Original Article

Seroprevalence and Associated Risk Factors for Hepatitis B Virus among Pregnant Women Attending a Public Health Facility in Osogbo, Nigeria

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Abstract

Background
Hepatitis B virus (HBV) infection among pregnant women has a high rate of vertical transmission and consequential effects on fetal and neonatal outcomes. The aim of this study was to determine the prevalence and associated risk factors of infection among pregnant women attending antenatal care services in Osogbo, Nigeria.

Methodology
This hospital based cross-sectional study was conducted among pregnant women attending routine antenatal care clinic between April and June 2021. Systematic random sampling technique was used to recruit 240 pregnant women, their data were collected by face to face interview using a pretested questionnaire, while blood sample was collected aseptically to determine hepatitis B surface antigen by enzyme linked immunosorbent assay test kit. Univariate and multivariate logistic regression were used to examine the association between explanatory variables and outcome variable.

Results
The mean age and seroprevalence of the study population were 27.50 ± 4.4 years and 5.8% respectively. The significant risk factors for HBV infection were tattooing (aOR = 5.22; 95% CI = 0.52–8.01; p = 0.0000), history of multiple sexual partners (aOR = 2.88; 95% CI = 1.92–12.42; p = 0.0044); and past history of contact with HBV patient (aOR = 2.17; 95% CI = 1.21–15.32; p = 0.0310) were significant predictors of HBV infection.

Conclusion
The seroprevalence of HBV from this study was of intermediate endemicity. We therefore, advocate for continuous health education programs on the mode of HBV transmission, high-risk behaviors and methods of preventions at antenatal care clinics to raise the awareness of mothers and limit the spread of infection.

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Introduction

Hepatitis B virus (HBV) is an infection of public health concern that affects approximately 2 billons individuals globally. [1] Other causes of viral hepatitis include hepatitis A virus-HAV, hepatitis C virus-HCV, hepatitis D virus-HDV, and hepatitis E virus-HEV.[2,3] Globally, hepatitis B is the most common, and most severe viral infection causing chronic liver diseases (the primary causative agent of hepatocellular carcinoma).[1,4]

HBV is an enveloped double stranded circular small circumference hepatotropic DNA virus of the Hepadnaviridae family and the Orthohepadna virus genus.[5] It can circulate with 108–1010 /mL of infectious particles thus, it is highly contagious (100 times more contagious than HIV) and can be easily transmitted through contact with infected body fluids.[1,5] HBV has been demonstrated in blood, saliva, semen, vaginal secretions, and to a lesser extent, perspiration, breast milk, tears, and urine. [6] Moreover, the virus is resistant to inactivation, and can remain stable at 25^0C for seven days in dried blood.[1,5] Protein biomarkers helpful in monitoring the evolution, treatment, and diagnosis of HBV include: hepatitis B surface antigen which is the outer protein coat of the virus (HBsAg), the hepatitis B surface antibody that is directed against the surface antigen (anti-HBs), the core hepatitis B antigen (HBcAg), the hepatitis B envelope antigen (HBeAg) and the hepatitis B envelope antibody (anti-HBe).[5,7]

The presence of HBsAg is an indication that the patient is potentially infectious of HBV, and World Health Organization (WHO) has used the seroprevalence (HBsAg) to categorize the burden of hepatitis B worldwide. Areas of low (< 2%) endemicity are western Europe / north America, areas of average (2%-7%) prevalence are north Africa / eastern Europe, and high (> 8%) endemic areas are west Africa / southeast Asia.[5] Nigeria, a sub-Saharan west African country can be classified as a high endemic country with an overall pooled HBV prevalence of 9.5%.[8]

The routes of HBV transmission occur through two (2) major pathways: horizontal and vertical transmissions. In horizontal transmission, viruses are transmitted among individuals of the same generation and major pathway of infection includes exposure to infected blood/body fluids, while in vertical transmission major pathway are perinatal (mothers to offspring), sexual activity, especially heterosexuality, and injection drug use.[9]In areas of low and average endemicity, vertical transmission has been recognized as a major route whereas, in highly endemic HBV regions just like Nigeria, HBV infection has been documented to spread majorly through both vertical, and horizontal transmission. [6,10,11]

