ORIGINAL ARTICLE

Seroprevalence of hepatitis B virus infection among pregnant women at the antenatal booking clinic of a Tertiary Hospital in Lagos Nigeria

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Abstract

Objectives: The objectives were to determine the seroprevalence of hepatitis B virus (HBV) infection and assess the major risk factors among Nigerian pregnant women.

Subjects and Methods: This was a cross-sectional descriptive study carried out among pregnant women at the antenatal clinic of a Tertiary Hospital in Lagos, Nigeria. A total number of 150 consenting pregnant women were selected for the study. A structured pretested interviewer-administered questionnaire was used for the data collection. Sera were collected and tested for hepatitis B surface antigen (HBsAg) and hepatitis B e antigen (HBeAg).

Results: Of the150 women screened during the study, 11 (7.3%) were seropositive for HBsAg. Of these 11 women, 4 (36.4%) were also positive for HBeAg. There was no statistically significant difference in the mean ages of participants who were seropositive for HBsAg and those who were negative for the virus ($P = 0.888$). There were statistically significant differences in the seroprevalence of HBsAg recorded among respondents with previous surgery (odd ratio [OR] - 2.97; 95% confidence interval [CI] - 1.08-16.67; $P = 0.046$), previously affected sibling or spouse (OR - 5.03; 95% CI - 1.11–25.27; $P = 0.001$) and those with two or more lifetime sexual partners (OR - 4.11; 95% CI - 2.85–9.22; $P = 0.024$).

Conclusion: The sero-prevalence rate of HBV infection and also its infectivity is high in Lagos, Nigeria. These findings thus support the need for a nationwide policy of routine and widespread HBV screening among pregnant women.

Key words: Hepatitis B surface antigen, hepatitis B virus, infectivity, Lagos, Nigeria, seroprevalence

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Introduction

Infections due to viral hepatitis are systemic diseases caused by viruses A–E that mostly involve the liver.[1] Infection caused by hepatitis B virus (HBV) is a serious public health problem causing about two billion infections worldwide[2] with approximately 350 million people remaining chronically infected.[3] It is thought to be the main etiological factor in over 75% of chronic liver diseases.[4] It is a blood borne infection[5] and its transmission is commonly through exposure to infectious blood products or body fluids (urine, semen, sweat, saliva, and tears), use of contaminated needles, blood transfusion, vertical transmission (mother to child through the placenta and infected birth canal), and unprotected sexual contact.[1] Identified risk factors include blood transfusion, occupational exposure, history of sexually transmitted infection, exposure to hepatitis and ethnicity.[6]

Diagnosis of HBV infection is by the presence of hepatitis B surface antigen (HBsAg) in serum. The presence of hepatitis

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B e antigen (HBeAg) shows the disease is active with viral shedding to the bloodstream. Antibodies to e antigen begin to appear in the serum at the time HBeAg is disappearing. The presence of the e antigen indicates a period of high maternal infectivity, as the presence of e-antibodies indicates low infectivity. Complete resolution of the disease is indicated by the disappearance of HBsAg and the appearance of antibodies. Thus, these antibodies provide immunity, whether obtained from the resolution of infection or vaccination with HBsAg.[7]

Prevalence rate of 10% of HBV was found among pregnant women in Hong Kong,[2] 12% in Taiwan,[8] 17.3% in Burkina Faso[9] and 7.9% in Nigeria.[10] Perinatal infection is a major route of infection in endemic (mainly developing) countries.[11] About 10–20% of women seropositive for HBsAg transmit the virus to their neonates.[6] Without intervention, women who are seropositive for both HBsAg and HBeAg have a mother-to-child transmission rate of 70–90%.[12,13] Infected neonates have an almost 90% risk of chronic liver disease[2] and also the chance of spreading the disease to their siblings and to the community.[6] Similarly, when pregnant women are infected, they constitute a serious health risk not only to their unborn child, but also the society at large.[6] Although, it does not appear that acute HBV infection increases mortality during pregnancy or that it has teratogenic effects, but higher incidences of low birth weight and prematurity have been reported.[14]

Identification of infected pregnant women, which is not yet a routine practice in most obstetric units in Nigeria, may not only help to detect neonates that would require postexposure prophylaxis, but also to know those women who might require treatment and their sexual and household contacts who will benefit from testing and treatment if necessary.[15] Unlike other previous studies [15,16] that did not differentiate carriers of HBsAg from those with active infection (HBeAg positive), our present study will therefore aim at determining the seroprevalence of HBV and its infectivity and then assess the major risk factors among the Nigerian pregnant women, in comparison to other previous Nigerian studies, as a prerequisite to determining the significance of a nationwide policy of routine and widespread HBV screening during antenatal care in the country.

