

## Distribution of HBs Antigenaemia in Pregnant Women-A Community Based Epidemiological Studies

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### ABSTRACT

Infection with hepatitis B virus (HBV) is a serious public health problem worldwide and leads to a wide spectrum of clinical presentations, ranging from asymptomatic carrier state to acute self-limiting infection or fulminant hepatic failure, chronic hepatitis with progression to cirrhosis, and hepatocellular carcinoma (HCC). Transmission of HBV from carrier mothers to their babies can occur during the perinatal period, and appears to be the most important factor in determining the prevalence of infection in high endemic areas. Three hundred (300) sera samples were screened among pregnant women attending a rural ante-natal clinic, using standard ELISA and the 5-panel test methods to estimate the prevalence, Markers and identify risk factors associated with the infection. Structured questionnaire was administered to subjects to obtain risk factors associated with the Hepatitis B Virus. Result showed a prevalence of 38 (12.6%) among the pregnant women screened. Based on Age, subjects aged 20-24 recorded the highest prevalence of 14(4.7%) years, closely followed by those aged 15-19 with a prevalence of 10(3.3%) This Prevalence on age of subjects in this category was found to be statistically insignificant  $P > 0.005$ . Subjects at the second trimester of pregnancy recorded a higher prevalence of 34(11.3%).  $P > 0.005$  Serological markers showed; 28 (9.3%), 35 (11.6%), 5 (1.7%), 33(11.0%) and 20(6.7) for HBsAg, Anti HBs, HBeAg, Anti HBe and Anti HBe respectively ( $P < 0.005$ ). The findings showed a high prevalence of HBV infection among pregnant women. Screening of women in this category therefore would help in the early detection of HBsAg and possible prevention of neonatal transmission; hence the need for routine antenatal screening of all pregnant women.

**Keywords:** Screening, HBsAg, Hepatitis B markers, Pregnancy.

### 1. INTRODUCTION

Hepatitis is a general term meaning inflammation of the liver and can be caused by a variety of different viruses such as hepatitis A, B, C, D and E (Zuckerman, 2000). Hepatitis B is one of the world's most common and serious infectious diseases. It is estimated that more than one third of the world's population has been infected with the hepatitis B virus WHO, 2008.

Globally, about one third of the population has been infected with HBV; six percent (6%) are chronic carriers and over 600,000 people die each year from acute disease or chronic sequelae secondary to HBV infection (Wright, 2006).

On the basis of the HBV carrier rate, the world can be divided into high, medium and low endemic regions. The major concern is about high endemic countries, especially in Asia and Africa, where the most common routes of infection remain vertical transmission from mother to child and horizontal transmission between children (WHO, 2008). Most countries in Africa have a high HBV endemicity, with the exception of Morocco and Tunisia, which have intermediate endemicity (Su *et al.*, 2010). A prevalence rate of 10% of HBV was found among pregnant women in Hong Kong (El *et al.*, 2012) and 17.3% in Burkina Faso (WHO, 2004) and 12% in Taiwan (Jacobsen *et al.*, 2010).

The prevalence of HBV surface antigen (HBsAg) has been reported to vary substantially among African countries from less than 5% to up to 15% (Sutcliffe *et al.*, 2002; Msuya *et al.*, 2006; Pirillo *et al.*, 2007). Sub-Saharan Africa is a region where the prevalence of anti-HBV antibodies and HBsAg is very high (Pawlotsky *et al.*, 1995; Kurbanov *et al.*, 2005; Makuwa *et al.*, 2006; Bekondi *et al.*, 2007). Infection caused by hepatitis B virus (HBV) is a serious public health problem causing about two billion infections worldwide (El Khourya and Wallace, 2012). Nigeria is classified among the group of countries endemic for HBV infection. A prevalence rate of 4.3 % was reported from Port Harcourt (Jacobsen *et al.*, 2010), 5.7% from Ilorin, (Ott *et al.*, 2012), 11.6% from Maiduguri (Kershenobich *et al.*, 2011) and 8.3% from Zaria (Kershenobich *et al.*, 2011). A seroprevalence of 23.3% was reported among patients attending antenatal clinic at the Aminu Kano Teaching Hospital (AKTH) (Alvarado-Mora *et al.*, 2011).