Infected newborns, children and adults have been reported to have close to 90%, 50% and up to 5% chance respectively of becoming chronic HBV carriers.[9] Hepatitis B-related liver cancer/cirrhosis develops in about 15-25% of adults who become chronically infected during childhood.[12]Pregnancy has been recognized as the major source of high HBV prevalence among children and the general population.[13] Thus, pregnancy is a significant HBV transmission hub and there is need to better understand the epidemiology of HBV in pregnancy, in order to develop strategies to reduce pediatric HBV infection and ultimately reduce its socioeconomic burden.[14] There is paucity of data on the prevalence and risk factors of HBV among pregnant women in Nigeria. This study therefore aimed to determine the prevalence and factors associated with the risk of acquiring HBV infection among pregnant women attending ante-natal clinic in a public health facility at Osogbo, Nigeria.

Methods

Study design and setting

This study was a cross-sectional, hospital based study conducted among pregnant women receiving antenatal care in a popular public health facility (State Specialist Hospital) in Osogbo, Nigeria.

Study population/eligibility criteria

All pregnant women attending antenatal care (ANC) in the hospital during the period of the study were the source population.

Inclusion criteria

Pregnant women attending ANC at Osun State Specialist Hospital during the data collection period.

Exclusion criteria

Pregnant women vaccinated against hepatitis B virus or having any pregnancy related complications were excluded from the study.

Minimum sample size determination

The minimum sample size for this study was determined based on a single population proportion formula. The estimated proportion (p) of 16.5% was used, the rate reported in a previous study.[15] Accordingly, sample size (n) was estimated with a confidence level (z) of 95%, error margin of 5%, and 10% non-response rate, the final sample size was 240.

Sampling selection was done using a systematic sampling method, after calculating the sampling interval 'k' (k was calculated by dividing the average of previous ANC attendee of the past 6 months by the calculated sample size). The first enrollee of the study was sampled by ballot among the first 10 ANC attendee list submitted on the first day of the study, and every subsequent 10th attendee was approached for participation in the study, in case of declination by the attendee, the next 10^{th} attendee was approached until the minimum sample size was achieved.

Data Collection Tools and Procedures

The study questionnaire was developed by reviewing different similar study.[7,13,16,17] The structured questionnaire was of different sections containing the sociodemographic characteristics, health care delivery system related factors, traditional practices, and behavioral related factors. The structured questionnaire was also use to collect both the participant's data (through a face-to-face interview) by the research assistants and blood sample for standard HBV testing by research phlebotomist.

About two milliliters of blood was collected from each enrolled participant through a standard aseptic blood collection procedure into a plain bottle for natural clotting. The collected sample was numbered along with the questionnaire for easy identification, after clotting, each sample was separated by centrifugation at 3,000 revolutions per minute (rpm) for 10 minutes at room temperature, the separated serum was stored in aliquots in a properly labeled Eppendorf tubes at -20^0C until analysis.[18] Reactive (positive) samples by a rapid test kit (MyBioSource, Inc. Diagnostic, USA) were further reconfirmed by the enzyme-linked immunosorbent assay (ELISA) kit (Bio-Rad, France) in the laboratory.

Data Quality Assurance

To ensure the quality of collected data, questionnaires was initially developed in English before being translated to the local (Yoruba) language and again translated back to English by a bilingual expert. The developed questionnaire was pretested on 5% (n=12) of the total sample size which were randomly selected at the State Specialist Hospital before the actual data collection was conducted to ensure the questionnaire was appropriate for the study and understandable by the respondent.[12] The collected data was daily checked for consistency and accuracy by the research supervisor. Training was however, done for the research assistants and research phlebotomists on data and blood collection techniques a week before the commencement of the study. Strict standardized operational procedures were adhered to during the pre-analytical and analytical phases of the laboratory tests to ensure quality, precise and accurate HBV result was obtained.

Data Processing and Analysis

The collected data were coded, entered into Excel spreadsheet (Microsoft software) before being exported to SPSS 24.0 (IBM Corporation, Armonk, NY, USA) and analyzed using descriptive and inferential statistics. Descriptive statistics were used to calculate frequencies. Inferential statistics were used to determine factors and their possible association withHBV using multiple regression analysis, level of significance is set at p-value < 0.05.

