

# Seroprevalence of HBV among people living with HIV in Anyigba, Kogi State, Nigeria

Cornelius Arome Omatola<sup>1</sup>, Joshua Idofe<sup>1</sup>, Martin-Luther Oseni Okolo<sup>1</sup>,  
Patience Omebije Adejo<sup>1</sup>, Mesach Maunta Maina<sup>2</sup>, Joseph Abraham Oyiguh<sup>3</sup>

1. Department of Microbiology, Kogi State University, Anyigba, P.M.B.1008, Kogi State, Nigeria.
2. Department of Veterinary Microbiology and Parasitology, University of Maiduguri, Borno State, Nigeria.
3. Department of Science Laboratory Technology, Federal Polytechnic Idah, Kogi State, Nigeria.

## Abstract

**Background:** Co-infection of HBV with HIV is associated with significant morbidity and mortality globally. In spite of increasing reports of HIV/HBV co-morbidities in Nigeria, little or no data exists on this subject in Anyigba. Therefore, we determined the prevalence of hepatitis B surface antigenemia among HIV positive patients on anti-retroviral treatment programme in Anyigba, Kogi State, North-Central Nigeria.

**Methods:** Sera samples obtained from 200 consented HIV patients were screened for HBsAg using the commercial rapid test membrane-based qualitative immunoassay. A structured questionnaire was used to collect information on patients' demographic variables and probable risk factors for HBV transmission.

**Results:** Overall, 3.5% of HIV patients were seropositive to HBsAg and the difference between seroprevalence rates and patients' age as well as gender was not statistically significant ( $p > 0.05$ ). There was significant difference between patients' demographic variables such as marital status ( $p = 0.013$ ) and educational level ( $p = 0.004$ ) and HBsAg seropositivity. Patients with a history of surgical applications ( $p = 0.01$ ) and who indulged in alcoholism ( $p = 0.03$ ) significantly had higher rates of concomitant HIV/HBV infection in the study area.

**Conclusion:** Our findings underscore the importance of routine screening for HBV in the HIV infected populations especially in developing countries where the infection is endemic. We advocate for public enlightenment programmes on routes of virus acquisitions with a view to reduce the morbidity and mortality associated HIV/HBV co-infection.

**Keywords:** HBV, HIV, co-infection, risk factors, Nigeria.

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## Introduction

Hepatitis B virus (HBV) is the most prevalent etiology of viral inflammation of the human liver<sup>1</sup>. Globally, more than 2 billion people are infected with Hepatitis B virus<sup>2,3</sup>, with approximately 360 million people being HBV carriers<sup>4</sup>. sub-Saharan Africa alone has over 8% of the HBV carriers rate<sup>5,6</sup>. Nigeria is one of the countries in

sub-Saharan Africa with high burden of HBV infection<sup>7</sup>. World Health Organization in<sup>8</sup> defines low prevalence as <2%, moderate prevalence as 2-8% and high prevalence as >8% HBsAg positivity. Approximately 13.6% of the total Nigerian populations are chronic carriers of HBV<sup>7</sup>. The risk of contracting HBV in Nigeria, a country with approximately 20,000 HBsAg seropositivity rate, is wide-ranging and reasons have been attributed to low compliance with HBV vaccination and high exposure through unprotected sexual intercourse, blood transfusion and perinatal transmission<sup>9</sup>.

Hepatitis B virus is a highly infectious agent that causes both acute and chronic infections across the globe<sup>10</sup> with prolonged forms often incriminated in liver cirrhosis and hepatocellular carcinoma<sup>11</sup> and about 600,000 deaths annually<sup>12</sup>. HBV is 50 - 100 times more infectious than

### Corresponding author:

Cornelius Arome Omatola,  
Department of Microbiology,  
Kogi State University, Anyigba,  
P.M.B.1008, Kogi State, Nigeria.  
Phone No:+2348061259317  
Email: [omatolac@gmail.com](mailto:omatolac@gmail.com)

HIV and 10 times more infectious than hepatitis C virus (HCV)<sup>13</sup>. Common practices such as use of tooth brush or razor blade can easily predisposed one to HBV infection due to the low infectious dose of the virus<sup>13</sup>. Majority of childhood infection results in chronic carriers of the virus while infection in adolescents/adults which usually occurs via sexual contact, contaminated needles, and less often from transfusion of blood products, usually resolves unless the individual is immunocompromised (e.g. HIV/AIDS patients)<sup>14</sup>. Patients with chronic disease usually do not present with symptoms; however, cirrhosis and liver cancer may eventually develop<sup>15</sup>.