Individuals with chronic infection are at risk for the development of complications of chronic hepatitis B such as cirrhosis, hepatic decompensation, and hepatocellular carcinoma (Lavanchy, 2004 and Goldstein, 2005). Chronic hepatitis B accounts for more than 600,000 deaths from decompensated cirrhosis or

hepatocellular carcinoma each year and is the 10th leading cause of death worldwide. (Lavanchy, 2004 and Goldstein, 2005).

Transmission is commonly through blood transfusion, blood products, use of contaminated needles, vertical transmission (mother to child through infected birth canal), and sexual contact (WHO, 2009). Neonates born of chronically infected mothers have a 70-90% risk of the infection progressing to a chronic phase (El Khourya and Wallaceb, 2012).

Vaccination is the most effective measure to reduce the global incidence of hepatitis B. Compared to other healthcare interventions, vaccination is an economically advantageous option, both in terms of cost-effectiveness and benefit-cost ratios. In 1991, the World Health Organization (WHO) recommended that all countries introduce a policy of universal hepatitis B vaccination to prevent and control HBV infection and its long term sequelae on a global scale.

## 2. MATERIALS AND METHODS

### Study area and population

The research was carried out at Jos North and South LGA, Plateau State-Nigeria. Pregnant women at various trimesters attending antenatal clinic of the communities were recruited for this study.

### Ethical Clearance/Subject's Consent

Ethical clearance was sought and obtained from the ethical committee of the PSSH, while informed consent was obtained from each Volunteer included in the study.

### Questionnaire

A well-structured questionnaire was issued to the subjects to obtain demographic and other relevant data.

### Sample collection

3 mls of venous blood was collected, duly labeled and allowed to clot and sera carefully separated into cryovials and stored at -20<sup>0</sup>C prior use.

**HBsAg TESTING:** Assay of collected commenced by carrying out an On-the-spot testing for HBsAg using the HBsAg test strip (Acon Laboratory incorporated USA), according to the manufacturer's instructions. Confirmatory tests were then performed with Monolisa HBsAg ULTRA assay (HBsAg ELISA test reagent) (Biorad Laboratories,USA) which is a one-step enzyme Immunoassay according to the manufacturer's instructions. HBV-5 panel test for the qualitative assessment of the markers of hepatitis B virus infection in human serum, plasma and whole blood. The HBV Panel Test is an Immunochromatographic assay method to quickly detect five major markers of HBV infections, HBsAg, Anti-HBs (HBsAb), Anti-HBc (HBcAb), HBeAg and Anti-HBe (HBeAb) in human blood specimens.

## 3. RESULTS AND DISCUSSION

Prevalence of HBV among the pregnant women screened showed 38 (12.6%) Seropositivity. Based on Age, subjects aged 20-24 recorded the highest prevalence of 14(4.7%) years, closely followed by those aged 15-19 with a prevalence of 10(3.3%) This Prevalence on age of subjects in this category was found to be statistically insignificant  $P>0.005$ . Table 1. Subjects at the second trimester of pregnancy recorded a higher prevalence of 34(11.3).  $P>0.005$ , Table 2. Risk factors among Pregnant women screened showed that 14(4.6%) of subjects that tested positive had history of sharing sharp objects such as razor blades, nail cutters and scissors. This is followed by those who had history of blood transfusion 3(1.0%)  $P>0.005$ , Table 3. Educational status of subjects screened showed that subjects with Secondary level of Education recorded 21(7.0) Prevalence, Table 4. Prevalence of Markers among positive subjects screened, showed that the highest rate of positivity for HBsAg was 9.3%, the HBeAg recorded 1.7%. Anti-HBs which indicates antibody to the HBsAg showed 11.6% while Anti-HBe positivity recorded 11.0%, Anti-HBc Positivity showed 6.7%,) Table 5. Changes in Liver Enzymes among subjects that tested positive for the HBV showed a record of 26.3% Abnormality in ALT.

