



Sero-Epidemiological Analysis of Hepatitis B Virus Infection among Apparently Healthy Young Adults in Omuaran-Community

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Authors' contributions

This work was carried out in collaboration among all authors. Authors JAN and COA designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors VTD, VOF and JAA managed the analyses of the study. Authors SO and II managed the literature search and performed the statistical analysis. All authors read and approved the final manuscript.

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ABSTRACT

Hepatitis B (HBV) infection is an important public health concern all over the globe. As a result of its asymptomatic nature, its prevalence among apparently healthy individuals becomes relevant for studies. Hence the prevalence survey of hepatitis B virus was conducted among apparently healthy young individuals. A total of two hundred samples were screened from volunteer subjects for Hepatitis B surface Antigen (HBsAg), using the one step immune-chromatographic test strip manufactured by Dia Spot® Diagnostics. Questionnaires were administered to obtain relevant information and demographic data. Overall result showed that 11 (5.5%) of the subjects tested were found to be positive. The highest prevalence was found among subjects aged 22-26 years with 7.8% prevalence compared to those aged 12-21 years with 4.4% prevalence ($P=0.1012$); ($p>0.05$). Based on demographic factors, female workers tend to demonstrate high positivity of

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12.5% compared to male with 10.0% prevalence, ($P=0.4929$); ($p>0.05$). Subjects involved with risky behavioral pattern by the use of unsterilized objects recorded a high prevalence of 5.3%, ($P=0.5748$); ($p>0.05$) among female subjects. Serum Alanine amino-transferases result showed no significant difference among the positive subjects. The results showed some measure of prevalence among the study population. It therefore becomes pertinent that the community be enlightened on the possible risk of infection by the virus. Efforts should be made to ensure vaccination against this infectious agent is intensified.

Keywords: *Epidemiological; hepatitis B virus; assay; infection; young-adults.*

1. INTRODUCTION

The term viral hepatitis usually describes infections caused by agents whose primary tissue tropism is the liver. Hepatitis B Virus (HBV) has assumed a major public health concern worldwide, but more prevalent in the developing countries [1,2]. More than 2 billion individuals are infected with HBV world-wide while some 280 million are chronic carriers thereby harboring the virus in their liver. About 2 million of these carriers die each year as a result of cirrhosis or primary liver cell cancer induced by the virus. Other hepatic conditions can also be caused by an overactive immune system, drugs, alcoholism, chemicals, and environmental toxins [3].

Viral hepatitis currently affects millions of children and adults, WHO estimates that in 2015, 257 million people were living with chronic hepatitis B infection while an estimated 887 000 deaths were recorded, mostly from cirrhosis and hepatocellular carcinoma (i.e. primary liver cancer). As at 2016, 27 million people (10.5% of all people estimated to be living with hepatitis B) were aware of their infection, while 4.5 million (16.7%) of the people diagnosed were on treatment [4].

According to the WHO report, Sub-Saharan Africa is considered to be a region of high endemicity with an average carrier rate of 10 - 20% in the general population. However, 70 to 95% of adults in the Sub-Sahara have at least one marker for HBV infection. In West Africa, it has been estimated that 40% of children will be infected by two years of age and above 90% by age of ten years, while chronic carrier rate will be 20% among these set of children [5,6]. Neonates born of chronically infected mothers have a 70-90% risk of the infection progressing to a chronic phase [7].

HBV is also carried in other body fluids, including saliva, tears, semen and vaginal secretions. Depending on the epidemiological pattern within

a geographic area, the main ways of transmission are sexual intercourse, parental contact or infection of the baby at birth from an infected mother [8]. A chronic carrier rate above 7% in a population is classified as hyper endemic. Studies done in Nigeria showed HBV carriage rate in the range of 9 to 39% [9,10].

