ISSN (Print): 2476-8316
ISSN (Online): 2635-3490
Dutse Journal of Pure and Applied Sciences (DUJOPAS), *Vol. 6 No. 1 March 2020*

Prevalence of Hepatitis B Surface Antigen (HbsAg) and its' Immunological Biomarkers among Pregnant Women attending Antenatal Clinic at Murtala Muhammad Specialist Hospital Kano, Nigeria

***[1]Mukhtar, Isyaku Gwarzo, [2]Auwal, Sulaiman Salisu**

[1,2]Department of Human Physiology,
Bayero University, Kano.

*Email: mukhtargwarzo@gmail.com

Abstract

Hepatitis B virus (HBV) infection is a global health problem with Sub-Saharan Africa one of the regions worst affected. Vertical transmission from mother to child remains one of the major routes of transmission of the virus. Improving vaccination coverage can however reduce the risk of vertical transmission significantly. The aim of this study was to determine the seroprevalence of hepatitis B surface antigen (HBsAg) and its' associated immunological biomarkers among pregnant women attending antenatal clinic at Murtala Muhammad Specialist Hospital, Kano. Fifty pregnant women aged 18-40 years were recruited and assessed for HBsAg, hepatitis B surface antibody (HBsAb), hepatitis B e antigen (HBeAg), hepatitis B e antibody (HBeAb), and hepatitis B core antibody (HBcAb) by lateral flow chromatography using onsite HBV 5-parameter rapid test kits (CTK Biotech., CA, USA).Prevalence of HBsAg was 38%. The highest prevalence of 36.80% was observed in the age range of 15 - 24 and 25 - 34 year categories. Out of the 38% that were HBsAg positive, 36.80% had HBsAb, 10.50% had HBeAg and HBeAb, while all had HBcAb. History of blood transfusion, presence of scarification marks, vaccination status, and level of education were not significantly associated with HBsAg seropositivity. Prevalence of HBsAg among pregnant women attending antenatal clinic at Murtala Muhammad Specialist Hospital is very high. However, prevalence of active HBV infection is low. There is need for health education, improved vaccination services, and policies aimed at early detection and treatment of HBV.

Keywords: Biomarkers, Hepatitis B virus, Kano, Pregnancy

INTRODUCTION

Hepatitis B virus infection is a global public health problem; the 15th leading cause of death worldwide and hence a target for elimination by world leaders (Lavanchy and Kane, 2016; World Health Organization, 2017). It has been estimated that about 2 billion people have been exposed to viral hepatitis globally and 325 million were carriers of HBV and HCV as at 2015 (Rufai *et al*., 2017; WHO, 2017). Viral hepatitis was estimated to have caused 800,000 deaths globally in 2015 and about 96% of this was attributable to HBV and HCV(McLachlan and Cowie, 2015; Lavanchy and Kane, 2016; WHO, 2017). Sub-Saharan Africa and Western Pacific regions are the worst affected. Estimated global prevalence is between 0.1%-20% with wide variations between and within countries (McLachlan, Locarnini, and Cowie, 2015; Basnayake

**Author for Correspondence*

and Easterbrook, 2016). Liver cirrhosis and primary liver cell carcinoma are the main final common causes of death from various forms of viral hepatitis (Xiao *et al*., 2015). Perinatal transmission and contact with infected blood, blood products and body fluids remain the main routes of transmission (Buseri *et al*., 2009). Perinatal transmission is the main route of transmission in hyperendemic countries and this can be reduced by early identification and treatment of infected mothers (Chowdhury and Eapen, 2009). About 20%-60% of children infected between the ages of 1-5 years go on to develop chronic infection (Sibley *et al*., 2015; Basnayake and Easterbrook, 2016).

Hepatitis B virus is a double-stranded DNA virus belonging to the family of hepadnaviridae which is known to replicate by reverse RNA transcription (Maclachlan and Cowie, 2015). The genome is made up of a 3200-base pair double-stranded DNA enclosed in a lipoprotein envelope (Shah and Singh, 2007).

