Prevalence and risk factors for hepatitis B viral infection among pregnant women attending a tertiary health care centre in Benin City

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Abstract

Hepatitis B (HBV) viral infection is a disease of public health importance, with about 360 million people reported to be chronically infected worldwide and an estimated 600,000 people dying yearly from HBV-related complications such as liver cirrhosis and hepatocellular carcinoma. At the same time, few adults who contract the infection become chronically infected (<5%), and most neonates infected by vertical transmission become chronically infected (80-90%). This study was designed to determine the prevalence of HBV infection and the associated risk factors among pregnant women attending the antenatal clinic at the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. This cross-sectional study was conducted between July 2022 and August 2023 among women attending the ante-natal clinic at the University of Benin Teaching Hospital. The prevalence of HBV infection among pregnant women attending antenatal clinics at UBTH was 9.2%. While the infection was more common among women who were unvaccinated for HBV, those who had more than one lifetime sexual partner, shared sharps and had previous spontaneous or induced miscarriages, there was no statistically significant association between any of these risk factors and the hepatitis B status of the participants. Hepatitis B viral infection is highly endemic among pregnant women in Benin City.

Introduction

Hepatitis is a liver inflammation characterized by inflammatory cells within the liver tissue.[1] It is commonly of viral origin but could be due to other etiologies like genetic factors, alcohol, autoimmune conditions and medications.[2] Viral hepatitis is the most common cause of jaundice in pregnancy worldwide.[3] At least five distinct types of viral hepatitis have been described, namely Hepatitis A (HAV), B (HBV), C (HCV), D (HDV) and E (HEV).[4] The clinical manifestations of these viral conditions are similar. Although these viruses may not be hepatotoxic, their immunologic response causes hepatic necrosis.[3]

Hepatitis B is a disease of public health importance, with over 2 billion people estimated to have been infected worldwide. While about 360 million are chronically infected and at risk of severe morbidity. Death mainly results from liver cirrhosis and Hepatocellular Carcinoma (HCC).[5] It has also been estimated that about 600,000 people die yearly from HBV-related complications.[5] While the endemicity is low in developed countries like the United States and the United Kingdom, with a prevalence of <2%, HBV infection is highly endemic in Africa, Southeast/Central Asia, Eastern Europe, the Middle East, and parts of South America where seroprevalence rates range from 5 to 20%.[3-7]

The natural history of HBV infection is age-dependent. It may

be an asymptomatic infection, acute HBV infection (lasting <6 months), chronic HBV infection (lasting >6 months), and may progress to be complicated by liver cirrhosis and HCC.[5,8] Chronic HBV occurs in about 80-90% of neonates infected perinatally, in about 30% of children infected before the age of 6 years and in <5% of infected (otherwise healthy) adults.[5,9]

The diagnosis of HBV is based on the presence of the surface antigen (HBsAg) in serum.[5,9] Those with the envelope antigen (HBeAg) and HBsAg in their serum are most infectious.[9] The risk of perinatal transmission of HBV is highest in pregnant women who are HBeAg positive and who have a high viral load ($\geq 10^6$ copies/mL).[9,10] About 70% to 90% of mothers without immune prophylaxis will transmit the infection to their babies. In contrast, those who are negative for the envelope antigen or have antibodies to the envelope antigen (anti-HBe) have a much lower transmission rate of 10-20%.[4,9,10] Perinatal transmission occurs at or near the time of birth from exposure to cervical secretions and maternal blood, but the mode of delivery does not influence the likelihood of transmission.[9] Also, breastfeeding has not been shown to increase the risk of transmission.[4,9,10] This study is relevant to determine the current burden and risk factors associated with HBV in pregnancy and assess the risk factors associated with this infection in Benin City. Data from this study is expected to form a basis for intensifying existing preventive strategies. The aim is to find out the prevalence and risk factors associated with hepatitis B infection among pregnant women in UBTH.

Materials and Methods

This cross-sectional study was conducted between July 1st 2022, and August 1st 2023, among women attending the ante-natal clinic at the University of Benin Teaching Hospital (UBTH) who had routine ante-natal screening for Hepatitis B. At the antenatal clinic in UBTH, hepatitis B screening is offered to all pregnant women routinely, and the screening is conducted using the Enzyme-Linked Immunosorbent Assay (ELISA) test kit. All women who presented for antenatal booking during the study period and consented to participate were included. The sample size for this study was calculated using a single population proportion formula.[11-17]

$$\frac{n = (Z_{\alpha/2})^2 \times p\ (1\text{-}p)}{d^2}$$

Prevalence (p) of hepatitis B viral infection among pregnant women was taken as 12.5% from a study conducted at the University of Benin Teaching Hospital just over a decade ago.[1] The margin of error (d) was set at 5%, while $Z_{\alpha/2}$ was 1.96 at a 95% confidence level.