HBV infection is highly endemic in Nigeria providing a prevalence range within the estimated prevalence in sub-Saharan Africa [11]. Several studies in Nigerian children have recorded prevalence rates of hepatitis B surface antigen (HBsAg) ranging from 4.1% to 44.7% varying from one locality to another. Some of these studies however were hospital based with obvious limitations where different screening methods were used [12]. Early diagnosis and treatment can help prevent liver damage. Hepatitis B vaccine is 95% effective in preventing infection and its chronic consequences; it was the first vaccine against a major human cancer [13]. This study was therefore carried out to detect the presence of HBsAg among apparently healthy individuals at our locations of study.

2. MATERIALS AND METHODS

2.1 Study Population

The study areas are selected secondary schools within Omu-aran community. Two hundred (200) blood samples were collected from apparently healthy volunteers, which include both genders. The selection of these schools was as a result of preliminary investigations conducted amongst students with regards to lifestyles and symptoms suspected to be an indicator for the HBV infection.

2.2 Ethical and Consent Consideration

2.2.1 Ethical permit

A proposal of the project was submitted to the Landmark University Ethical Review Committee

on Health related Research who subsequently approved the protocol for this study. All procedures complied with the declaration of Helsinki on research involving human subjects.

Subjects who gave informed consent and are asymptomatic for HBV by routine screening, were included in the study, while subjects who had once been vaccinated with the required three doses of the HBV vaccine and those who declined to offer consent were excluded from the study.

Well-structured questionnaire were used to obtain relevant information and demographic data from the study subjects.

2.3 Collection and Processing of Samples

Three (3 ml) of blood samples were collected aseptically by venipuncture using Syringe and needle. Each blood sample was transferred from the syringe into a carefully labeled plastic microtitre tube containing ethylene diaminetetraacetic acid (EDTA) and stored in the refrigerator at 4°C. Each resultant supernatant (Plasma) was carefully decanted into a new labeled tube and stored at -20°C until ready for use.

2.4 Laboratory Assay

Assay of collected sample was carried out using the HBsAg test strip manufactured by Dia Spot® Diagnostics, is a rapid chromatographic immune assay for the qualitative detection of hepatitis B surface antigen in serum or plasma. And can be read in-vitro having more than 99.9% sensitivity and 97.0% specificity. The interpretation of test results was performed according to the manufacturer’s specifications. Blood levels of alanine amino-transferase (ALT) and aspartate amino-transferase (AST) were analyzed using an automated chemistry analyzer (Cobas Integra 400™; Roche, Mannheim, Germany). The test

was carried out and interpreted according to the manufacturer’s instructions.

2.5 Statistical Analysis

Results were presented as percentages and frequencies while Data analysis was carried out using SPSS 10.0 software package. A p-value less than or equal 0.05 was considered significant. Chi-square (X^2) test was used to analyze categorical variables.

3. RESULTS AND DISCUSSION

3.1 Results

A total of 200 samples were tested for HBsAg. The age range of the subjects used in this study was 12 to 26 years. Most of the blood samples collected were from the female subjects 139(69.5%)] While 61(30.5%) was from the males. The female: male ratio was 3:1 (Table 1). Of the 200 samples tested for HBsAg, 189 (94.5%) tested negative while only eleven (11) tested positive giving a prevalence of 5.5%.

Considering the age group, subjects aged 22-26 years, recorded the highest prevalence of 7.8%, while subjects aged 17-21 years gave a prevalence of 5.7%. However, subjects aged 12-16 years showed a prevalence of 3.6%. Based on gender distribution, the prevalence of HBsAg in females which is 3.5% is higher compared to the males, which is 2.0% there was no statistical significance between the age groups and gender ($p>0.05$) with the value $p=0.1012$, as shown in Table 1.

The result based on educational background showed a prevalence of 11.4% among subjects who had no educational background, and 3.0% prevalence among secondary school students and 0% prevalence among students in tertiary institution with the value $p=0.5879$ as shown in Table 2.