HBV coinfection is one of the frequent complications in HIV positive patients<sup>16</sup> and due to the shared routes of transmission; the incidence rate of coinfection with both viruses is on the increase<sup>17</sup>. HIV/HBV co-morbidity has been identified as the one of the major factors that accelerates the progression of HIV disease<sup>18</sup> and individuals coinfecting with both viruses have been shown to be 17 times more likely at risk for death from complications of liver disease than those monoinfected with HBV<sup>19</sup>. Previous studies has documented HBV protein X that enhances the replication of HIV-1<sup>20</sup> while HIV decreases the rate of HBsAg clearance in acute infection and enhances the progression of liver disease in those with chronic hepatitis B<sup>21</sup>. With the introduction of HAART in both industrialized and developing countries, the incidence of AIDS-related opportunistic infections have decreased while liver disease resulting from chronic infection with HBV and HCV has emerged leading causes of morbidity and mortality in HIV-infected patients<sup>22-25</sup>. This is as a result of decreased response to HBV treatment which in turn raises the risk of hepatotoxicity of HAART and drug interactions<sup>26</sup>. The interaction of HBV and HIV therapies can lead to additional complexities due to increase potential for the selection of drug-resistant mutations<sup>26</sup>.

Epidemiological studies have shown that the seroprevalence of HBV/HIV co-infection vary from 5 to 10% in the USA to 20-30% in parts of sub-Saharan Africa and Asia<sup>12</sup>. In Nigeria, HIV/HBV co-infection rate is estimated to be within 10% and 70%<sup>26</sup>. Study on HIV/HBV co-infection is important as it will help to compliment the

epidemiological data on the two viruses in Nigeria which in turn would provide information on the variation in the prevalence of HIV/HBV co-infection rate<sup>6</sup>.

In Anyigba, Kogi State, Nigeria, there is currently no documented report on HBV/HIV co-infection to the best of our knowledge. In light of this background, it becomes crucial to determine the prevalence of HBV/HIV in Anyigba which will complement the epidemiological data on the two viruses in Nigeria and will in turn influence policy making as well as prevention and treatment strategies for HBV/HIV co-infection particularly in view of the implications of using HAART with anti-HBV potency.

## **Materials and methods**

### **Study area**

This study was conducted in Anyigba, a city in Kogi State, found in the North Central region of Nigeria. Anyigba which lies between latitude 7015'-7029' north and longitude 7011'-7032' east, has an average altitude of 420m above sea level<sup>27</sup>. Behavioral practices such as early age at first sexual intercourse, use of un-screened blood and blood products, scarification marks, promiscuity and intravenous drug use are common among the inhabitants.

### **Study population**

This was a hospital-based cross-sectional study in which 200 consenting HIV positive patients on Highly Active Anti-retroviral Therapy (HAART) at the Grimard Hospital and Maria Goretti Hospital between January and April, 2017 were recruited using a non-probability convenient sampling technique. These hospitals run a weekly HIV/AIDS clinic and are the most utilized health facilities in the study area with a record of approximately 2000 HIV patients per year. Trained medical personnel in each hospital clearly explained the objectives/benefits of the study to the patients and only those who gave consent by completing and endorsing filled-in questionnaires were consecutively recruited. Consenting attendees, male or female, aged 5 years and above who provided written informed consent were eligible for participation in the study. Ethical approval for the study was obtained from the hospital management board on health issues in accordance with the code of conduct for biomedical research involving human subjects (Ethical clearance no:058).