Subjects and Methods

This is a cross-sectional descriptive study carried out among pregnant women at the antenatal booking clinic of a Tertiary Hospital in Lagos, Nigeria over a period of 4 months. The hospital was an over 1000 bedded teaching hospital located in the Central Lagos metropolis in South-West Nigeria. The hospital immediate environ inhabited by civil servants, students, traders, and artisans. It is the largest hospital in the state and offers mainly clinical services. The hospital also provides services to patients from the neighboring South-Western states.

The minimum sample size (N) was calculated using the statistical formula by Fisher[17] as illustrated below:

$$N = \frac{Z^2\, p(1-p)}{d^2}$$

Where, P is the prevalence of HBV in a previous Nigerian study[10] =7.9%.

Z is the unit normal deviate corresponding to the desired type I error rate = 1.96 (at 5% type I error).

d is the absolute error or precision by researcher (at $P < 0.05$) = 0.05.

$$N = \frac{1.96^2 \times 0.079\,(1-0.079)}{0.05^2}$$

The minimum sample size (N) calculated is 101.32. However, for ease of data collection, collation and analysis, a nearest sample size of 150 was used and, therefore, a total number of 150 consenting pregnant women were selected by consecutive sampling method for the study.

A structured and pretested interviewer administered questionnaire was used for the data collection and other relevant data extracted from the case records of these women. Gestational age was estimated from the date of last menstruation and modified with ultrasound scan as appropriate.

A volume of 3 ml venous blood sample was obtained by venepuncture from each participant and collected in labeled plain universal specimen bottle. At the Central research laboratory of the College of Medicine each clotted sample was centrifuged at 3000 rpm for 5 min. The sera collected was tested for HBsAg and HBeAg using multiplex latex rapid agglutination slide test kits manufactured by Grand Medical Diagnostic Limited., USA. Reactive samples for HBsAg and HBeAg were further confirmed using the enzyme-linked immunosorbent assay (Bio Rad, France).

All quantitative data were entered in the computer and analyzed using SPSS version 17 for Windows (manufactured by SPSS Inc. 233 South Wacker Drive, 11th Floor Chicago, IL 60606-6412)".[18] Descriptive statistics was computed for all relevant data. The risk factors of HBV infection were obtained using multivariate logistic regression analysis involving crude odd ratio (OR) and confidence interval (CI). Logistic regression models were adjusted for sociodemographic factors (i.e. age group, marital status, parity, tribe, and educational status) and some identified major risk factors for HBV infection (i.e. histories of previous surgery, blood transfusion (s), affected sibling or spouse and number of lifetime sexual partners). Association between HBV infection and these sociodemographic and major risk factors was tested using Chi-square. All significance were accepted at $P < 0.05$.

Ethical approval for the study was obtained from the Hospital's Health Research and Ethics Committee and written consent obtained from each participant prior to involvement in the study.

Results

Out of the 150 consenting pregnant women screened during the study (age range of 18–44 years and mean age of 28.7 ± 4.5 years), 11 (7.3%) were seropositive for HBsAg. Out of these 11 women, 4 (36.4%) were also positive for HBeAg.

In Table 1, the highest proportion of HBsAg seropositive women was found among those at or above 40 years of age (33.3%, OR - 15.42; 95% CI - 4.66–98.41). However, there was no statistically significant difference in the mean ages of participants who were seropositive for HBsAg and those who were negative for the virus (33.9 ± 9.7 vs. 32.2 ± 10.3 years; $P = 0.888$). On examination of other sociodemographic characteristics of the respondents [Table 2], there were also no significant differences found between the women with HBsAg positivity and those without the infection with respect to marital status ($P = 1.113$), tribe ($P = 0.092$), religion ($P = 0.156$) and educational status ($P = 0.077$) but a statistically significant relationship was demonstrated among those women with higher parity ($P = 0.042$).