**Table 1: Distributions of Pregnant women screened based on Age.**

Age (years)	Total Number Exam. (%)	No. Pos. (%)	No. Negative (%)	P-value	OR	95% C.I
15-19	60 (20.0)	10(3.3)	50 (16.7)	0.070	1.33	0.33-5.36
20-24	150 (50.0)	14 (4.7)	136 (45.3)		0.69	0.18-2.60
25-29	40 (13.3)	7 (2.3)	33 (11.0)		1.41	0.33-6.10
30-34	27 (9.0)	4 (1.3)	23 (1.7)		1.16	0.23-5.81
35-39	10 (3.3)	2 (0.7)	8 (2.7)		1	
40-44	8 (2.7)	1 (0.3)	7 (2.3)			
45-49	5 (1.7)	0 (0)	5 (1.7)			

**Table 2: Distributions of Pregnant women screened based on Trimester.**

	Total Number Exam. (%)	No. Pos. (%)	No. Negative (%)	P-value	OR	95% C.I
<b>Trimester</b>						
<b>First</b>	8 (2.7)	0 (0.0)	8 (2.7)		-	-
<b>Second</b>	243(81.0)	34 (11.3)	209 (69.7)		1.83	0.62-5.42
<b>Third</b>	49 (16.3)	4 (1.3)	45 (15.0)	0.150	1	

**Table 3: Distributions of Pregnant women screened based clinical Risk Factors.**

	Total Number Exam. (%)	No. Pos. (%)	No. Negative (%)	P-value	OR	95% C.I
<b>Exposure to risky behaviors (Sharing of sharp objects)</b>						
<b>Yes</b>	80 (26.6)	14 (4.6)	66 (22.0)		1	
<b>No</b>	220 (73.3)	24 (8.0)	196 (65.3)	0.114	1.73	0.85-3.54
<b>History of Blood Transfusion</b>						
<b>Yes</b>	16 (5.3)	3 (1.0)	13 (4.3)		1	
<b>No</b>	284(94.7)	35 (11.6)	249 (83.0)	0.223	1.64	0.45-6.05
<b>History of Vaccination</b>						
<b>Yes</b>	67 (22.3)	1 (0.3)	66 (22.0)		1	
<b>No</b>	233 (77.7)	37 (12.3)	196 (8.03)	0.119	0.08	0.01-0.60

**Table 4: Distributions of Pregnant women screened based on demographic Factors and Educational Status.**

	Total Number Exam. (%)	No. Pos. (%)	No. Negative (%)	P-value	OR	95% C.I
<b>Family status:</b>						
<b>Monogamy</b>	239 (79.7)	27 (9.0)	212 (70.1)		1	
<b>Polygamy</b>	61 (20.3)	11(3.6)	50 (16.7)	0.151	0.58	0.27-2.25
<b>Educational status:</b>						
<b>Primary</b>	50 (16.7)	3 (1.0)	47 (15.7)		0.69	0.17-2.71
<b>Secondary</b>	136 (45.3)	21( 7.0)	115 (38.3)		1.96	0.83-4.64
<b>Tertiary</b>	20 (6.7)	6 (2.0)	14 (4.7)		4.61	1.39-15.29
<b>Informal</b>	94 (31.3)	8 (2.6)	86 (28.6)	0.045	1	

KEY: OR = Odd ratio.CI = Confidence Interval

**Table 5 - Prevalence of HBV markers among Positive subjects screened**

	HBsAg	HBeAg	Anti- HBs	Anti- HBe	Anti- HBc	P-Value
<b>Results</b>	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
<b>Positive</b>	<b>28 (9.3)</b>	<b>5 (1.7)</b>	<b>35 (11.6)</b>	<b>33(11.0)</b>	<b>20(6.7)</b>	
<b>Negative</b>	<b>272(90.)</b>	<b>295(98.0)</b>	<b>265(88.0)</b>	<b>267(89.0)</b>	<b>280(93.3)</b>	P<0.0001
<b>Total</b>	<b>300(100)</b>	<b>300(100)</b>	<b>300(100)</b>	<b>300(100.0)</b>	<b>300(100.0)</b>	

## DISCUSSION

Neonates who contract Hepatitis B Virus will have almost 90% risk of developing chronic HBsAg carriage and chronic liver disease. Infants may also spread the disease to siblings and to the community Sriprakash and Anil (1997). About 80-90% of chronic infections have been found amongst infected neonates born to HBsAg positive carrier mothers, followed by 30% of children uninfected before 6-months of age (Vranckx *et al.*, 1999)

When a pregnant woman is infected with HBV, there is a chance she may infect her fetus; 10-20% of women seropositive for HBsAg transmit the virus to their neonates (Vranckx *et al.*, 1999). In women who are seropositive for both HBsAg and HBeAg, mother-to-child transmission is approximately 90%. (Rumi, *et al.*, 1998; Luka, *et al.*, 2008).

