitis B virus (HBV) is an important public health problem (Flower et al., 2022). Considering the prevalence of HBV infections found in Nigeria, this study aimed to investigate seroepidemiological aspects of HBV infection and its associated factors among patients attending a tertiary hospital in Port Harcourt, Nigeria.

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## 2. Material and methods

This cross-sectional study was conducted among patients attending the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria. Between September 2013 and October, 2015, participants were recruited randomly from patients presenting at the hospital.

The study population included male and female subjects who were at the clinics, or have a family relationship with this population. The individuals were informed in detail about the research objectives and the confidentiality of the data. Informed written and/or oral consent was obtained, after a detailed explanation of the study, at the time of sampling from all participants or their legal guardians, in case of individuals under age 18. The study protocol was approved by the Ethics Committees of University of Port Harcourt (UPH/R&D/REC/04) and University of Port Harcourt Teaching Hospital (UPTH/ADM/90/S.II/VOL.X/653), and all participants gave a written/oral informed consent (IC). The participants were interviewed to obtain information on sociodemographic characteristics, HBV vaccination, and other risk behaviors.

Serum samples from 92 participants were screened for a serological marker of HBV (HBsAg), infection by Monolisa HBsAg ULTRA enzyme-linked immunosorbent assay (ELISA) kit (manufactured by BIO RAD Laboratories, California, United States) following the manufacturer's guidelines.

Current HBV infection was defined as a positive HBsAg test result. HBV exposure was defined as a positive HBsAg test result. To compose the database, the questionnaires from 92 participants included were analyzed to obtain sociodemographic information and factors associated with HBV transmission, including: age; sex; and marital status. Data analysis was performed in the statistical package for social sciences (SPSS) software version 13. This study used the chi-squared test ( $X^2$ ) or the Fisher's exact test (for categorical variables) to assess differences between proportions, and determine p values (two-tailed). The prevalence rate of HBV exposure (HBV marker: HBsAg positive) and a 95% confidence interval (CI) were calculated. The 95% confidence intervals (CI) were used to verify potential predictors of HBV infection and/or exposure (presence of HBsAg marker) (Hosmer et al., 2013). A p-value less than 0.05 was considered statistically significant.

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## 3. Results

### 3.1 Patient characteristics

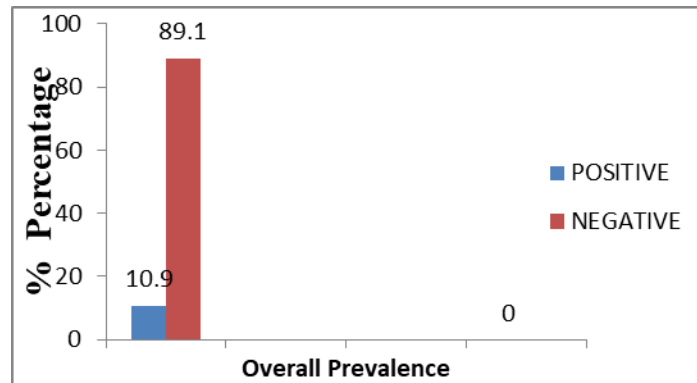
A total of 92 individuals were enrolled in this study. Most of this population (79.3% female and 20.7% male) was over 41 years old (66.7%). The majority of participants were either single (73.9%) or married (26.1%). Socio-demographic characteristics are shown in Table 1.