Table 1. Distribution of HBsAg according to age and gender

| Age (years) | Number tested | Gender | | Number of positive subjects | | Number of negative subjects | |
|-------------|---------------|-----------|------------|-----------------------------|---------|-----------------------------|------------|
| | | Males | Female | Male | Female | Male | Female |
| 12-16 | 83 | 15(7.5%) | 68(34.0%) | 1(0.5%) | 2(1.0%) | 14(7.0%) | 66(33.0%) |
| 17-21 | 53 | 16(8.0%) | 37(18.5%) | 1(0.5%) | 2(1.0%) | 15(7.5%) | 35(17.5%) |
| 22-26 | 64 | 30(15.0%) | 34(17.0) | 2(1.0%) | 3(1.5%) | 28(14.0%) | 31(15.5%) |
| Total | 200 | 61(30.5%) | 139(69.5%) | 4(2.0%) | 7(3.5%) | 57(29.5%) | 132(66.0%) |

$P=0.1012$

Table 2. Distribution of HBsAg based on educational background

| Educational status | Number tested | Gender | | Number of positive subjects | | Number of negative subjects | |
|--------------------|---------------|-----------|------------|-----------------------------|----------|-----------------------------|-----------|
| | | Male | Female | Male | Female | Male | Female |
| None | 70 | 30(42.9%) | 40(57.1%) | 3(10.0%) | 5(12.5%) | 27(90.0%) | 35(87.5%) |
| Secondary | 100 | 21(21.0%) | 79(79.0%) | 1(4.8%) | 2(2.5%) | 20(95.2%) | 77(97.5%) |
| Tertiary | 30 | 10(33.3%) | 20(66.7%) | 0(0%) | 0(0%) | 10(100%) | 20(100%) |
| Total | 200 | 61(30.5%) | 139(69.5%) | 4(6.6%) | 7(5.0%) | 57(93.4%) | 34(24.5%) |

*P=0.5879***Table 3. Distribution of HBsAg based on demographic factors**

| Occupation | Number tested | Gender | | Number of positive subjects | | Number of negative subjects | |
|------------|---------------|----------|-----------|-----------------------------|----------|-----------------------------|------------|
| | | Males | Female | Male | Females | Male | Female |
| Students | 130 | 31(23.8) | 99(76.2%) | 1(3.2%) | 2(2.0%) | 30(96.8%) | 97(98.0) |
| Workers | 70 | 30(42.9) | 40(57.1%) | 3(10.0%) | 5(12.5%) | 27(90.0%) | 35(87.5) |
| Total | 200 | 61(30.5) | 139(69.5) | 4(6.6%) | 7(5.0%) | 57(93.4%) | 132(95.0%) |

*P=0.4929***Table 4. Distribution of HBsAg based on risky behaviors**

| Risky behavior | Number tested | Number of positive subjects | | Number of negative subjects | | | |
|-----------------------------|---------------|-----------------------------|------------|-----------------------------|----------|-----------|------------|
| | | Male | Female | Male | Female | | |
| Use of unsterilized objects | 190 | 59(31.1%) | 131(68.9%) | 4(6.8%) | 7(5.3%) | 55(93.2%) | 124(94.7%) |
| Multiple sex partners | 64 | 24(37.5%) | 40(62.5%) | 2(8.3%) | 5(12.5%) | 22(91.7%) | 35(87.5%) |
| Alcohol consumption | 24 | 20(83.3%) | 4(16.7%) | 2(10.0%) | 0(0%) | 18(90.0%) | 4(100%) |

*P=0.5748***Table 5. Distribution of HBsAg based on clinical history**

| Clinical history | Number subjects tested | Gender | | Number positive | | Number negative | |
|---------------------------------------|------------------------|----------|-----------|-----------------|--------|-----------------|-----------|
| | | Male | Females | Males | Female | Male | Female |
| Previous History of STDs | 4 | 2(50.0%) | 2(50.0%) | 1(50.0%) | 0(0%) | 1(50.0%) | 2(50.0%) |
| Previous History of blood transfusion | 17 | 2(11.8%) | 15(88.2%) | 0(0%) | 0(0%) | 2(50.0%) | 15(50.0%) |
| Previous History of surgery | 5 | 2(40.0%) | 3(60.0%) | 0(0%) | 0(0%) | 2(50.0%) | 3(50.0%) |

(P>0.05)

Based on demographic factors, a 2.3% prevalence among students and 11.4% prevalence among workers was recorded (*P=0.4929*) as shown in Table 3.