Even though much is known about the prevalence of HBV infection in Nigeria, there is wide variation in reported prevalence from different parts of the country and study population. In a meta-analysis of studies spanning 13-year period (2000-2013), Musa *et al.* (2015)reported a pooled national prevalence of 13.6%(0.5%-46.8%) and 14.1% among pregnant women in Nigeria. Yakasai *et al*. (2012)reported a prevalence of 7.9% among pregnant women attending antenatal clinic at a Aminu Kano Teaching Hospital in Kano, North West Nigeria. In another study among pregnant women in Kebbi State, North West Nigeria, a prevalence of 16.6% was reported (Yakubu *et al*., 2016). In a cross-sectional study of 124 HIV infected pregnant women attending antenatal clinic at Jos University Teaching Hospital, North Central Nigeria, Okoye *et al*. (2015) reported a prevalence of 12.1%. Researchers from south western part of the country generally reported lower prevalence rates compared to what was reported from northern part of the country. A prevalence rate of 4% was reported by Daniels *et al.*(2017) among pregnant women in Owo, Ondo state while Anaedobe *et al*. (2015) reported a prevalence of 8.3% among similar cohort in Ibadan.

Most studies in North West Nigeria focused on seroprevalence of HBsAg only rather than the complete biomarkers of HBV infection which gives a better picture of active on-going infection. Theaim of this study therefore, was to determine the seroprevalence of HBsAg and its immunological biomarkers among pregnant women attending antenatal clinic at Murtala Muhammad Hospital, Kano, North West Nigeria.

MATERIALS AND METHODS

STUDY AREA

The study was conducted at the antenatal clinic of Murtala Muhammad Specialist Hospital, Kano, Nigeria. The hospital is a 648-bed secondary health facility own by Kano state government. It was established in 1928 by the then British colonial government to provide health care services to colonial workers and those of native authority. The hospital provides both general and specialized care including maternity services to the teaming populace of Kano State and its environs.

Kano state is one of the 36 states of Nigeria with 44 local government areas. Located in the Sahel Savanah, it has a population of 9,383,682 people according to2006 national census (National Population Commission and ICF International, 2013). The state lies between latitude 12^{o}00′N and longitude 8^{o}31′E.

STUDY POPULATION

Study population was made up of pregnant women attending antenatal clinic of Murtala Muhammad Specialist Hospital, Kano, Nigeria aged 18 – 40 years.

STUDY DESIGN AND SAMPLING TECHNIQUE

The study was a cross-sectional descriptive study and systematic sampling technique was used to select subjects for the study.

SAMPLE SIZE DETERMINATION

Minimum sample size was determined using the formula for estimating minimum sample size for health survey (Lwanga and Lemeshow, 1991).

$n = Z^2 P(1-P)/d^2$

Where

n = minimum sample size

P = prevalence from previous study, 3.5% (Okonko, Okerentugba, and Akinpelu, 2012)

d = degree of precision which was put at 5%

Z = standard normal deviate corresponding to 95% which is 1.96

$n = (1.96)^2 \times 0.035 \times 0.973 / 0.0025 = 50.$

INCLUSION/EXCLUSION CRITERIA

All pregnant women between the age of 18-40 years who consented to participate in the study were selected while subjects with history of liver disease, alcohol ingestion, and indiscriminate use of non-steroidal anti-inflammatory drugs were excluded from the study.

ETHICAL CONSIDERATION

Ethical clearance was obtained from the research and ethics committee of Kano State Ministry of Health (MOH/off/797/T.I/362)and all participants were required to sign individual informed consent form prior to commencement of the study.

DATA COLLECTION

A structured interviewer administered questionnaire was used to obtain socio-demographic and HBV related information of the subjects.

SAMPLE COLLECTION AND PROCESSING

Blood was collected in the morning, 8.00am everyday and determination of HBsAg, HBsAb, HBeAg, HBeAb, and HBcAb was by lateral flow chromatographic immunoassay using onsite HBV5-parameter rapid test kits (CTK Biotech., CA, USA)according to manufacturer's instructions. Subjects were initially assessed for presence or absence of HBsAg; those found to be HBsAg positive were then tested for the other biomarkers.