**Table 1** Socio-demographical characteristics of the study participants

Variables	No. Tested (%)
<b>Age groups (years)</b>	
20-30	17 (18.5)
31-40	27 (37.5)
41 & above	48 (66.7)
<b>Sex</b>	
Females	73 (79.3)
Males	19 (20.7)
<b>Marital Status</b>	
Married	68(73.9)
Singles	24 (26.1)
Total	92 (100.1)

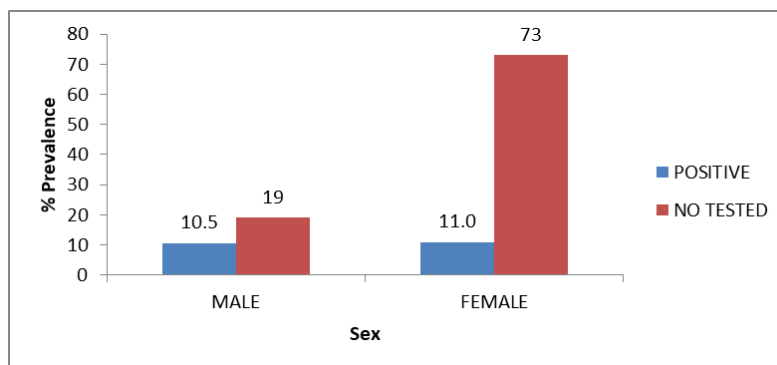
**3.2 Overall Prevalence of HBV**

Of the 92 patients tested, 10 (10.9%) were positive while 82 (89.1%) were negative (Figure 1).



**Figure 1** Overall prevalence of HBV

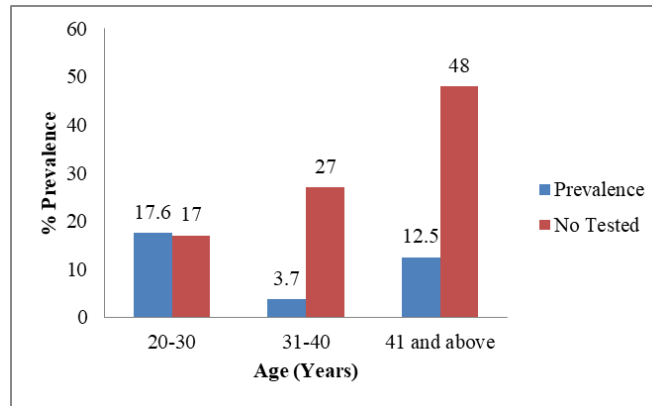
**3.3 Prevalence according to Socio-demographical characteristics**



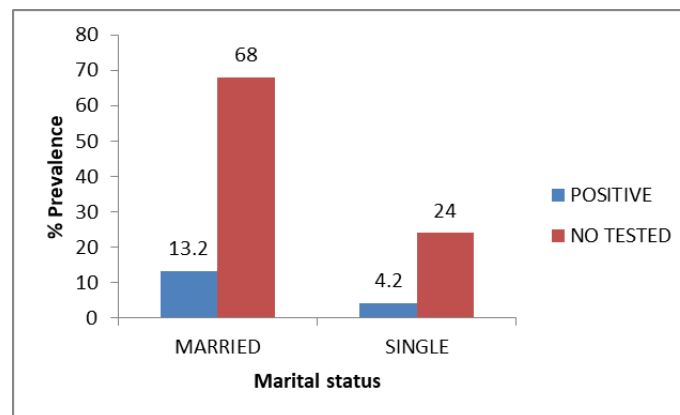
**Figure 2** Prevalence of HBV with sex

Of 92 participants, the prevalence rate of HBV exposure was 10.9%. Ten (10.9%) had been infected with HBV (Figure 1). Among them (10/92), the majority were females (11.0%, 8/73) than males (10.5%, 2/19) (Figure 2); the highest

prevalence rate of an HBsAg occurred in the age group of 21-30 years (17.6%, 3/17); and with decreasing age (Figure 3). This was by the patients between in age range  $\geq 41$  (12.5%, 6/48). Lowest prevalence was observed among the age group of 31-40 (3.7%, 1/27). A higher prevalence of HBV (13.2%, 9/68) occurred in the married than singles (4.2%, 1/24).



