

# Serodiagnosis of Hepatitis B Virus Infection among Jessu Community of Gombe State, Nigeria

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**Abstract:** Hepatitis B virus causes disease of the liver and is a global health problem that leads to liver cirrhosis and hepatocellular carcinoma. Despite the dangers posed by this silent and deadly disease, there is little or no documented work on Hepatitis B infections in Jessu community, Gombe State, North East Nigeria. This study was undertaken to determine the seroprevalence of Hepatitis B Virus infection and possible risk factors associated with the transmission of HBV. Blood samples (3ml) were collected from 196 eligible consented subjects and the serum samples were tested for the presence of HBsAg using On Site HBsAg Rapid Test Kit manufactured by CTK Biotech, USA. The OnSite HBV 5-Parameter Rapid Test also manufactured by CTK Biotech, USA was used to confirm those that were positive. Of the 196 eligible subjects examined, 5.6% were confirmed positive for HBsAg, 8.6% were males and 2.9% were females. Age distribution of HBsAg among the population shows the highest seroprevalence of 8.9% HBsAg in ages 16-30 years, followed by 4.5% in ages 31-45 years while ages 0-15 years had 3.5% seroprevalence. Participants who share sharp objects recorded the highest prevalence of 6.3% HCV infection followed by blood transfusion with 5.9% prevalence and those with multiple sex partners had the least prevalence of 1.8% HCV infection. The seroprevalence of 5.6% HBV in this study indicated the presence of HBV in Jessu Community in Gombe State, North East Nigeria.

**Keywords:** Hepatitis, HBV, Hepatocytes, Hepatocellular Carcinoma, HBsAg, OnSite HBV 5-Parameter Rapid Test

## 1. Introduction

Hepatitis B virus infection is a contagious disease of the liver and a serious public health problem resulting to acute, chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma [1- 2]. It is 50 to 100 times more infectious than Human Immunodeficiency Virus (HIV) and 10 times more infectious than hepatitis C virus [3-7].

Hepatitis B viral infection is caused by hepatitis B virus (HBV) and spread primarily by blood, blood products and other body fluids [8]. The virus infects the liver, interfering with the functions of the liver by replicating in the liver tissues and attaches themselves to the hepatocytes using Pre S domain of the viral surface antigen, penetrating the cytoplasm and move into the nucleus of the hepatocytes.

During the course of the infection, the host immune response results in viral clearance and hepatocytes damage leading to hepatocellular necrosis and inflammation [9]. HBV itself does not cause cell death; most of the hepatocellular damages associated with HBV infection are mediated by cytotoxic CD<sub>8</sub><sup>+</sup> T-lymphocytes directed against the viral infected cells. Infection with HBV may lead to acute hepatitis, chronic hepatitis, hepatic failure, liver cirrhosis and Hepatocellular Carcinoma [10].

Sexual transmission of hepatitis B may occur, particularly in unvaccinated men who have sex with men and heterosexual persons with multiple sex partners or contact with sex workers. Infection in adulthood leads to chronic hepatitis in less than 5% of cases [8, 11].

Globally, Hepatitis B virus infection remains one of the most serious health problem facing humans today, with an

estimated incidence of 4.5 million and mortality of 786,000 deaths per year worldwide with Sub-Saharan Africa, including Nigeria having the highest incidence [12- 13]. Despite the dangers posed by this silent and deadly disease, there is little or no documented work on Hepatitis B infections in Jessu, Gombe State, Nigeria.

## 2. Materials and Methods

### 2.1. The Study Area

The study was carried out in Jessu village of Balanga Local Government Area of Gombe State, North-East, Nigeria. The study covers the period between Augusts – December 2017.

### 2.2. Ethical Consideration

Ethical clearance was obtained from the Ethical Committee of Gombe State Specialist Hospital, Gombe, before the commencement of the work.

### 2.3. Consent

The informed consent of each participant was obtained prior to sample collection and analysis.

### 2.4. Inclusion Criteria

All eligible subjects, male and female residence in Jessu Community who gave informed consent were included in the study.