DATA ANALYSIS

Data was analyzed using statistical software for social science (SPSS) version 23.0. Results were expressed as frequencies and percentages and Chi-squire test was used to determine association between categorical variables. The significant difference was set at $p<0.05$.

RESULTS AND DISCUSSION

A total of 50 pregnant women aged 18-40 years were recruited for the study. The participants were divided into two independent groups based on their HBsAg status: HBsAg positive (38%) and HBsAg negative (62%). The 18 – 24 and 25 – 29 year age brackets had the highest HBsAg seropositivity of 36.84% each followed by 30 – 34 year age bracket with 15.78%. There was statistically significant association between age group categories and HBsAg

seroprevalence ($X^2 = 4.657$, p = 0.045). Majority of the participants in both groups were Hausas (94.79% and 96.77%)and there was no significant association between HBsAg seroprevalence and ethinicity ($X^2 = 2.250$, p = 0.240). Similarly, majority of the participants in both groups were married (94.74% and 96.77%, $X^2 = 2.250$, p = 0.240), had some level of formal education (89.47% and 87.10%, X^2 1.315, p = 0.102), were full time housewives (73.68% and 70.98%, X^2 = 0.793, p = 0.136), and were urban dwellers (52.63% and 70.97%, $X^2 = 1.719$, p = 0.103). Results of socio-demographic characteristics of the participants are shown on Table 1.

Nineteen of the subjects (38%) were positive to HBsAg while 31 (62%) were HBsAg negative. Of the 19 subjects that were HBsAg positive, 7 (36.8%) had HBsAb, 2 (10.5%) had HBeAg, 2 (10.5%) had HBeAb, and 19 (100%) had HBcAbas indicated in Table 2.

Seventy-four percent (74%) of the participants in both groups had at least one dose of HBV vaccination and there was no statistically significant association between HBsAg seroprevalence and vaccination status, history of blood transfusion, and history of scarification marks- Table 3.

Table 1: Sociodemographic characteristics of the subjects

Variable		**HBsAg Negative N(%)**	**HBsAg Positive N(%)**	**X^2 Statistic**	**P Value**
Age (year)				4.657	0.045*
	18-24	9(29.03)	7(36.84)		
	25-29	5(16.13)	7(36.84)		
	30-34	12(38.71)	3(15.78)		
	35-39	5(16.13)	2(10.53)		
Ethnicity				2.250	0.240
	Hausa	30(96.77)	18(94.74)		
	Igbo	0(00)	1(5.26)		
	Yoruba	1(3.23)	0(00)		
Marital status				2.250	0.240
	Married	30(96.77)	18(94.74)		
	Single	1(3.23)	0(00)		
	Divorced	0(00)	1(5.26)		
Level of education				1.315	0.102
	Primary	3(9.68)	2(10.53)		
	Secondary	10(32.26)	9(47.37)		
	Tertiary	14(45.16)	6(31.58)		
	Informal	4(12.90)	2(10.53)		
Occupation				0.793	0.136
	Housewife	22(70.98)	14(73.68)		
	Civil servant	5(16.13)	4(21.05)		
	Others	4(12.90)	1(5.26)		
Place of residence				1.719	0.103
	Urban	22(70.97)	10(52.63)		
	Rural	9(29.03)	9(47.37)		

*Statistically significant variable.

Table 2: Prevalence of HBsAg and its immunological biomarkers among the participants

Biomarker	**Absent N(%)**	**Present N(%)**
HBsAg	31(62)	19(38)
HBsAb	12(63.20)	7(36.80)
HBeAg	17(89.50)	2(10.50)
HBeAb	17(89.50)	2(10.50)
HBcAb	0(00)	19(100)

HBsAg = hepatitis B surface antigen, HBsAb = hepatitis B surface antibody, HBeAg = hepatitis B e antigen, HBeAb = hepatitis B e antibody, HBcAb = hepatitis B core antibody

Table 3: Association between HBsAg seroprevalence and other hepatitis B risk factors