**Figure 3** Prevalence of HBV with age



**Figure 4** Prevalence of HBV with marital status

#### 4. Discussion

This study adds important granularity to our understanding of the hepatitis epidemic (Flower et al., 2022). The prevalence of HBV serological marker (HBsAg) describes the endemicity of Hepatitis B in this population group, and may provide necessary information to guide prevention and control policies improving public health (Demarchi et al., 2022). In this study, a high prevalence rate of HBV exposure (10.9%) was found, which was high when compared to the Nigeria's overall pooled prevalence (9.5%) of HBV (Ajuwon et al., 2021), the 10.1% and 9.0% that Ajuwon et al. (2021) obtained for studies between 2010–2014 and 2015–2019, respectively, the 10.2% found by Noubiap et al. (2015), the 9.7% found among pregnant women attending ANC in Bue'a Health District, Cameroon (Besong Frambo et al., 2014), the 9.5% found in Ghana (Ephraim et al., 2015), 9.3% found in Kenya (Okoth et al., 2006), the 9.20% found in Banjul, The Gambia (Bittaye et al., 2019), the 8.3% in Ibadan (Chinenye et al., 2015), the 8.2% found in FMC Yola, Adamawa State (Olokoba et al., 2011), the 8.0% found in Koutiala, Mali (MacLean et al., 2011), the 7.3% found in pregnant women in Kano, Nigeria (Dawaki and Kawo, 2006), the 6.8% reported in Ekiti State, southwestern Nigeria (Esan et al., 2014), the 6.7% found in Bauchi (Mustapha et al., 2020), the 6.6% in Cross River State, Nigeria (Utoo, 2013), the 6.0% found in Ethiopia (Yazie and Tebeje, 2019), the 5.6% in Sudan (Elsheikh et al., 2007), the 5.3% in Yenagoa, Bayelsa State, the 4.3% in Zaria, North-western-Nigeria, 1.6% found in Iran (Afzali et al., 2015); the 3.9% found in pregnant women attending ANC in Muhimbili national hospital Tanzania (Rashid, 2011; Rashid et al., 2014), the 3.0% in blood prime donors in Brazil (Almeida-Neto et al., 2013), and the 2.7% in Benue State, Nigeria (Emmanuel et al., 2014). The difference could be due to the fact that this study was conducted in a tertiary facility situated in urban area.

This prevalence is lower than 21.3% found in Ibadan, Nigeria (Otegbayo et al., 2003), 23.9% and 15.1% in two studies in Jos, Nigeria (Uneke et al., 2005; Egah et al., 2007), the 20.4% found in Cameroon (Ducancelle et al., 2013), the 18.2% in pregnant women in Zaria, Nigeria (Luka et al., 2008), 17.1% in sex workers in Nasarawa State, Nigeria (Nneka, 2007), the 17.2% prevalence documented in Bayara hospital, Bauchi State, Nigeria (Ndako et al., 2012), the 16.5% in Osogbo, Osun State (Kolawole et al., 2012), the 13.4% found in Japanese Immigrants and Descendants in Brazil (Demarchi et al., 2022), the 13.3% found in patients in Nasarawa State, Nigeria (Pennap et al., 2010), the 12.5% in Edo State (Ugbebor et al., 2011), and the 12.3% found in Minna, Niger State (Ndams et al., 2008). The differences in the reported seroprevalence rates of HBV among the participants may be due to variation in the study groups, geographical location, socio-cultural practices, study design, level of care for the study facility, sample size and test methods employed. Most of the studies quoted above were carried out at secondary and tertiary level of care located mostly in urban or semi urban populations. The lower prevalence of HBV compared to the previous Nigerian studies may be due to increased awareness about the disease (Locarnini et al., 2015).

