



# Seroprevalence of Hepatitis B Virus Infection amongst Pregnant Women in a Community North Central Nigeria

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author NJA Made substantial contributions to the drafting and conception of this Research. Author MJD Made substantial contributions on design module of the work. Authors FVO and II Made substantial contributions on the laboratory analysis of the samples obtained. Author OO Made substantial contributions on the statistical analysis used in the work. Author OMC Made substantial contributions to the field analysis and sample collection of this Research. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background:** Hepatitis B virus (HBV) is a global challenge mostly in developing countries. Hepatitis B virus has infected almost one third of the world population. Pregnant women infected with hepatitis B virus (HBV) can transmit the infection to their fetuses and newborns. As a result of the developing status of most of our communities screening of antenatal attendees is rarely done as a routine in most health facilities that offers antenatal services, hence the need for this studies at our location of study.

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**Methods:** One hundred and ninety (190) serum samples were screened among pregnant women on ante-natal care, using standard ELISA method. A well-structured questionnaire was administered to individuals to determine incidence rates and identify relative risk factors that predispose subjects to the Hepatitis B Virus (HBV) infection.

**Results:** From the total samples screened, Sixty-three, 63 (33.2%) were found to be positive for Hepatitis B virus. The highest prevalence was found among those aged 21-30 with overall number of 37(19.5%) Positivity,  $X^2 = 1.508$ ;  $P = 0.471$ . Considering educational status of subjects screened, high prevalence was recorded among those without formal education with 25(13.2%) Prevalence,  $x^2 = 5.381$ ;  $P = 0.146$  considering the various risk factors, subjects with history of tattooing/tribal markings recorded 41(21.6%), while women in their second trimester of pregnancy had a higher prevalence of 42(22.2%).

**Conclusions:** This study recorded a high prevalence of Hepatitis B virus infection amongst pregnant women at our study location, which also reflects high probable risks of HBV perinatal transmission. It is therefore strongly recommended that pregnant women be routinely screened for Hepatitis B virus infection as part of antenatal care services.

*Keywords: Hepatitis B; infection; pregnant; women.*

## ABBREVIATIONS

HBV :Hepatitis B Virus;  
CTL :Cytotoxic T lymphocyte;  
ALT :Alanine transaminase;  
ANC :Antenatal care;

## 1. BACKGROUND

Hepatitis B virus (HBV) is classified under the Orthohepnavirus (Genus) and Hepadnavirus (Family). The Virus consist of several particle (virion) such as outer lipid envelope and icosahedral which comprises of protein [1,2]. Furthermore, these nucleocapsid serve as an enclosure material to viral DNA polymerase that converse the transcriptase activity [3]. The enclosed protein inside the outer envelope serves as a medium for viral binding and entry of cells that are susceptible. According to Jake (2010), HBV viruses are spherical, have a double-shell and are 42nm in diameter [4].

Hepatitis B infects the liver of apes and humans thereby causing an inflammation referred to as hepatitis. Yoo, (2018) revealed that hepatocellular carcinoma also known as liver cancer is the sixth most occurring cancer globally and causes a large number of cancer deaths and consequently infect human thereby causing inflammation called hepatitis [5]. Most part of the Asian and African countries has experienced an epidemic of disease. This particular disease was formally known as serum hepatitis.

Infection with hepatitis B virus can either be chronic or acute (self-limiting). The acute form of this virus can be treated within a period of weeks to months unlike the chronic form.

Subsequently, adult or older children who are infected have the tendency of full recovery and furthermore develop resistance to this virus. [6].

However, infant and young children are mostly exposed to this virus due to low protective immune system to fight the infectious agent. Research has also revealed that only 5% of infants infected during child birth will have immunity to the virus and recover from the infection, while 70% of young children aged 1- 6 will recover fully from the infection [7].

The Hepatitis B virus is asymptomatic in nature. This nature of asymptomatic is found in chronic infection of HBV and sometime related with chronic liver inflammation (chronic hepatitis), thereby leading to cirrhosis of the Liver, which progresses to hepatocellular carcinoma [8]. Infected mother with hepatitis B surface antigen has 20% rate of transferring this virus to the new born offspring and 90% of mother are usually at a high risk of positive hepatitis B antigen [9].