### Sample collection and storage

Two (2) ml of blood sample was aseptically collected from each of the 200 consenting HIV positive patients by vein-puncture into a well labeled non-anticoagulant tube. Information concerning patients' demographic profile and associated risk factors were also obtained by means of structured questionnaires. Blood sample obtained from each patient was centrifuged at 3000rpm for 8-10 seconds to separate sera from whole blood. Sera samples were stored at -20°C in line with the manufacturer's instruction until screened for HBsAg.

### Assays for HBsAg

A one step test was carried out to detect HBsAg in serum using Coschesic strips®. This method is immuno-chromatographic and qualitative in nature and detects HBV antigen in human blood. The test strip which is coated with the mouse monoclonal anti-HBs capture antibody has more than 99.9% sensitivity and 98.6% specificity when read in-vitro. The test and interpretation of the results were done in accordance with the guidelines of the kit's manufacturers.

### Data analysis

Sample size (N) was determined using formula  $N = Z_{\alpha}^2 pq / d^2$  where:  $Z_{\alpha}$  = standard normal deviate set at 1.96, corresponding to 95% confidence level;  $p$  = prevalence,  $q=1-p$  and  $d$  = degree of precision set at 0.05 (95% confidence interval). Assuming a prevalence of 14% based on the most recent HBsAg prevalence from a similar study<sup>28</sup>,  $q=86\%$  (0.86) and  $N=185$  which was approximated to the nearest hundred as 200. Data generated from the study was analyzed using the statistical packages for social sciences (SPSS version 16.0). Descrip-

tive data was presented as simple summaries in statistical tables. Chi square test was used to establish differences between participants' variables and prevalence rates. A p-value 0.05 was set as level of statistical significance.

### Results

Table 1 shows the socio-demographic data and outcome of HBsAg test among HIV patients in Anyigba. Seven (3.5%) of the 200 HIV patients in this study tested positive to HBsAg with the highest prevalence rate (13.3%) in patients that were aged  $\geq 51$ . Sixty one males and 139 females participated in this study, out of which 2(3.27%) males and 5(3.59%) females respectively were positive to HBsAg. Though the number of participated females were twice that of the males, the difference between gender and HBV infection was not statistically significant ( $p>0.05$ ). Marital status related seroprevalence showed higher HBV prevalence (20%) among HIV patients who were widowed compared to those who were single (9.09%) and married (1.39%) and the difference between HBV infection and marital status was statistically significant ( $p<0.05$ ). Educationally, patients with primary and no formal education had significantly higher hepatitis B surface antigenemia rate (37.0%) compared to those with secondary (4.2%) and tertiary (1.2%) levels of education. Table 2 depicts the possible predisposing factors of HBV infection. History of surgery and high rate of alcohol consumption were significantly related to HBV infection ( $p<0.05$ ). Other factors such as poor knowledge of HBV infection, history of intravenous drug use, multiple sexual partners, mouth-to-mouth kissing, history of blood transfusion were also noted with higher HBsAg seroprevalence rates although, the difference between each variable and HBsAg seropositivity was not statistically significant ( $p>0.05$ ).

**Table 1: HBV infection distribution in relation to socio-demographic characteristics of HIV patients**

Variable	No tested	No (%) positive	P-value
<b>Age range</b>			
5-20	25	1(4.0)	0.30
21-30	66	2(3.0)	
31-40	42	1(12.4)	
41-50	52	1(1.9)	
≥ 15	15	2(13.3)	
<b>Gender</b>			
Male	61	2(3.27)	0.91
Female	139	5(3.59)	
<b>Marital status</b>			
Single	36	3(9.09)	0.013
Married	146	2(1.39)	
Divorced	6	0(0.00)	
Widowed	12	2(20.00)	
<b>Highest qualification</b>			
None	4	1(25.0)	0.005
Primary	25	3(12.0)	
Secondary	24	1(4.2)	
Tertiary	147	2(1.2)	
<b>Occupation</b>			
Business woman	12	1(8.33)	0.85
Students	34	2(5.88)	
House wives	67	2(2.99)	
Civil servants	76	2(2.63)	
Farmers	5	0(0.00)	
Unemployed	6	0(0.00)	