Compliance with Ethics Guidelines

Approval for the study was obtained from the institutional ethical committees of the hospital and the State University in conformity to the Helsinki Declaration on Human experimentation as amended by the 64th World Medical Assembly.[19] Participants aged 18-44 years signed the consent form themselves,nd those under 18 years signed the assent forms while their parents/ guardians signed the consent forms...Moreover, a the study participants were assured of anonymity and confidentiality of the information provided.

Result

Sociodemographic Characteristics

A total of 240 pregnant women attending ANC at state specialist hospital, Osogbo, were systematically recruited to have a response rate of 100%. The age of the respondents ranged from 15 to 44 years with a mean of 27.50 ± 4.4 years. Forty eight point eight percent (48.8%) of the pregnant women age ranges from 25 to 29 years. Likewise, ninety seven point nine percent (97.9%) of the study participants were married. Forty one point three percent (41.3%) of the study participants completed tertiary education. Fifty five point four percent (55.4%) were privately employed, while fifty two point one percent (52.1%) were between N30,000 – N50,000 average monthly income. Eighty three point eight percent (83.8%) were multigravida and sixty point four percent (60.4%) were on the third trimester period (Table 1).

Table 1. Socio-demographic characteristics of pregnant women attending antenatal clinic

Variables	Categories	Number (n)	Percentage (%)
Age (yrs)	15 – 19	8	3.0
	20 – 24	50	20.8
	25 – 29	117	48.8
	30 – 34	55	22.9
	35 – 39	8	3.3
	40 – 44	2	0.8
Marital Status	Single	5	2.1
	Married	235	97.9
Average Monthly Income	<₦30,000	23	9.6
	₦30,000 – ₦50,000	125	52.1
	>₦50,000	92	38.3
Occupation	Student	22	9.2
	Self / privately employed	133	55.4
	Government employed	80	33.3
	Unemployed	5	2.1
Educational Status	No Formal/Quran Education	40	16.7
	Primary/Quran Education	28	11.7
	Secondary	73	30.4
	Tertiary and above	99	41.3
No of Pregnancies	Primigravida	39	16.3
	Multigravida	201	83.8
Gestational age	1st trimester	7	2.9
	2nd trimester	88	36.7
	3rd trimester	145	60.4

Seroprevalence of HBV Infection

The overall prevalence of HBV infection among pregnant women in this study was 5.8% [95% CI (3.5-9.6)]. HBV infection was more (25.0%) among pregnant women of 35-39 years age range group than other age range groups in the study population. Single parenthood pregnant women had a high rate of HBV prevalence as compared to their married counterparts (20.0% vs 5.5%). Multigravida pregnant women had a prevalence of 6.5% as compared to 2.6% from primigravida. Unemployed pregnant women had a high prevalence of HBV infection (40.0%) compared to students (13.6%), privately employed (6.0%), and government employed (1.3%) participants. Moreover, pregnant women on average monthly income <N30,000 had a more prevalence of 26.1% than other participants in the study. HBV positivity was more among pregnant women with primary education (17.9%) than other counterparts. Likewise, pregnant women in their first trimester had a high prevalence of HBV infection (28.6%) as compared to their second and third trimester (4.5% vs 5.5%) counterparts. However, there was no statistically ($p>0.05$) significant difference between the proportions of HBsAg positives and negatives with respect to age range, marital status, and number of pregnancies. There was a statistically ($p<0.05$) significant difference in the proportions of HBsAg positives and negatives with respect to occupation, average monthly income, educational status, and gestation age (Table 2).

Table 2. Seroprevalence of HBV infection among pregnant women based on socio-demographic characteristics