In this study, 12.6% of pregnant women screened in our location of study were seropositive for the HBsAg. A similar work by Ndako *et al.* (2012) among pregnant women in Bayara Bauchi recorded a prevalence of 17.2%. The result obtained is significant if compared with a related study in Maiduguri which showed that prevalence increased from 11.6% in 1994 to 15.8% in 1999 (Onwuka and Baba, 1999). The study by Ndams *et al.*, 2008 among pregnant women at Minna, reported 12.3% prevalence.

Furthermore, the results obtained in this study are equally higher than those obtained by Pennap *et al.* (2011) who recorded a prevalent rate of 6.67% among pregnant women attending ante-natal clinic in Federal Medical Center Keffi, from Zaria, (8.3%) prevalence in a study carried out in Northwest Nigeria (Luka *et al.*, 2008 and Jatau *et al.*, 2009) and from Port Harcourt, South Nigeria (2.89%) prevalence was reported by (Obi *et al.*, 2006) while Akani *et al.*, 2005 reported a prevalent rate of 4.3% and from Ilorin, North Central Nigeria (Agbede, *et al.*, 2007) recorded a prevalence of 5.7% in a study conducted among mothers and their pre-school children.

In this study women aged 20-24 recorded 4.7% prevalence compared to other age groups, this is compared to the work of Ndako *et al.* (2011) where women aged 20-29 recorded 6.1% prevalence. This is however contrary to the report of Pennap *et al.* (2011) who recorded a high prevalence of 12.5% among pregnant women aged 40-44. The resultant high prevalence among this age group in our study is attributed to the fact that these women fall within the sexually active age bracket. According to Zali *et al.* (1996), age is an important factor in epidemiological studies hence the age of acquiring infection was found to be a major determinant of the incidence of HBV.

Most of the women studied were in the 2nd trimester of gestation, this group also had the highest HBsAg seropositivity of 11.3%, the result obtained in this study is similar to those of Ndako *et al.* (2011) where most of the women studied were also in their 2nd trimester of gestation, with a seropositivity of 12.8%, this is however lower than those of Ndams *et al.*, 2008 who obtained a higher prevalence of 13.4% at the 2nd trimester of pregnancy.

Women with a history of blood transfusions recorded a prevalence of 1.0%, while those with history of use of unsterilized/sharp instruments also recorded 4.6% prevalence which was statistically higher compared to other risk factors. This implies that the infections in this class of women possibly resulted from wounds obtained from exchange or re-use of sharp instruments.

Transmission mechanisms of infection include vertical transmission from mother to child, which is associated with a greater probability of generating carriers and consequently of maintaining the infection in the population. Some authors point out that the proportion of carriers among children born to mothers with a history of HBsAg seropositivity can range between 70% and 90% (Sáenz-González *et al.*, 2001) Thus, inclusion of the vaccine against HBV in the universal vaccination program has been recommended among the strategies for controlling the infection (WHO, 2008). These screening programs would allow the timely administration of a vaccine in newborns born to seropositive mothers (Sáenz-González *et al.*, 2001).

Sociodemographic factors, most importantly the level of health education on prevention, may play a role in our location of study. Other reasons include low economic status, low educational level, lack of early seeking of health-care assistance, and absence of a better effective utilization of available health-care facilities.

In endemic areas, where the rate is >5%, most individual are infected from a carrier mother to her baby through placenta and during delivery (vertical transmission) or in early childhood while horizontal transmission is also possible among children, families and close personal relations (Dufour *et al.*, 2000). Without intervention, a mother who is positive for HBsAg has a 20% risk of passing the infection to her offspring at the time of birth. This risk is as high as 90% if the mother is also positive for HBeAg. Hepatitis B virus has a high rate of vertical transmission causing congenital infections in babies born to infected mothers. The finding of this present study confirms the findings of earlier studies that HBV is endemic in Nigeria. It has also shown that ignorance remains a key factor in the spread of HBV in Nigeria, (Onwuliri *et al.*, 2008). From this study the highest rate of positivity recorded with regards to seromarkers involved the HBsAg with 9.3%, according to (Lee, 2010).