When the immune systems of the host fight back, this may cause viral clearance and hepatocellular damage. Meanwhile, there is no significant effect when the innate immune systems respond to this virus. HBV is very harmful because it affects the function of the liver by replicating within the liver cell in the host which further produces antiviral cytokines capable of removing Hepatitis B virus from viable hepatocyte. This cytotoxic T lymphocyte (CTL) eradicates the virus [10,11].

The damages caused by HBV to the liver are as a result of the host immune system responding to the virus which is a foreign substance. This can

in turn, cause damage to the liver cell through the immune response in fighting the HBV. This is to show that the process of immune response to the virus is both destructive and protective.

However, studies reveal that a balanced outcome can be obtained in this process. Some infected chronic carriers of this virus may be healthy without any damage or development of cirrhosis severe scarring or fibrosis of the liver) and its complication [12].

Hepatitis B infection can be found in neonates, which results during the process of parturition. Maternal acute hepatitis B virus occurs with 70% transferability. Documentations showed that about 35% to 50% of hepatitis B virus (HBV) carriers occur during child birth due to the transfer of contaminated fluid or blood from infected mother in-utero to the offspring [13,14].

Hepatitis B antigen in pregnant women sometimes determines the perinatal transmission rate of the virus. Studies conducted showed that, mothers infected with both Hepatitis B surface 's' antigen and the 'e' antigen, will record about 70% - 90% offspring related chronic carriers [15].

## 2. MATERIALS AND METHODS

### 2.1 Study Area

This research was conducted among pregnant women attending the ante-natal unit of the New Bussa General Hospital-North central Nigeria.

### 2.2 Study Population

This study focused on pregnant women attending the antenatal unit of the New Bussa General Hospital. A well-structured questionnaire was issued to obtain demographic and other related data from the volunteer subjects.

### 2.3 Inclusion and Exclusion Criteria

All consenting pregnant women between age 15 and 49 years were considered eligible to participate in this research. Non-pregnant women were excluded from the study.

### 2.4 Sample Collection

Venous blood of about 3mls was collected from the volunteer-subjects, which were labelled appropriately. The blood samples obtained were allowed to clot and sera carefully separated into cryovials and stored at -20°C prior use.

## 2.5 Sample Processing

Samples obtained, were screened using the HBsAg ELISA kit; CTK Biotech, Inc. Procedures for the assaying of sample using the ELISA Kit was based on the manufacture's manual.

## 2.6 Data Analysis

Data obtained were subjected to statistical analysis. Comparison of numerical variables between the study groups was done using chi square. Frequency tables and percentages were utilised for categorical responses. Significant difference and association between variables were assessed at 95% level of confidence and 5% alpha level. This implies that only probability values (p-values) that are  $P < 0.05$  are considered significant.

## 3. RESULT

Of the one hundred and ninety (190) sera samples screened for HBsAg, 63 (33.2%), were positive while 127(66.8%) were negative.

**Table 1. Total number of sera samples**

Total number of samples	Number of positive samples	Number of negative samples
190	63 (33.2%)	127 (66.8%)

The seroprevalence of HBsAg in relation to age group showed a higher prevalence among subjects aged 21 – 30 with a record of 37(19.5%) positivity, this was closely followed by subjects 31–40years with 14(7.4%) prevalence, and in contrast subjects aged 10 – 20 years recorded 12 (6.3%) positivity.

Based on marital status, married women showed the highest prevalence of 60 (31.6%), compared with single women with 3 (1.6%) positivity.  $P < 0.005$ .

Considering demographic factors, the highest prevalence was observed among House wives with a record of 42 (22.1%), while traders recorded 9 (4.7%), followed by civil servants 7(3.7%), however volunteers who engaged in farming, recorded a positivity of 5 (2.6%).  $P$  value 0.000.