### 2.5. Exclusion Criteria

Subjects who had been vaccinated with the required three doses of the vaccine, those who declined to offer consent and those who are not residence in Jessu Community were excluded from the study.

### 2.6. Sample Size

A sample size of one hundred and ninety- six (196) was calculated according to the formula described by Thrusfield [14].

### 2.7. Materials

OnSite HBsAg Rapid Test manufactured by CTK Biotech, Inc, 6748 Nancy Ridge Drive, San Diego, CA 92121, USA.

OnSite HBV 5-Parameter Rapid Test, manufactured by CTK Biotech, Inc, 6748 Nancy Ridge Drive, San Diego, CA 92121, USA.

### 2.8. HBsAg Rapid Test

#### 2.8.1. Assay Procedure

The HBsAg Rapid Test Strips (CTK Biotech, Inc. 6748 Nancy Ridge Drive, San Diego, CA 92121, USA) were brought to room temperature prior to the assay. Three milliliters (3ml) of plasma were collected into the sample containers. When ready to test, the pouches were opened at

the notch and test strips removed. The strips were dipped into the specimen for at least 10 seconds, and the specimens were not allowed to reach above the level indicated by the arrows on the strips. The strips were removed from the specimens and placed on a flat, dry surface.

#### 2.8.2. Results

The test results were read within 15 minutes. Negative Control: Only the C band shows color development. The T band shows no color development. Positive Control: Both C and T bands show color development. The appearance of any burgundy color in the T band, regardless of intensity, was considered reactive.

### 2.9. Hbv Profile

The OnSite HBV 5-Parameter Rapid Test (CTK Biotech, Inc, 6748 Nancy Ridge Drive, San Diego, CA 92121, USA) is a lateral flow chromatographic immunoassay consisting of 5 test panel strips assembled in one cassette. Each strip of the panel member is composed of a sample pad, colloid gold conjugate pad, nitrocellulose membrane (NC membrane) strip pre-coated with control band (C band) and test band (T band), and absorbent pad.

#### 2.9.1. Assay Procedure

The test components were brought to room temperature prior to assay. The pouch devices were open and placed on a clean, flat surface. The devices were labeled with specimen's ID number. Three Drops of the specimen were dispensed into each of the sample well avoiding air bubbles.

#### 2.9.2. Results

Results were read in 15 minutes. Positive results were visible within one minute. Negative Result: If only the C band is developed on the HBsAg, HBsAb, HBeAg strip or both C and T bands are developed on either the HBeAb or the HBcAb strip, the test indicates the absent of the parameter being tested. Positive Result: If both C and T bands are developed on the HBsAg, or HBsAb, or HBeAg strip or only the C band is developed on the HBeAb or HBcAb strip, the test indicates the presence of the parameter being tested. Invalid: If no C band is developed, the assay on the strip is invalid regardless of color development on the T band.

### 2.10. Statistical Analysis

The data obtained was analyzed using statistical package for social sciences (SPSS) version 22. Chi-square test was used ( $P \leq 0.05$ ).

## 3. Result

Of the 196 samples screened, 11(5.6%) tested positive for HBsAg. Male subjects recorded a prevalence of 8/93 (8.6%) while female subjects had a prevalence of 3/103(2.9).  $\chi^2 = 2.987$ ;  $P = 0.042$ ;  $P < 0.05$  (Table 1).

Table 2: Indicates the age distribution of HBV infection

where ages 16 – 30 years had the highest prevalence of 7/79 (8.9%), followed by ages 31 – 45 years with prevalence of 1/22(4.5%) and ages 0 – 15 years had the least prevalence of 3/86 (3.5%).  $X^2 = 2.889$ ;  $P = 0.577$ ;  $P > 0.05$ .