		HBV Infection	
		Positive	Negative
Variables	Categories	n (%)	n (%)
Overall Prevalence		14 (5.8)	226 (94.2)
Age (yrs)	15 – 19	1 (7.1)	7 (3.1)
	20 – 24	2 (14.3)	48 (21.3)
	25 – 29	6 (42.9)	111 (49.3)
	30 – 34	3 (21.4)	5 2(23.1)
	35 – 39	2 (14.3)	5 (2.2)
	40 – 44	0 (0.0)	2 (0.9)
MaritalStatus	Single	1 (7.1)	4 (1.8)
	Married	13 (92.9)	222 (98.2)
Average Monthly Income	<₦30,000	6 (42.9)	17 (7.5)
	₦30,000 – ₦50,000	5 (35.7)	120 (53.1)
	>₦50,000	3 (21.4)	89 (39.6)
Occupation	Student	3 (21.4)	19 (8.4)
	Self / privately employed	8 (57.1)	125 (55.3)
	Government employed	1 (7.1)	79 (35.1)
	Unemployed	2 (14.3)	3 (1.3)
Educational Status	No Formal/Quran Education	5 (35.7)	35 (15.5)
	Primary/Quran Education	5 (35.7)	23 (10.7)
	Secondary	3 (21.4)	70 (31.1)
	Tertiary and above	1 (7.1)	98 (43.6)
Gravity	Primigravida	1 (7.1)	38 (16.8)
	Multigravida	13 (92.9)	188 (83.2)
Gestational age	1st trimester	2 (14.3)	5 (2.2)
	2nd trimester	4 (28.6)	84 (37.2)
	3rd trimester	8 (57.1)	137 (60.9)

Clinical and Cultural Factors

Out of 240 study participants, 16.7% and 11.7% of the pregnant women had a history of hospital admission and surgical procedure, respectively. Ten point four percent of the women had abortion experience while, dental history and blood transfusion account for 4.6% and 3.3% respectively. Multi ear/nose piercing/facial tribal mark and tattooing (18.3% and 11.7% respectively) are major cultural behavioral practice reported among the study population.

History of contact with known HBV patients within their household and multiple sexual partners was reported among 15% and 8.7% of the participants respectively. Alcohol drinking and Female genital mutilation were recorded among 5.4% and 4.2% of the study participants respectively (Table 2). Using Multivariate regression analysis, women with tattoo, multiple sex partners and contact with known HBV patient have a significant association with hepatitis B infection (Table 3).

Table 3. Risk factors for HBV infection among pregnant women in the study population

Variables	Categories	HBV Infection		Univariate analysis		Multivariate analysis	
		Pos [n (%)]	Neg [n (%)]	cOR (95% CI)	p-value	aOR (95% CI)	p-value
Medical Related Factors							
History of abortion	Yes	2 (0.8)	23 (9.6)	1.47 (0.31-6.99)	0.6273	1.24 (0.22-6.35)	0.9824
	No	12 (5.0)	203 (84.6)	1.00 (Reference)		1.00 (Reference)	
History of Blood transfusion	Yes	1 (0.4)	7 (2.9)	2.40 (0.28-21.05)	0.4274	1.10 (0.12-17.23)	0.9899
	No	13 (5.4)	219 (91.3)	1.00 (Reference)		1.00 (Reference)	
History of hospital admission	Yes	3 (1.3)	37 (15.4)	1.39 (0.37-5.2)	0.6237	0.99 (0.31-5.01)	0.7306
	No	11 (4.6)	189 (78.8)	1.00 (Reference)		1.00 (Reference)	
History of surgical procedure	Yes	2 (0.8)	26 (10.8)	1.28 (0.26-6.05)	0.7536	1.67 (0.21-5.45)	0.7063
	No	12 (5.0)	200 (83.3)	1.00 (Reference)		1.00 (Reference)	
History of dental procedure	Yes	1 (0.4)	10 (4.2)	1.66 (0.20-13.99)	0.6404	1.15 (0.11-11.15)	0.9811
	No	13 (5.4)	216 (90.0)	1.00 (Reference)		1.00 (Reference)	
Socio-cultural factors							
Tattoo	Yes	3 (1.3)	25 (10.4)	2.19 (0.57-8.40)	0.2517	5.22 (0.52-8.01)	0.0000*
	No	11 (4.6)	201 (83.8)	1.00 (Reference)		1.00 (Reference)	
Multiple sexual partners	Yes	5 (2.1)	16 (6.7)	7.29 (2.18-24.35)	0.0012	2.88 (1.92-12.42)	0.0044*
	No	9 (3.8)	210 (87.5)	1.00 (Reference)		1.00 (Reference)	
Multi Ear/nose piercing tribal marks	Yes	8 (3.3)	36 (15.0)	7.04 (2.3-21.50)	0.0006	1.01(4.25-22.73)	0.8150
	No	6 (2.5)	190 (79.2)	1.00 (Reference)		1.00 (Reference)	
History of alcohol drinking	Yes	2 (0.8)	11 (4.6)	3.26 (0.65-16.38)	0.1518	1.09 (0.45-15.01)	0.3012
	No	12 (5.0)	215 (89.6)	1.00 (Reference)		1.00 (Reference)	
History of contact with HBV contact	Yes	6 (2.5)	30 (12.5)	4.90 (1.59-15.11)	0.0057	2.17 (1.21-15.32)	0.0310*
	No	8 (3.3)	196 (81.7)	1.00 (Reference)		1.00 (Reference)	
History of female genital mutilation	Yes	2 (0.8)	8 (0.4)	4.54 (0.87-23.77)	0.0731	1.10 (0.65-22.23)	0.9213
	No	12 (5.0)	218 (90.8)	1.00 (Reference)		1.00 (Reference)	