In Table 3, 13.8% of participants with history of previous surgery were seropositive for HBsAg compared to 5.8% of those without such history (OR - 2.97; 95% CI - 1.08–16.67; $P = 0.046$). Out of the participants who had previously had blood transfusion (s), 6.1% were positive for HBsAg while a similar proportion (7.7%) were positive among those with no history of prior blood transfusion (OR - 0.75; 95% CI - 0.32–4.59; $P = 0.166$). There were also statistically significant differences in the seroprevalence of HBsAg recorded among respondents with previously affected sibling

Table 1: Age distribution of the study population (n=150)

Age group	*n* (%)		Crude OR	95% CI
	HBsAg positive	HBsAg negative		
15-19	0 (0.0)	5 (100.0)	0.11	0.10-3.97
20-24	1 (4.2)	23 (95.8)	2.73	1.92-10.24
25-29	1 (1.7)	59 (98.3)	1.00	Reference
30-34	5 (13.9)	31 (86.1)	4.28	1.77-15.96
35-39	2 (10.5)	17 (89.5)	6.91	0.23-16.83
≥40	2 (33.3)	4 (66.7)	15.42	4.66-98.41
Total	11 (7.3)	139 (92.7)		
P				0.888

CI=Confidence interval; OR=Odd ratio; HBsAg=Hepatitis B surface antigen. *P<0.05

Table 2: Sociodemographic characteristics of the study population (n=150)

Characteristics	*n* (%)		Crude OR	95% CI
	HBsAg Positive	HBsAg Negative		
Marital status				
Single	1 (7.7)	11 (92.3)	1.00	Reference
Married	10 (7.2)	128 (92.8)	0.97	0.11-4.57
P				1.113
Parity				
Primigravidae	3 (5.8)	49 (94.2)	1.00	Reference
Multigravidae	8 (8.2)	90 (91.8)	2.55	1.07-10.28
P				0.042
Tribe				
Yoruba	4 (6.9)	54 (93.1)	1.00	Reference
Hausa	3 (11.1)	24 (88.9)	1.74	1.11-11.42
Ibo	3 (6.0)	47 (94.0)	0.86	0.03-5.88
Others	1 (6.7)	14 (93.3)	0.91	0.47-10.52
P				0.092
Religion				
Christianity	7 (8.0)	80 (92.0)	1.00	Reference
Islam	4 (6.6)	57 (93.4)	0.56	0.04-7.79
Others	0 (0.0)	2 (100.0)	−2.33	−8.51-5.07
P				0.156
Educational status				
None	1 (14.3)	6 (85.7)	1.00	Reference
Primary	3 (10.0)	27 (90.0)	0.79	0.22-3.21
Secondary	4 (5.3)	72 (94.7)	0.33	0.04-1.19
Tertiary	2 (6.5)	29 (93.5)	0.68	0.41-3.07
Postgraduate	1 (16.7)	5 (83.3)	2.11	1.52-8.83
P				0.077

CI=Confidence interval; OR=Odd ratio; HBsAg=Hepatitis B surface antigen. *P < 0.05

Table 3: Major risk factors for HBsAg infection among the study population (n=150)

Risk factors	*n* (%)		Crude OR	95% CI
	HBsAg positive	HBsAg negative		
History of previous surgery				
No	7 (5.8)	114 (94.2)	1.00	Reference
Yes	4 (13.8)	25 (86.2)	2.97	1.08-16.67
P				0.046
History of blood transfusion (s)				
No	9 (7.7)	108 (92.3)	1.00	Reference
Yes	2 (6.1)	31 (93.9)	0.75	0.32-4.59
P				0.166
History of affected sibling or spouse				
No	8 (5.8)	129 (94.2)	1.00	Reference
Yes	3 (23.1)	10 (76.9)	5.03	1.11-25.27
P				0.001
Number of lifetime sexual partner (s)				
<2	5 (4.6)	104 (95.4)	1.00	Reference
≥2	6 (14.6)	35 (85.4)	4.11	2.85-9.22
P				0.024

CI=Confidence interval; OR=Odd ratio; HBsAg=Hepatitis B surface antigen. *P<0.05

or spouse (OR - 5.03; 95% CI - 1.11–25.27; $P = 0.001$) and those with two or more lifetime sexual partners (OR - 4.11; 95% CI - 2.85–9.22; $P = 0.024$).