Based on trimester, subjects at their 2<sup>nd</sup> trimester showed the highest prevalence of 42 (22.1%), followed by those at their 1<sup>st</sup> trimester with 18

**Table 2. Distribution of HBsAg according to age**

Age	Total number of samples examined (%)	Number of positive samples (%)	Number of negative samples (%)
10 – 20	44 (23.2)	12 (6.3)	32 (16.8)
21 – 30	100 (52.6)	37 (19.5)	63 (33.2)
31 – 40	46 (24.2)	14 (7.4)	32 (16.8)
<b>Total</b>	<b>190 (100)</b>	<b>63 (33.2)</b>	<b>127 (66.8)</b>

*Chi Square ( $\chi^2$ ) = 1.508; n df = 2; p = 0.471*

**Table 3. Distribution of HBsAg according to trimester**

Characteristics	Total number of samples examined (%)	Number of positive samples (%)	Number of negative samples (%)
1 <sup>ST</sup> trimester	20	18 (9.5)	2 (1.1)
2 <sup>nd</sup> Trimester	95	42 (22.1)	53 (27.9)
3 <sup>rd</sup> Trimester	75	3 (1.6)	72 (37.9)
<b>Total</b>	<b>190</b>	<b>63 (33.2)</b>	<b>127 (66.8)</b>

*Chi square ( $\chi^2$ ) = 1.508, df = 2, P value = 0.471*

**Table 4. Prevalence of HBsAg among pregnant women screened based on marital status**

Status	Total number of samples examined (%)	Number of positive samples (%)	Number of negative samples (%)
Married	160 (84.2)	60 (31.6)	100 (52.6)
Single	27 (14.2)	3 (1.6)	24 (12.6)
Divorced	2 (1.1)	0	2 (1.1)
Widowed	1 (0.5)	0	1 (0.5)
<b>Total</b>	<b>190 (100)</b>	<b>63 (33.2)</b>	<b>127 (66.8)</b>

*Chi square ( $\chi^2$ ) 8.771; df = 3; P value = 0.033*

**Table 5. Prevalence of HBsAg among pregnant women according to educational status**

Status	Total number of samples examined (%)	Number of positive samples (%)	Number of negative samples (%)
None	60 (31.6)	25 (13.2)	35 (18.4)
Primary	45 (23.7)	10 (5.3)	35 (18.4)
Secondary	39 (20.5)	15 (7.9)	35 (18.4)
Tertiary	46 (24.2)	13 (6.8)	24 (12.6)
<b>Total</b>	<b>190 (100)</b>	<b>63 (33.2)</b>	<b>33 (17.4)</b>

*Chi Square ( $\chi^2$ ) = 5.381; df = 3; P = 0.146*

**Table 6. Prevalence of HBsAg among pregnant women based on occupational status**

Status	Total number of samples examined (%)	Number of positive samples (%)	Number of negative samples (%)
House wife	78 (41.1)	42 (22.1)	36 (18.9)
Trading	59 (31.1)	9 (4.7)	50 (26.3)
Civil servant	47 (24.7)	7 (3.7)	40 (21.1)
Farming	6 (3.2)	5 (2.6)	1 (0.5)
<b>Total</b>	<b>190 (100)</b>	<b>63 (33.2)</b>	<b>127 (66.8)</b>

*Chi Square ( $\chi^2$ ) = 37.485; df = 3; P value = 0.000*

**Table 7. Distribution of HBsAg based on risk factors in pregnant women**

Risk factors	Total number of samples examined (%)	Number of positive samples (%)	Number of negative samples (%)
Tattoo	99 (52.1)	41 (21.6)	58 (30.5)
Sharp objects	26 (13.7)	9 (4.7)	17 (8.9)
Transfusion	25 (13.2)	5 (2.6)	20 (10.5)
I.V Drugs	40 (21.1)	8 (4.2)	32 (16.8)
<b>Total</b>	<b>190 (100)</b>	<b>63 (33.2)</b>	<b>127 (66.8)</b>

Chi Square value ( $\chi^2$ ) = 8.147; df = 3; P = 0.043

(9.5%) while subjects at their 3<sup>rd</sup> trimester recorded 3(1.6%) positivity. P < 0.005.

Based on educational status of subjects screened, subjects without any formal education recorded the highest prevalence of 25 (13.2%), compared to those with secondary education recording 15 (7.9%) positivity.

Furthermore, subjects with tertiary level of education recorded 13 (6.8%) positivity, compared to those who had at least a primary level of education; these recorded 19 (5.3%) positivity. P < 0.005.