Based on risky behaviors, 5.8% prevalence was recorded among subjects with history of using unsterilized objects in the past, 10.9% prevalence was recorded among subjects who had more than one sex partners and 8.3%

prevalence among subject that indulge in alcohol, (*p=0.5748*) shown in Table 4. Based on clinical history, 50.0% prevalence was recorded among subjects who had once been diagnosed with STDs, Table 5.

Table 6 shows the ALT and AST result for the positive samples. All 11(100%) subjects recorded a normal result while none (0%) of the subjects recorded an abnormal result.

Table 6. Determination of serum Alanine aminotransferase level (ALT) and Aspartate aminotransferase on HBsAg subjects

| Age group | Sex | No of positive subjects (%) | ALT | | AST | |
|-----------|---------|-----------------------------|------------|--------------|------------|--------------|
| | | | Normal (%) | Abnormal (%) | Normal (%) | Abnormal (%) |
| 12-16 | Males | 1(6.7%) | 1(6.7%) | 0(0%) | 1(6.7%) | 0(0%) |
| | Females | 2(13.3%) | 2(13.3%) | 0(0%) | 2(13.3%) | 0(0%) |
| 17-21 | Males | 1(6.3%) | 1(6.3%) | 0(0%) | 1(6.3%) | 0(0%) |
| | Females | 2(12.5%) | 2(12.5%) | 0(0%) | 2(12.5%) | 0(0%) |
| 22-26 | Males | 2(6.7%) | 2(6.7%) | 0(0%) | 2(6.7%) | 0(0%) |
| | Females | 3(8.8%) | 3(8.8%) | 0(0%) | 3(8.8%) | 0(0%) |
| Total | | 11(100%) | 11(100) | 0(0%) | 11(100%) | 0(0%) |

(P>0.0)

3.2 Discussion

Worldwide, viral hepatitis is the commonest cause of liver dysfunction. The prevalence of HBV varies between 2% in developed countries where the prevalence is low to about 8% in developing countries where infection is endemic with sex, age and socioeconomic status as important risk factors for infection [14].

From this study, the overall prevalence of HBsAg among apparently healthy individuals in Omuraran community was 5.5%. This is comparable to the result obtained by Ndako et al. [15] who recorded a prevalence of 5.3% among alcoholic subjects and 5.4% prevalence among blood donors reported in a study conducted at Benin City [16]. Another study conducted by Uguwuja and Uguwu [17] showed a 4.1% prevalence of HBsAg among adolescents in Abakaliki, South-Eastern Nigeria, which is lower than the result obtained in this study.

Okonko et al. [18] reported a lower prevalence of 2.5% among apparently healthy blood donors in Port Harcourt which is similar to the 2.4% prevalence recorded in a similar study conducted in Yola, Nigeria- according to the report of Olokoba et al. [19], and a Null result (0.0%) reported by Alli et al. [20] among blood donors in Ibadan. The 5.5% prevalence of HBV in this study is higher than the prevalence rate of 1.6% among blood donors in Port Harcourt reported by Ejele and Ojule [21] and 4.0% prevalence reported in the work of Abdalla et al. [22], among Kenyan donors.

The differences in prevalence in this study could be attributed to difference in population selection. Results obtained showed that 7.8% of the subjects in the age group 22-26 years had the highest prevalence of HBsAg compared to their counterparts in age group 12 to 21 with

prevalence of 4.4%. This is similar to the work of Buseri et al. [23], who reported HBV prevalence to be highest among subjects aged group 18-27 years.