**Table 2: Distribution of HBsAg in positive sera in relation to predisposing factors of HBV infection**

Variable	No. tested	No Positive	P-value
<b>1. Knowledge of HBV</b>			
Yes	73	1(1.37)	0.21
No	127	6(4.72)	
<b>2. Mouth-To-Mouth Kissing</b>			
Yes	142	5(3.52)	0.98
No	58	2(3.44)	
<b>3. Shared Sharp Objects</b>			
Yes	125	3(2.40)	0.52
No	75	4(5.33)	
<b>4. History of Circumcision</b>			
Yes	61	2(3.28)	0.91
No	139	5(3.60)	
<b>5. No of Sexual Partners</b>			
One	25	1(4.00)	0.73 5 (4.17)
Two	55	1(1.82)	
Two	120		
<b>6. History of STDs</b>			
Yes	73	2(2.74)	0.66
No	127	5(3.94)	
<b>7. Use of Condom</b>			
Regular	52	3(5.77)	0.91
Occasional	76	2(2.63)	
Never	72	2(2.78)	
<b>8. Had Blood Transfusion</b>			
Yes	28	1(3.57)	0.98
No	172	6(3.49)	
<b>9. History of Surgery</b>			
Yes	25	3(12.00)	0.01
No	175	4(2.29)	
<b>10. History of IDU</b>			
Yes	7	1(14.29)	0.11
No	193	6(3.11)	
<b>11. Immunized For HBV</b>			
Yes	68	3(4.41)	0.62
No	132	4(3.03)	
<b>12. Tribal Marks</b>			
Yes	33	1(3.03)	0.87
No	167	6(3.59)	
<b>13. Alcohol Consumption Rate</b>			
Low	162	3(1.85)	0.03
Moderate	31	3(9.68)	
High	7	1(14.29)	

## Discussion

In HBV endemic countries, the severity of HBV infection has been classified into low (<2%), moderate (2-8%) and high (>8%) prevalence by WHO<sup>8</sup>. An overall 3.5% HBsAg seropositivity was observed in this study, thus suggesting a moderate prevalence of HBV infection among HIV patients undergoing anti-retroviral therapy in Anyigba, Kogi State, Nigeria. HBsAg seropositivity rate of 3.5% in the population of HIV patients in this region calls for great concern as HBV/HIV co-morbidity have been linked with high risk of mother-to-child transmission and accelerated progression of HIV infection<sup>20-21</sup>. Findings in this study is comparable to the 3.6% reported<sup>29</sup> in Biu, Borno State, Nigeria. It is also similar to the 3.6% by Smit et al.<sup>30</sup>, 3.2% by Rai et al.<sup>31</sup>, 3% by Lodenyo et al.<sup>32</sup> and 3.7% by de Almeida et al.<sup>33</sup> previously reported among HIV patients in Netherlands, Japan,

Johannesburg and Brazil respectively. Lower prevalence of 2.7%, 1.2%, 1.13%, 1.8%, and 2.6% was earlier reported among HIV positive patients in Nigeria, Tanzania, Mali, Iran and New York respectively<sup>34-38</sup>. Okonko et al.<sup>39</sup> also reported 2.5% HBV/HIV coinfection among apparently healthy blood donors in Ibadan, Nigeria. The seroprevalence rate in our study is however lower than the prevalence of HBV/HIV co-infection range of 10-70 % earlier reported for Nigeria<sup>26</sup>. This lower prevalence rate is likely due to the efforts of the public health agencies on HIV/AIDS prevention in the Country since measures aimed at preventing HIV infection also protect against HBV which shares similar transmission routes with HIV. This study revealed that though more females (3.59%) than the males (3.27%) were seropositive, they were comparable (p = 0.91) in HBsAg seropositivity. This finding supports the report of Sule et al.<sup>40</sup> from the same setting

that both male and female were apparently equal in exposure to HBV. Previous studies<sup>41-44</sup> reported similar findings. The higher ratio of females to male (2.3:1) in this study may be attributed to the fact that more females than males' visits hospitals for medical attention in Nigeria, a reason previously reported<sup>45</sup>.