Variable		HBsAg -ve N(%)	HBsAg +ve N(%)	X^2 Statistic	P Value
Vaccination status				0.496	0.201
	Vaccinated	24(77.47)	13(68.42)		
	Not vaccinated	7(22.58)	6(31.58)		
Blood transfusion				0.036	0.243
	Positive history	9(29.03)	6(31.58)		
	Negative history	22(70.97)	13(68.42)		
Scarification marks				0.016	0.273
	Present	7(22.58)	4(21.05)		
	Absent	24(77.42)	15(78.95)		

Prevalence of HBsAg among pregnant women attending antenatal clinic at Murtala Muhammad Specialist Hospital was high according to the present study. This is far above what many studies from the region and across the country have reported previously (Akani *et al*., 2005; Yakasai *et al*., 2012; Yakubu *et al*., 2016). In a case control study involving 303pregnant and non-pregnant women attending antenatal clinic in Aminu Kano Teaching Hospital, Yakasai *et al*. (2012) reported a prevalence of 7.9% which is far below our reported prevalence of 38%. This could be attributed to the lower sample size in our study compared to theirs. Their study was conducted at a teaching hospital, which is attended by educated elites, and relatively well to-do families in the state, unlike the hospital where we conducted this study, which is mainly attended by families with low socio-economic status who are more likely to be exposed to the risk factors of HBV infection. Musa *et al*. (2015) reported a nationwide prevalence of 14.1% from a meta-analysis of studies spanning a period of 10 years.

They noted a wide variation in prevalence rates reported by various researchers across the country and attributed them to the differences in study designs, sample size, and methods of HBsAg detection used. A relatively higher rate of 12.1% was however reported by a study from Jos, North Central Nigeria (Okonko *et al*., 2012). Anaedobe *et al*. (2015) reported a prevalence of 8.3%, while Daniels *et al*. (2017) reported a prevalence of 3% among pregnant women in Ibadan, South West Nigeria. The prevalence in southern parts of the country seems to be lower than that from the north, this could be partly due to better immunization coverage, higher literacy level, better access to health education programs in that region compared to the north, and north-west in particular, where low literacy level, low immunization coverage, high rate of polygamy, and some harmful traditional practices that constitute drivers of HBV infection may be more prevalent. Differences in the method of assaying HBsAg among the different research could also explain the variations observed in these studies. Various studies have reported relatively lower rates compared to this study from South-South and South-Eastern parts of the country. While Utoo, (2013) reported a prevalence of 6.6% from Cross Rivers State, Onuzulike and Ogueri, (2007) reported 10.3% in a population of pregnant women in Imo state. Similarly, Akani *et al*. (2005) reported a prevalence of 4.3%. However, Baba *et al*. (1999) reported what looked like a relatively high prevalence rate (15.8%) from north eastern city of Maiduguri. Again, higher population size coupled with low immunization coverage in north-west Nigeria could account for the observed differences.

The prevalence rate of HBsAg among pregnant women is even lower across other African countries with Awole and Gebre-Selassie, (2005) reporting 3.7% prevalence in an Ethiopian population. This is similar to what was reported by Ngaira *et al.* (2016) in Kenya (3.8%). Lower population size, relative political stability, wider immunization coverage, and better health policies could be the reasons for the lower prevalence recorded in these countries.

Despite the high prevalence of HBsAg among the respondents only a few of them had evidence of active infection and therefore majority were either new infections or chronic carriers. This is because, few months after exposure to HBV, an individual may develop acute fulminant hepatic failure with significant mortality; develop anti-HBs antibodies and undergo spontaneous resolution; or develop HBeAg and hence active viral infection (WHO, 2017).The prevalence of HBeAg in this study is much lower than what was reported by Anaedobe *et al*. (2015) among pregnant women in south-west Nigeria who reported prevalence of HBeAg among the HBsAg positive respondents as 26.7%. This showed that a moderate number of their subjects harbored the active form of the disease at the time of the study. HBsAg is the first of the biomarkers to appear, typically 1 - 10 weeks after an acute exposure to HBV and 2 - 6 weeks before onset of symptoms. It is considered the hallmark of HBV infection and its disappearance gives way to hepatitis B virus surface antibody (HBsAb) (Shah and Singh, 2007). Hepatitis B core antigen (HBcAg) is an intracellular antigen that is not detectable in serum. It is assessed indirectly by its antibody (HBcAb) which remain detectable throughout the course of the infection (MacLachlan, Locarnini, and Cowie, 2015). Hepatitis B e antigen (HBeAg) denote viral replication and infectivity. Following acute infection, HBeAg appears shortly after HBsAg. Most people will have detectable viral DNA and active tissue damage during this phase (Shah and Singh, 2007; Rodriquez-Frias and Jardi, 2008; MacLachlan, Locarnini, and Cowie, 2015).