Furthermore, the 10.9% reported in this study is consistent with global trends (WHO, 2017) and the overall prevalence (10.87%) reported by Demarchi et al. (2022) in Brazil. It is also similar to that from studies done by Oluboyo et al. (2014), Mustapha et al. (2020) and is in agreement with prevalence of 6–25% in the WHO African region (Mustapha et al., 2020). HBV prevalence appears to be declining over time. Studies conducted between 2000 and 2013 by Musa et al. (2015) recorded the highest prevalence of 14.0% and 9.6–18.6% in a country wide systematic review. The 10.9% prevalence reported in this study is similar to 11.2% found in Cameroon (Bigna et al., 2017) and the 11.2% found in Burkina Faso (Lingani et al., 2018), the 11.0% in Makurdi, Benue State (Mbaawuaga et al., 2008), and the 10.3% found in Port Harcourt, Nigeria (Ejele and Ojule, 2004).

These apparent downward trend in prevalence of HBV in Nigeria may in part reflect coverage of the universal HBV vaccination introduced in 2004, and the likely improvements in socio-economic conditions across time-period. The results suggest that to further reduce HBV prevalence in Nigeria, a dedicated focus on socio-economic, cultural and population health factors are required. Suffice to note that similar results by all study groups may be linked to identical WHO approved test kits (Mustapha et al., 2020).

The relatively high prevalence found in this study may be due to lack of information and inadequate measures to check the morbidity of the virus. These differences might not be unconnected with the fact that some of the studies were not from the same risk group. This information reinforces the idea that Nigeria has a heterogeneous distribution of HBV exposure just like a country such as Brazil (Souto, 2016; Lima et al., 2020; Demarchi et al., 2022).

The association between HBV exposure and younger age (<30 years old; 17.6%) found in this study has been reported previously (Mattacastro et al., 2003; Demarchi et al., 2022). The association between HBV exposure and younger age (<30 years old) found in this study has been reported previously (Eke et al., 2011). This observation deviated from what was reported elsewhere (Ximenes et al., 2015; Lima et al., 2020; Dos Santos Weis-Torres et al., 2020). Mustapha et al. (2020) found highest prevalence of 10.5% in those older than 35 years. Ajuwon et al., (2021) found a higher prevalence (12.7%) in the age group > 17, (those born before 2004), then decreased to 11.4% in the age group ≤ 17. Demarchi et al. (2022) also indicated that the prevalence was high among age group 21-30 (26.7%). Olayinka et al. (2016) found higher HBV prevalence (15.7%) in 60-69 years than in younger age groups. Isa et al. (2014) found higher prevalence of HBsAg among the > 50 age group (16.7%). It is noteworthy that most of the patients infected with HBV were less than 30 years old. This association suggests that, with increasing age, the risk of acquiring HBV by exposure decreases mainly because of the elevated HBV prevalence among the inhabitants of Rivers State, Nigeria. And this high rate of seropositivity observed among the 20-30 age group may be due to the high rate of sexual activity, tattooing and multiple sex partners with which this age group is usually associated. It also correlates with the peak age of greatest sexual activity thus supporting the role of sexual intercourse in the transmission of HBV infections, and those with multiple sexual partners were significantly associated with the disease. In contrast, Comia and co-workers found out that, this factor was not significantly associated with the infection but only proves that this factor is equally at risk for infection (Comia et al., 1999). Other risk factors were not significantly associated with the infection and this corresponds with the study of Dawaki and Kawo that these risk factors are poorly associated with the infection (Dawaki and Kawo, 2006).

The mechanism associated with the establishment of persistent infection is strongly age related. In fact, most individuals infected with HBV have a 90% chance of becoming chronic carriers (Dawaki and Kawo, 2006). This may decrease to 30% at the age of five years while adults have a 6-10% chance of developing a persistent infection (Aganga et al., 1999; Alter and Mast, 1994). This ancient disease, hepatitis B has been found in all populations, though the incidence and risk are high among people living under crowded conditions, drug addicts, the sexually promiscuous and certain occupations, involving blood or blood products such as serum (Dawaki and Kawo, 2006).