Table 3: showed distribution of HBsAg among participants in relation to risk factors. Individual with multiple sex partners had prevalence of 1/56 (1.8%) while those without multiple sex partners revealed prevalence of 10/140 (7.1%).  $X^2 = 2.167$ ;  $P = 0.141$ ;  $P > 0.05$ . Prevalence of HBsAg in relation to history of blood transfusion shows that, people with history of blood transfusion (17) had prevalence of

1(5.9%), while those without the history of blood transfusion (179) had prevalence of 10 (5.6%).  $X^2 = 0.003$ ;  $P = 0.960$ ;  $P > 0.05$ . Regarding surgical history 0/18 (0.0%) no case of hepatitis B infection was recorded, while a prevalence of 11/178 (6.2%) was noted among individuals without a history of surgery.  $X^2 = 1.178$ ;  $P = 0.278$ ;  $P > 0.05$ .

The distribution of HBsAg with respect to sharing of sharp objects showed a higher prevalence of 8(6.3%) in those that share sharp objects, while 3(4.3%) prevalence was recorded in those who do not share sharp objects.  $X^2 = 0.362$ ;  $P = 0.548$ ;  $P > 0.05$ .

**Table 1.** Distribution of HBsAg among Jessu Community in Relation to Sex.

HBsAg Rapid Test HBV 5 Parameter Test			
Sex	No. Tested	No. Pos. (%)	No. Confirmed Pos. (%)
Male	93	8 (8.6)	8(8.6)
Female	103	3 (2.9)	3(2.9)
TOTAL	196	11 (5.6)	11 (5.6)

$X^2 = 2.987$ ;  $P = 0.04$

**Table 2.** Distribution of HBsAg among Jessu Community in Relation to Age.

HBsAg Rapid Test HBV 5 Parameter Test			
Age Group	No. Tested	No. Pos. (%)	No. Confirmed Pos. (%)
0-15	86	3 (3.5)	3 (3.5)
16-30	79	7 (8.9)	7 (8.9)
31-45	22	1 (4.5)	1 (4.5)
46-55	6	0 (0.0)	0 (0.0)
56-above	3	0 (0.0)	0 (0.0)
TOTAL	196	11 (5.6)	11 (5.6)

$X^2 = 2.889$ ;  $P = 0.577$

**Table 3.** Prevalence of HBsAg among Jessu Community in Relation to HBV risk factors.

Risk HBsAg Rapid Test HBV 5 Parameter Test				
Factors	Tested	No. Pos. (%)	Confirmed Pos. (%)	$X^2/P$ Value
Multiple sex partners				
Yes	56	1 (1.8)	1 (1.8)	$X^2 = 2.167$ $P = 0.141$
No	140	10 (7.1)	10 (7.1)	
Total	196	11 (5.6)	11(5.6)	
Blood Transfusion				
Yes	17	1(5.9)	1(5.9)	$X^2 = 0.003$ $P = 0.960$
No	179	10(5.6)	10(5.6)	
Total	196	11(5.6)	11(5.6)	
Surgery				
Yes	18	0(0.00)	0(0.00)	$X^2 = 1.178$ $P = 0.278$
No	178	11(6.2)	11(6.2)	
Total	196	11(5.6)	11(5.6)	
Sharing of sharps				
Yes	126	(6.3)	8(6.3)	$X^2 = 0.362$ $P = 0.548$
No	70	3 (4.3)	3(4.3)	
Total	196	11(5.6)	11(5.6)	

## 4. Discussion

This study revealed 5.6% seroprevalence of HBV infection (HBsAg) among residence of Jessu Community Gombe State, Nigeria, placing Gombe State, specifically Jessu community as an area of intermediate HBV endemicity (2-7% of HBsAg positive) according to World Health Organization criteria [9]. The result of this study was in conformity with 5.3% prevalence reported by Ndako [15] in

Billiri Local Government of Gombe State, Nigeria, and 6% prevalence reported by Adoga [4] among blood donors in Nasarawa State. The result is, however, lower when compared to 12.8% prevalence reported by Obi [16] among HIV patients in Borno and Gombe States of Nigeria, 8% prevalence reported by Isa [17] among Children attending Mohammed Shuwa Memorial Hospital Maiduguri, Borno State.