The 18-24 year and 25 – 34year age brackets had the highest prevalence of HBsAg among the subjects. This is similar to what was reported in other studies (Baba, Onwuka, and Baba, 1999; Esan *et al*., 2014; Ngaira *et al*., 2016). This is the most productive age group associated with risky behaviors such as: multiple blood transfusions, multiple sexual partners, and drug abuse.

This study found no association between HBsAg and history of blood transfusion, vaccination status, history of scarification marks, place of residence, occupation, trimester of pregnancy, and marital status.

CONCLUSION

There is high prevalence rate of HBsAg with lower evidence of active infection among pregnant women attending the antenatal clinic of Murtala Muhammad Specialist Hospital.

REFERENCES

Akani, C. I., Ojule, A. C., Opurum, H. C., and Ejilemele, A. A. (2005). Sero-prevalence of hepatitis B surface antigen (HBsAg) in pregnant women in Port Harcourt, Nigeria. *Nigerian Postgraduate Medical Journal*, **12**:266-270.

Anaedobe, C. G., Fowotade, A., Omoruyi, C. E., and Bakare, R. A. (2015). Prevalence, socio-demographic features and risk factors of Hepatitis B virus infection among pregnant women in Southwestern Nigeria. *Pan African Medical Journal*, **20**: 1–11.

Awole, M., and Gebre-Selassie, S. (2005). Seroprevalence of HBsAg and its risk factors among pregnant women in Jimma, Southwest Ethiopia. *Ethiopian Journal of Health Development,***19**:45-49.

Baba, M. M., Onwuka, I. S., and Baba, S. S. (1999). Hepatitis B and C virus infections among pregnant women in Maiduguri, Nigeria. *Central European Journal of Public Health,***7***:* 60-62.

Basnayake, S. K., and Easterbrook, P. J. (2016). Wide variation in estimates of global prevalence and burden of chronic hepatitis B and C infection cited in published literature. *Journal*

of Viral Hepatitis, **23**:545–559.

Buseri, F. I., Muhibi, M. A., and Jeremiah, Z.A. (2009). Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, south-west Nigeria. *Blood Transfusion*,**7:**293–299.

Chowdhury, S. D., and Eapen, C. E. (2009). Perinatal transmission of hepatitis B. *Hepatitis B Annual,* **6**: 80-88.

Daniels, A. O., Ogundeyi, S. B., Owaniki, S. R. (2017). Sero-Prevalence of HBs Ag and HCV Antigenaemia Among Pregnant Women in Owo , South-West , Nigeria . *Global Advanced Research Journal of Microbiology*, **6**: 8–12.

Esan, A., Omisakin, C. T., Ojo-Bola, T., Owoseni, M., Fasakin, K., and Ogunleye, A. (2014). Sero-Prevalence of Hepatitis B and Hepatitis C Virue Co-Infection among Pregnant Women in Nigeria. *American Journal of Biomedical Research,* **2**:11-15.

Lavanchy, D., and Kane, M. (2016). Global Epidemiology of Hepatitis B Virus Infection. In: Coleman, W. B., and Tsongalis, G. J (Eds.), *Hepatitis B Virus in Human Diseases*. Pp. 187-203. Switzerland. Humana Press, Springer International Publishing.

Lwanga, S.K., Lemeshow, S. (1991). *Sample size determination in health studies: A practical manual*. Geneva, Switzerland. World Health Organization.