The high prevalence rate of HBV was recorded among subjects aged 22-26 in this study which suggests that most of these subjects may have acquired the infection through risky lifestyles or behaviors such as the use of unsterilized objects while others may have acquired the infection, through sexual promiscuity. The classification of high endemicity from HBV infection has been greater than 7% in an adult population as reported by Uneke et al. [24]; Okonko and Udeze [25], but comparatively low in this study. The incidence of HBV transmission through sex and unsterilized objects could be reduced with the introduction of HBV vaccines and public enlighten campaign against this virus [26,27].

Based on gender it was found that male subjects recorded a higher seropositivity for HBsAg (6.6%) compared to their female counterparts (5.0%). The difference was however, not significant ($p > 0.05$); the reason for this difference might be due to larger number of female volunteers used in this study. Uneke et al. [24] suggested that both sexes are equally susceptible to HBV infection while gender may not necessarily be an important epidemiological determinant of HBV infection. Mehmet et al. [28] reported that males had higher prevalence rate than females in both rural and urban areas with observation that male sex was an important risk factor for HBsAg positivity, which is contrary to the result obtained in this study. Balogun et al. [29] in their study reported higher prevalence of HBsAg among males than females in Lagos, Nigeria.

A similar study also reported a higher HBsAg seroprevalence in males than females among

subjects attending Dental Clinic at the University College Hospital (UCH), Ibadan and this was suggested to be due to shorter HBsAg carrier rate in females than males [30,31,32]. In addition, the reason for the high infection rate among the males may be due to habits such as multiple sexual partnership and poor educational background which affect enlightenment and promote the transmission of the virus [32]. Lack of statistically significant difference in the prevalence between males and females in this study suggests that both genders are equally exposed to HBV infection [33,17]. Based on Educational background, a prevalence of 11.4% among subjects without any Educational background were found to be higher than the 3.0% prevalence among secondary school students and the 0% prevalence among those with tertiary education, which shows that educational background may assist at prevention of transmission by enlightenment strategies.

Analysis based on clinical history of the subjects showed 50.0% prevalence was recorded among subjects with history of Sexually Transmitted Diseases (STDs) compared to 0% prevalence recorded among subjects with history of blood transfusion and surgery respectively. Based on demographic features, prevalence of 11.4% among the workers was higher than the 4.3% prevalence among students, possible reasons might be due to lack of awareness as most of them do not have knowledge of the virus and are at high risk of infection [34,18]. Risky behavioral pattern showed 5.5% prevalence among individuals who were exposed to unsterilized objects compared to 3.5% and 1.0% prevalence among those that have more than one sex partner and subjects involved in alcoholism respectively, which are both high predisposing factors in the population as observed by Ndako et al. [35] in a study among apparently healthy individuals in an Urban setting in North central Nigeria.

The Amino-transferase levels of the individuals within the age groups used for the study were normal. The mean serum alanine amino transferase (ALT) enzyme level of subjects who tested positive was normal. (ALT normal range for study area/center: 1-12 IU/L). Which had no significant difference from aspartate amino transferase (AST) enzyme level (AST normal limit for study area/center: 1-18 IU/L). The transaminase enzyme levels in this study could also reflect the clinical characteristics of the study population involved. No abnormal ALT and

AST levels were recorded as 100% of the results all the positive samples showed that ALT and AST levels were normal [36].

4. CONCLUSION

This outcome of this research calls for a prompt enlightenment through mass screening of members of the community to identify those with the hepatitis B infection, establishing appropriate measures to manage the infection such as mass immunization of the uninfected population against the virus and periodic public health education to enlighten the entire community on the scourge of HBV infection. The possible risk factors and routes of infection are required as a measure to prevent spread of infection in the surrounding communities at large.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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