The significantly higher HBsAg seropositivity rate in HIV patients who were aged  $\geq 50$  was also reported<sup>46</sup> among cohort of HIV patients in Nassarawa State, Nigeria. Reason for the age of peak infection in this study could be attributed to increased parenthood responsibility as patients within this age group constitute economically productive years in the Nigerian workforce. Unsafe sexual behavior of the polygamous men coupled with their religious inclination, socio-economic, cultural and occupation of the men as was previously opined by Bello et al.,<sup>29</sup> in the northern Nigeria could be possible explanation for the observed prevalence.

Analysis by marital status showed that the widowed patients significantly had higher HBsAg prevalence and reason could be attributed to absence of family cover which could shield or restrain them from having multiple sexual partners. This significant association of marital status with HBV infection is in conformity with previous reports of Sule et al.<sup>28</sup> in Kogi State, Sirisena et al.<sup>47</sup> in Plateau State, Ezegbudo et al.<sup>48</sup> in Anambra State and Mohammed et al.<sup>49</sup> in Kanu State.

Educational related HBsAg seroprevalence revealed higher HBV infection in HIV patients with primary/no formal education compared to those with secondary and tertiary levels of education and there was a significant difference between patient's educational status and HBsAg seropositivity ( $p < 0.05$ ). The steady decrease in prevalence observed in present study may be a reflection of the fact that educated individuals are likely more enlightened on the dangers posed by hepatitis B when seropositive to HIV and as such could implement strategies in preventing HBV infection. This may be evident from the lower prevalence of HBsAg (1.37%) in patients with prior knowledge of HBV infection compared to those without previous knowledge (4.72%). This finding supports the assertion<sup>48</sup> that prevalence rates of infections such as HIV, HBV and HIV/HBV co-infection were inversely associated with educational status. Finding from present study was also previously corroborated by re-

ports of Sule et al.<sup>28</sup> in Ankpa and Mehmet et al.<sup>50</sup> in the Southeastern region of Turkey. Efforts geared towards improving the level of education to reduce poverty and improve the quality of life of these vulnerable communities should therefore be considered in order to achieve a breakthrough in the fight against HIV/HBV co-morbidity in Nigeria.

The significantly higher hepatitis B surface antigenemia rate in patients with history of surgical application is similar with previous reports in Ethiopia<sup>51</sup> and Benue State<sup>34</sup>, Nigeria. Practices such as use of poorly unsterilized instruments during surgical procedures as previously opined by Uwaezuoke et al.<sup>52</sup> could be responsible for the significantly higher antigenemia among patients with such history. The strong association between alcohol consumption and HBV infection ( $P=0.00$ ) in this study is in conformity with previous report of Ndako et al.<sup>53</sup>, but contradicts finding of Mbaawuaga et al.<sup>34</sup> People who consume high rate of alcohol are likely more promiscuous and the fact that they may also fail to protect themselves through correct and consistent condom use could be a possible explanation for the higher predisposition to concomitants HIV/HBV infection.

### Limitations

The seroprevalence in the current study may reflect the true burden of disease in the study area, since only hospital-based cases were considered. Also, findings from the present study might not be generalizable to the entire country, as it showed to be at variance with some published studies from other parts of Nigeria. Despite these limitations, this study provides baseline seroprevalence data on HBV/HIV co-morbidity for future studies.

### Conclusion

The results of this study showed that HBV/HIV co-infection is endemic amongst HIV positive patients in Anyigba, Kogi State, North Central Nigeria. Considering the impact of antiretroviral on the progression of HBV, we recommend that all recently diagnosed HIV cases be screened for HBV as this will improve management of HBV/HIV co-infection. The high prevalence of HBV infection in patients with no knowledge of HBV infection underscores the need for continuous public health education on ways of avoiding risky behaviors such as alcoholism and unprotected sexual intercourse.

## Conflict of interest

None declared.

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