HBV positivity was significantly higher among females (11.0%) than males (10.5%). The results equal the findings of Lingao et al. (1986) wherein females had a significantly higher HBsAg prevalence (10.95%) than males with 10.52%. These findings suggest that sex difference in HBsAg prevalence appears to be due to a difference in viral exposure with females being more exposed probably due to its inherently lifestyle or behaviour. This finding is in contrast to the findings from Isa et al. (2014) who reported that males were infected more with HBsAg (15.9%) than females (11.8%), Ikobah et al. (2016) who reported higher prevalence in males (1.5%) than females (1.0%) and Zafrin et al. (2019) who found higher HBV prevalence in males than females. Males had *higher HBV prevalence (10.89%) than females (6.06%) in a study by (Omatola et al., 2020)*. This may have been due to variation in the location of the study and the social lifestyles of the male population of the study. Although with no clear evidence at hand, it is possible that these infected females may have multiple risk factors for infection.

The prevalence of HBV in relation to marital status showed that higher prevalence of HBV occurred in the married (13.2%) than the singles (4.2%). This as well might be due to the rate of faithfulness to sexual partner (s) among the married and the singles. This collaborated with the study by Mustapha et al. (2020) who reported higher prevalence of HBV in women married before 18 years (6.5%), Zafrin et al. (2019) who found higher HBV prevalence in the married than the singles and Eke et al. (2011) who found the prevalence to be higher among the married than the singles. This is in contrast with a report from Jos, Plateau state (Sirisena et al., 2002), and Demarchi et al. (2022) who found the prevalence of HBsAg to be higher among the singles than the married. Innocent-Adiele (2021) also reported *higher prevalence in singles (10.5%) compared to the married (4.7%)*. Isa et al. (2014) also reported higher HBV prevalence in singles (14.4%) than the married (13.3%). It is also in contrast to the study done by Comia et al. (1999) which showed that there was no significant difference between infected married and single cases. Ezegbudo et al. (2004) which reports that significant infection rate from HIV, HBV, and HIV-HBV co-infection were associated with marital status. The finding of this study disagrees with that of Olayinka et al. (2016) who found the prevalence of HBV to be higher in singles (19.6%) than the married (12.7%). This may be due to the fact that single people constitute a greater risk population in the transmission of HBV due to exposure to promiscuous sexual activity and unhealthy habits and lifestyles

Determining the prevalence of HBV infection among patients is important in planning for any intervention to control this infection among them. Furthermore, the information obtained may be used in a wider sense to create awareness among all categories of patients or even healthcare workers about the magnitude of the risk of contracting or transmitting the virus.

This study has some limitations. First, as a cross-sectional study, the exposure and outcome were simultaneously assessed. For this reason, it is impossible to draw any conclusions on causality. Despite these limitations, this work highlights the importance of promoting further investigation surrounding HBV and other infectious diseases in patients.

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## 5. Conclusion

This study on the seroprevalence of Hepatitis B infection among patients attending the University of Port Harcourt Teaching Hospital showed a high seroprevalence (10.9%), which indicates a rise in the prevalence of HBV in the study area. The prevalence of HBV in females (11.0%) was slightly higher than that of males (10.5%). These findings views females and males as fairly equivalent in the risk of HBV infection. The prevalence of young adults was higher than older adults, this is considered cogent as younger adults are implicated as risk factors for HBV infection. The findings of this study confirm the findings of other studies that HBV is endemic in Nigeria. This should inspire measures targeted at the reduction of the prevalence through information, and the promotion of early testing and the effective care of infected people. Large cross-sectional studies are needed to better characterize HBV prevalence, but mass screening may not be warranted. However, national Hepatitis B vaccination strategies and educational measures to control this infection should be considered.

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## Compliance with ethical standards

### *Acknowledgments*

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### *Disclosure of conflict of interest*

Authors have declared that no competing interests exist.

### *Statement of ethical approval*

All authors hereby declare that all experiments have been examined and approved by the University of Port Harcourt Research Ethics committee and University of Port Harcourt Teaching Hospital Research Ethics committee and have, therefore, been performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

### *Statement of informed consent*

All authors declare that informed consent was obtained from all individual participants included in the study.

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