MacLachlan, J. H., Locarnini, S., and Cowie, B. C. (2015). Estimating the global prevalence of hepatitis B. *The Lancet*, **386:**1515–1517.

Maclachlan, J. H., and Cowie, B. C. (2015). Hepatitis B Virus Epidemiology. *Cold Spring Harbor perspectives in medicine*, **5**:e021410.

Musa, B. M., Bussell, S., Borodo, M. M., Samaila, A. A., and Femi, O. L. (2015). Prevalence of hepatitis B virus infection in Nigeria, 2000-2013: a systematic review and meta-analysis. *Nigerian Journal of Clinical Practice*, **18**:163–172.

National Population Commission (NPC) [Nigeria] and ICF International. (2013). *NIGERIA DEMOGRAPHIC AND HEALTH SURVEY*.

Ngaira, J. A. M., Kimotho, J., Mirigi, I., Osman, S., Ng'ang'a, Z., and Lwembe, R. (2016). Prevalence, awareness and risk factors associated with Hepatitis B infection among pregnant women attending the antenatal clinic at Mbagathi District Hospital in Nairobi, Kenya. The *Pan African Medical Journal*, **7**:86-88.

Okonko, I. O., Okerentugba, P. O., and Akinpelu, A. O. (2012). Prevalence of HBsAG among Attendees of ARFH Centre in Ibadan , Southwestern Nigeria. *American-Eurasian Journal of Scientific Research*,**7**:100–105.

Okoye, F., Anzaku, A., Ocheke, A., Musa, J., and Sagay, A. (2015). Burden and Determinants of Hepatitis B Virus Co-infection in a Cohort of HIV Positive Pregnant Women in Jos, Nigeria. *International Journal of tropical disease and Health*, **9**:1–9.

Onuzulike, N., and Ogueri, E. O. (2007). Sero-prevalence of hepatitis B surface antigen (HBsAg) in pregnant women in Owerri, Imo State of Nigeria. *Research Journal of Biological Sciences*, **2**:178-182.

Rodriguez-Frias, F., and Jardi, R. (2008). Molecular virology of the hepatitis B virus. *Virologia Molecular Del Virus de La Hepatitis B*, **2**:2-10.

Rufai, T., Mutocheluh, M., Kwarteng, K., and Dogbe, E. (2014). The prevalence of hepatitis B virus E antigen among Ghanaian blood donors. *Pan African Medical Journal*, **17:**53-57.

Shah, S., and Singh, S. (2007). Hepatitis B virus serology: Use and interpretation. *Hepatitis B Annual,* **4**:39-54.

Sibley, A., Han, K. H., Abourached, A., Lesmana, L. A., Makara, M., and Jafri W. *et al*. (2015). The present and future disease burden of hepatitis C virus infections with today's treatment paradigm. *Journal of Viral Hepatitis*, **22**:21–41.

Utoo, B. T. (2013). Hepatitis B surface antigenemia (HBsAg) among pregnant women in Southern Nigeria. *African Health Sciences,***13**:1139-1143.

World Health Organization. (2017). *Global hepatitis report*. Geneva. Retreived from: https://www.who.int/hepatitis/publications/global-hepatitis-report2017/en/.

Xiao, J., Lin, H., Liu, T., Zeng, W., Li, X., Shao X. et al. (2015). Disease burden from hepatitis B virus infection in Guangdong Province, China. *International Journal of Environmental Research and Public Health*, **12**:14055–14067.

Yakasai, I. A., Ayyuba, R., Abubakar, I. S., and Ibrahim, S. A. (2012). Sero-prevalence of Hepatitis B Virus Infection and its Risk factors among Pregnant Women Attending Antenatal Clinic at Aminu Kano Teaching. *Journal of Basic Clinical Reproductive Sciences*, **1**:49–55.

Yakubu, A., Sahabi, D. M., Umar, A., Saidu, Y., and Magaji, U. F. (2016). Prevalence of HBsAg among prospective blood donors and pregnant women in Kebbi State, Nigeria. *Nigerian Journal of Basic and Applied Sciences*, **24**:57–63.