The presence of HBsAg for longer than 6 months after acute infection indicates chronic infection. The detection of HBsAg and absence of IgM anti-HBc in a single serum specimen also generally indicates chronic HBV infection. Shortly after the appearance of the HBsAg, the hepatitis B e antigen (HBeAg) generally becomes evident (Ganem and Prince, 2004). Although serum HBV DNA assays will show the presence of HBV DNA prior to the appearance of HBsAg or HBeAg, with HBV DNA levels, (Rehermann *et al.*, 1996).

The HBeAg recorded in this study showed 1.7%. Previous study (Yang *et al.*, 2004) reported that the presence of HBeAg in serum indicate active viral replication. The continued presence of HBeAg generally reflects higher HBV DNA levels and greater infectiousness according the study, Some patients with chronic HBV infection may have resolution of their HBeAg along with appearance of anti-HBe, and this usually

correlates with low (or absent) HBV levels and relatively normal levels of hepatic aminotransferase levels (Lee,1997).Conversely, Anti-HBe recorded 11.0%. Anti-HBs which indicate antibody to the HBsAg showed 11.6% While Anti-HBs recorded 18.7% positivity among subjects aged 15-19years, subjects aged 25-29 years recorded 8.4% positivity to the Anti-HBs. For those patients who resolve their infection, HBsAg disappears at about 3 to 6 months, often just prior to the detection of antibodies to hepatitis B surface antigen (anti-HBs).The presence of anti-HBs following acute infection generally indicates recovery and protective immunity against re-infection. In addition, patients with resolution of infection have disappearance of HBeAg and development of antibodies to hepatitis B e antigen (anti-HBe). Patients with resolved infection have persistence of anti-HBc for life, but about 4 to 6 months after the appearance of anti-HBc, the total anti-HBc predominantly consists of IgG. Some patients with self-limited infection, however, may still have low levels of HBV DNA in blood; whether the HBV DNA is part of intact virions remains unknown (Rehermann,1996).Earlier studies (Zhang *et al*, 2010) reported that the history of vaccination could be attributed to HBsAb positivity, which should increase the confidence of the population on immunization process.

Changes in Liver enzymes in the study conducted by Tsai *et al*,(2008), showed that Liver function tests are used to determine if the liver has been damaged or its function impaired. Elevations of certain liver tests in relation to others aids in that determination. The aminotransferases (which include ALT and AST) are notably elevated in liver damage caused by liver cell disease (hepatocellular disease). Alanine aminotransferase (ALT), Pregnant women screened in this study recorded 26.3% Abnormality in ALT levels which have been correlated positively with liver inflammation, while patients with persistently normal ALT levels had significantly lower liver damage compared with patients with either intermittent or persistently elevated ALT Levels (Zhang *et al*, 2011).Therefore measurement of aminotransferase levels by serial observations and analysis remain the most common and convenient way to identify liver inflammation in patients particularly with chronic HBV infection.

#### 4. CONCLUSION AND RECOMMENDATION

The reported prevalence in this study is a cause for concern and warrants the initiation of routine antenatal screening for HBV infection within communities. Similarly, HBV positive pregnant women represent a major reservoir of the virus in any community and can be passed on to the children either vertically or even horizontally. This finding equally underscores the need for a comprehensive programme of action to reverse the present state of endemicity and to halt further spread of the virus. It is hereby strongly recommended that awareness campaign about the disease be intensified while public immunization of the populace is highly encouraged.

#### 5. ACKNOWLEDGEMENT

Vice-Chancellor and Management of Landmark University Omu-aran, Kwara state.  
Staffs of the Microbiology Laboratory, LMU-Omuaran.  
Department of Biomedical sciences LAUTECH, Oshogbo Campus.  
Staffs of Virology department Federal College of Medical Laboratory Technology,Vom Plateau State.

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