Discussion

This study assessed the positivity of hepatitis B virus using hepatitis B surface antigenemia (HBsAg) in serum of pregnant women receiving antenatal care in State Specialist Hospital, Osogbo. The overall seroprevalence as calculated from the percentage of people in the study population being positive for HBV was 5.8%.

This finding, according to the WHO classification, can be categorized as an intermediate endemicity (2%-7%).[18]A similar intermediate endemicity/prevalence of 3% and 6.7% had earlier been reported among pregnant women in Osogbo, and Gamawa, Nigeria respectively.[20,21]

This similarity in the prevalence may be as a result of same socio-demographic and economic characteristics that exist among the study population. The overall HBV prevalence obtained from this study was similar to earlier findings from the studies conducted among pregnant women in Nekemte, Ethiopia.[12]

However, the observed prevalence in this study was low as compared to earlier studies among pregnant women in Osogbo, and Keffi, Nigeria with reported prevalence of 16.5%and 19.8% respectively, despite having 'similar to same' socio-demographic and economic population.[15,22] The differences in the observed prevalence might be due to ongoing community awareness campaign on the dangers and factors that promotes HBV infectivity in communities.
Generally, the seroprevalence of HBV in Nigeria and other low and middle income countries had shown an intermediate or high endemicity level over the last five decades due to the difference in the study target group, people living standards, behavioral and cultural practices across different countries.[12,23,24]

It is noteworthy to state that most of the earlier reported medical risk factors for HBV infection such as history of blood transfusion, history of abortion, hospital admission history and histories of surgical and dental procedures were not significant risk factors for HBsAg positivity among pregnant women in this study. This may be due among other things to the adopted national policy and protocol on blood transfusion which ensures that blood and blood products were properly screened and free from HBsAg, HIV antibodies and venereal diseases before being transfused, and also the universal precautionary measure being taken by medical staff in the wake of heightened awareness on HIV and possibly COVID-19 where all patients are treated as if infected and therefore necessary precautions are taken to minimize risks to the attending medical staff as well as the patients.

However, this study identified multiple sex partners as a risk factor in HBV infectivity, this was in agreement with earlier studies,[17,25–27]and reinforcing earlier believe that sexual intercourse is major route of HBV transmission worldwide.[26] Likewise, tattooing, and past history of contact with known HBV patients were also identified as risk factors for HBV infection from this study. This was also in agreement with earlier studies that identify tattooing and history of affected relation as a potential risk factor for HBV infection.[17,28] Therefore, changes in sexual practice and cultural behavior modification can be an important and major step towards reduction of hepatitis B infection.

Conclusion

The seroprevalence of HBV from this study was of intermediate endemicity and pregnancy remains a potential source of transmission of HBV to unborn babies. Considering the fact that HBV infection and its attendant sequelae is a life threatening issue to both the mother and the infant, we advocate for free HBV screening, continuous health education programs on the mode of HBV transmission, high-risk socio-cultural practices and methods of preventions at antenatal clinics in order to limit the spread of the disease.

Authors' contributions

All authors contributed to the design and implementation of the study. They all participated in the development of first draft and approved together the final draft of the manuscript for publication.

Conflict of interest

No conflict of interest was declared by the authors.

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