The result also showed a sharp declined of HBsAg prevalence when compared to 14% prevalence reported by

Wasa and Maigana [18] among undergraduate students of Gombe State University, 26.5% prevalence reported by Mustapha and Jibrin [19] among HIV patients in Gombe, Gombe State.

Gender distribution, revealed higher HBsAg prevalence in males (8.6%) compared to females (2.9%) counterpart, despite the high number of females (103) participation, the difference was significant ( $p = 0.04$ ). This is similar to what was reported by Okonko [20] with HBsAg prevalence higher among males (10.2%) than the females (5.9%), Wasa and Maigana [18] found higher HBsAg prevalence among males (20%) than females (5%), Mehmet [21] reported higher prevalence rate of 12.7% in males than 2.1% in females. The reasons for the high rate of prevalence among the males may be due to habits such as use of sharp objects in tattooing, intravenous drugs usage, homosexuality and keeping multiple sexual partners (sometimes encouraged on religion/cultural ground) which may be common among the males than in females counterparts and may play a role in the higher prevalence observed among men compared to women. The higher prevalence observed in males (8.6%) by this study contradicts findings of Okonko [20] who reported a higher HBsAg prevalence in females (10.2%) than males (5.5%), Sule [22] reported higher HBsAg seropositivity among females (15.6%) than the males (11.7%), Okechukwu [23] found higher prevalence in females (65.5%) than males (34.4%). The disparity may be attributed to the differences in socio-cultural, religious beliefs and the sample size or methodology used in the study areas and populations considered.

Age distribution of HBsAg showed age group 16-30 years had the highest prevalence of 8.9%, followed by ages 31-45 years with 4.5% prevalence and ages 0-15 years with 3.5% prevalence. Statistically, the difference observed among age group in this study was not significant ( $p = 0.577$ ). This is similar to the report of Okonko [20] that age was not significantly associated with HBsAg seropositivity among attendees of Association for Reproductive Family and Health (AFRH) Centre in Ibadan, Nigeria. Age of acquiring infection is the major determinant of the incidence and prevalence rates [11]. Higher HBsAg prevalence has been previously reported among younger age groups in some parts of Nigeria and outside Nigeria. Okonkwo [20] reported the highest prevalence among ages 16-29 years; Khan [5] found the highest prevalence among ages 21-30 years. Okechukwu [23] found the highest prevalence of HBsAg among ages 21-30 years. Mustapha and Jibrin [19] reported the highest prevalence among ages 40-49 years, Adewole [24] reported the highest prevalence among ages 30-40 years, Sule [22] reported the highest prevalence among ages 40-80 years. The findings may be due to the fact that most of the participants fall within the age range of high sexual activity thus supporting the role of sex in the viral transmission. In addition, youthful exuberance, sharing of contaminated sharp objects for fashionable expressions such as tattoo, ear and nose piercing increases their risk of exposure to infection.

The distribution of HBsAg in relation to the history of

blood transfusion showed that those with a prior history of transfusion recorded the higher prevalence of 5.9% than those with no history of blood transfusion. High risk of HBV infection in most of the developing and underdeveloped world countries is due to lack of proper screening of blood. All blood donations should be screened for evidence of infection including HBV prior to the release of blood and blood components for clinical use. This study revealed that 6.2% prevalence had no prior history of surgery while 0.0% prevalence had a prior history of surgery suggesting that surgery is not related to HBV infection in Gombe State, Nigeria. Participants who share sharp objects recorded a higher prevalence of 6.3% when compared to 4.3% prevalence of those who do not share sharp objects. This is similar to the report of Edia-Asuke [25].

## 5. Conclusion

The prevalence of 5.6% HBsAg among residence of Jessu Community Gombe State, Nigeria, revealed that HBV is endemic in Gombe State and Nigeria and there is a sharp decline of HBsAg prevalence when compared to 14% prevalence reported by Wasa and Maigana, [18] among undergraduate students of Gombe state University, Gombe state. This decline may be due to interventions by non governmental organizations on HIV/AIDS as prevention measures for HIV/AIDS can also prevent HBV infection. This study has provided additional information on the burden of HBV infection to the existing stock in Gombe State and Nigeria.

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