#### 4. DISCUSSION

The High rate of HBV prevalence recorded among pregnant women from this study is alarming which poses a major global health concern to our location of study. Studies conducted by Olaleye, et al. 2013 [16] and Sonia, et al. 2014 [17] showed 35% - 50% of hepatitis B virus (HBV) carriers occur during child birth due to the transfer of contaminated fluid or blood from infected mother either in-utero to the offspring [16]. Hence, the perinatal transmission's dependence on hepatitis B e antigen status of the mother. Further studies revealed that mothers infected with both e antigen and the surface antigen recorded 70%-90% chronic carriers status among the offspring [17].

The result obtained in this study is in contrast with related studies conducted in Benin city Nigeria among women attending antenatal clinic which recorded a lower prevalence of 2.2% [18] while a rather high prevalence rate of 4.6 % and 5.6 % was recorded by Obi *et al.*, (2006) and El Sheikh *et al.*, (2007) in Nigeria and Sudan respectively. Although, there was a higher prevalence of 22.5% among pregnant women in Rwanda in a study conducted by Mwumvaneza, et al. (2017), [19].

This estimated burden effectively classifies HBV infection as highly endemic (>8%) among

pregnant women in our study location according to the World Health Organization [20]. The wide variations in the reported seroprevalence of HBV in the pregnant women may be due to geographical variation, differences in cultural practices, sexual behaviour and practices, and differences in the test methods employed to detect HBV infection [21].

Considering the marital status of the subjects screened, the highest prevalence rate of 31.6% was recorded among married subjects compared to single mothers with 1.6% seropositivity, this agrees with a similar work done by Sali *et al*, in Iran which revealed higher prevalent rate of 77.4% among married women especially among those from polygamous settings with infected husbands.

This highlights the fact that marriage increases the risk of HBV infection as certain cultures allows men to have more than one partner legally at the same time, stressing the role of men in the widespread of infection as sexual contact with an infected partner plays a major role in transmission of HBV independent of its endemicity [22]. In the study by Abdollahi, *et al* the rate of HBV was higher in singles than those who had married at least once [23]. In another study by Zali *et al.* marital status was also a key indicator of prevalence [24]. Hence the need for periodic screening of intending couples before marriage is highly advocated.

A statistical significant difference was observed in this study based on occupational status of subjects screened, a prevalence of 42 (22.1%) was recorded among full time house wives, compared to other subjects in other status, this can be attributed to the culture inherent at our location of study with regards to most women not being allowed to engage in paid employment.

Based on educational status, highest seroprevalence rate of 13.2% was recorded among subjects with non – formal education.

This agrees with the work of Belyhun, (2016) in Ethiopia which also showed similar results at a rate of 7.4% [25]. Based on trimester, highest prevalence rate was recorded among subjects in their second trimester followed by those at the first trimester, the result obtained from this research indicates that women infected with hepatitis B virus during pregnancy would invariably infect their offspring during childbirth, this agrees with the work of [26].

Considering other independent risk factors, the highest seroprevalence rate of 21.6% was observed among those with recorded history of tattoos followed by those that had contacts with sharp objects with the rate of 4.7%. However, a prevalence of 2.6% positivity was recorded for subjects with history of blood transfusion. This showed a similar result with the work of Bertolini, (2006) in Parana, Brazil and Al Awaidy, (2006) in Oman, Qatar which revealed such practices as an important route for the spread of HBV. It is worthy of note that the identifiable variables as observed from our study subjects contributes immensely as predisposing factors to the acquisition of among our study population [27,28].

## 5. CONCLUSION

Health education on the prevention of hepatitis B transmission among households should be based on sound epidemiological data. Prejudice and indiscriminate segregation of cases or carriers should be avoided. Cases and carriers should be advised to practise good personal hygiene, including proper hand washing and aseptic handling or disposal of items contaminated with blood and other body secretions. Household members should avoid the habits of sharing items such as toothbrushes, towels, handkerchiefs, clothes, razors, and combs. Similarly there should be a routine screening for HBV markers among the population at periodic intervals, while the need for Hepatitis B vaccination is strongly recommended for communities with a high level of susceptibility to the infectious agent.

## CONSENT

Only consented volunteers, obtained through volunteer forms filled by respective subjects were enrolled for the study. The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## ETHICAL APPROVAL

Ethical clearance and approval was obtained from the appropriate ethical committee of the Hospital.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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