Discussion

The sero-prevalence of HBV infection reported in our study was 7.3%. This is quite similar to prevalence figures from hospital based studies in Northern Nigeria of 8.2%,[16] 7.9%[10,19] and 8.3%[13] respectively. These areas are inhabited mostly by the Hausa ethnic group, and the rates are higher than cross-sectional studies in the Central and Southern parts of Nigeria.[15,20-23]

A more recent study by Adeyemi *et al.* in Ibadan[24] found a significantly higher prevalence of 16.3% for HBV infection among women in tertiary and nontertiary health facilities. Though this exceeds rates even for studies from the North, Adeyemi's study did find a prevalence of 6.4% in tertiary health facilities and 30.9% in the nontertiary health facilities. These studies were conducted in tertiary health facilities like ours where there is a greater number of women with higher levels of education and enlightenment concerning hepatitis B and its risk factors.

Differences in sexual behaviour and practices, cultural practices, geographical variation, test methods employed for HBV detection and the level of health education on prevention of HBsAg acquisition, may all play significant role in the wide variations of HBsAg seroprevalence noted in the literatures. The findings also suggest that there is a high endemicity of HBsAg infection, defined as HBsAg prevalence of more than 7% in an adult population,[25] in the country.

Hepatitis B e antigen seroprevalence of 36.4% was recorded among pregnant women who tested positive for HBsAg. This implies a high risk of chronic infection and vertical transmission of HBV from mother to child. Although, this is much higher than the figure reported by Mbaawuaga *et al.* in Makurdi Nigeria (30.3%)[26] and Madzime *et al.* in Zimbabwe (0.8%);[27] but still similar to that reported by Harry *et al.* in Maiduguri, Nigeria (39%).[28] This reported figure from our study is even much lower than the seroprevalence rate of 62.5% recorded among pregnant women attending the antenatal clinic at Aminu Kano Teaching Hospital, Kano, Nigeria.[10] Therefore, the issue of perinatal transmission of HBV infection cannot be ignored.

The respondents who were at or above the age of 40 years had the highest prevalence of 33.3% in the study group while those within the age range of 15–19 years had the lowest prevalence of 0.0%. This finding is a pointer to the improved education, awareness and acceptance of childhood immunization among the now westernized parents. This distribution, however, is at variance with that of other studies where the highest prevalent rates were reported among those in the younger and more sexually active age group.[10,15,29-31]

Multigravidae were reported to exhibit a significant risk of HBV infection in our study; this finding suggests that acquisition of HBV infection which may be related to sexual lifestyle may not necessary be influenced by education as tendency to engage in unprotected sexual intercourse cuts across all categories of respondents irrespective of educational status.[32] This also corroborates the less likelihood of acquisition of the infection based on marital status, tribe, and religion as discovered in this study. Although, this was at variance to the findings from similar works by Yakasai in Kano[10] and Rabiu in Lagos[33] where a significantly high prevalence of HBsAg were reported among the married, pregnant women compared to their single counterparts.

Our study also showed that pregnant women with previous surgeries, those with sibling (s) or spouse who were previously affected by HBV infection and those with increased number of lifetime sexual partners are at a statistically significant risk of acquiring HBsAg virus infection. This finding is a pointer to the significant role played by person-to-person contact in the transmission of the virus.[34,35] However, the reduced risk of infection among women with previous blood transfusion (s) further emphasized the existence of safe blood transfusion services, heralded by screening for the common blood-borne infections, presently being practiced all over the world.

The study is hospital-based and the findings may not be representative of the overall picture of Hepatitis B endemicity or the variations between regions/tribes in Nigeria. There was also selection bias in the enrolment of participants and unnecessary extension of the study duration due to the incessant industrial actions in the health sector which further limits the generalizability of the study to the whole population. However, in view of the high rates of HBV infection in Nigeria, it is necessary for future community-based studies to be undertaken in the country using larger sample sizes and even more specific assays of other serological markers of the infection such as anti-HBs, anti-HBe and antiHBc antibodies, which are antibodies to the structural antigens (s-, e- and c-) of the virus and indicators of previous exposure, as a mean of distinguishing accurately the carrier or chronic state of the virus from acute infection.

Conclusion

The sero-prevalent rate of HBV infection and also its infectivity is high in Lagos, Nigeria. These findings thus support the need for a nationwide policy of routine and widespread HBV screening among pregnant women during antenatal care in the country. Health-care providers attending to these pregnant women should also be aware of

this high infectivity and provide measures such as universal precaution to prevent horizontal transmission. These efforts together will guarantee optimal fetomaternal outcome and satisfactory health care delivery system for the parents and the health care providers.

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