Data concerning the sociodemographic parameters of the participants (age, marital status, level of education, occupation), reproduction-related factors (parity, spontaneous/induced miscarriages, gestation age at booking) and medical/behavioural factors (HBV vaccination status, number of lifetime sexual partners, previous blood transfusion, scarification marks, sharing of sharps, intravenous drug use and contact with jaundiced patient) were obtained from patient's case notes/electronic records and an interviewer-administered structured questionnaire. Results of Hepatitis B screening were extracted from the above sources and the (dedicated) antenatal clinic laboratory records.

Data was analyzed using the IBM Statistical Package for Social Sciences (SPSS) software, and results were presented in prose and frequency tables. Values were reported as proportions for qualitative variables, whereas means and standard deviations were employed to describe quantitative data. The Pearson Chi-square test was used for associations, and ethical approval was obtained from the University of Benin Teaching Hospital's Research and Ethics Committee.

Results

Sociodemographic characteristics

A total of 185 respondents participated in this study. The mean age and gestational age at the participants' booking were 31.34 (SD 5.596) and 17 weeks and four days, respectively. Sixty-four percent of the participants were aged between 25 to 34, while 24% were within the age bracket of 35 to 44 years.

Most participants were married (93.5%) and had at least a sec-

Table 1. Sociodemographic characters of pregnant women at Antenatal Care (ANC) booking.

Variables	Frequency N=185	Percent %
Age (years)		
15-24	18	9.7
25-34	119	64.3
35-44	44	23.8
45-54	4	2.2
Mean age	31.34±5.596	
Marital status		
Married	173	93.5
Unmarried	12	6.5
Highest level of education		
No formal education	2	1.1
Primary	11	5.9
Secondary	46	24.9
Tertiary	126	68.1
Occupation		
Health worker	11	5.9
Other civil servant	39	21.1
Trader	80	43.2
Student	11	5.9
Unemployed	12	6.5
Others	32	17.4
Parity		
Nullipara	80	43.2
Primipara	42	22.7
Multipara	63	34.1
Booking GA		
≤13 weeks	71	38.4
14-27 weeks	87	47.0
≥28 weeks	27	14.6

GA, Gestational Age

Table 2. Hepatitis B (HBV) prevalence among pregnant women in the University of Benin Teaching Hospital (UBTH).

HBsAg result	Frequency N=185	Percent %
Positive	17	9.2
Negative	168	90.8

ondary level of education (93%). While 162 (87.5%) of the respondents were gainfully employed, 12 (6.5%) of them were unemployed, and 11 (5.9%) were students. Health workers accounted for 5.9% of respondents. Based on participants' parity, nearly half (43.2%) of the respondents were nulliparous (Table 1).

A total of 17 of the 185 women who participated in this study tested positive for hepatitis B. The prevalence of hepatitis B infection in pregnancy from this study was 9.2% (Table 2). Twenty-six of the 185 women in this study had been vaccinated against hepatitis B, with hepatitis B vaccine coverage of 14.1% (Table 3). A total of 85 (54.1%) of the participants in this study had more than one lifetime sexual partner, while 82 (44.3%) had a previous spontaneous or induced miscarriage. The majority of the respondents, however, had not previously been transfused with blood (87.6%), had no scarification marks (73.0%) and had no history of sharing sharps (77.3%). Overall, the presence of risk factors for hepatitis B infection was low (Table 3). The burden of hepatitis B infection was mainly among respondents aged 15 to 24 (22.2%). Married and unmarried women had similar prevalence of infection (9.2% and 8.3%, respectively). A similar trend was observed among those employed and the unemployed/students (34.2% and 34.1%, respectively). The prevalence of hepatitis B infection declined with increasing level of education from 50.0% among those with no formal education to 6.3% among those with a tertiary level of education (Table 4). The hepatitis B viral infection was more common among those who were unvaccinated (10.1% *vs* 3.8%), those who had more than a one lifetime sexual partner (13.0% *vs* 4.7%), those who shared sharps (16.7% *vs* 7.0%) and those who had a previous spontaneous or induced miscarriage (12.2% *vs* 6.8%) (Table 5).

Discussion

Perinatal (vertical) transmission of HBV infection is a cause for concern because this is the primary route of transmission worldwide, even though it is a preventable event.[5] Furthermore, a majority of neonates (80-90%) infected via vertical transmission

Table 3. Risk factors associated with Hepatitis B (HBV) infection.

Variables	Frequency N=185	Percent %
Hepatitis B vaccination		
Vaccinated	26	14.1
Unvaccinated	159	85.9
Lifetime sexual partners		
1	85	45.9
>1	100	54.1
Blood transfusion		
Yes	23	12.4
No	162	87.6
Scarification marks		
Yes	50	27.0
No	135	73.0
Sharing of sharps		
Yes	42	22.7
No	143	77.3
Previous spontaneous/induced miscarriage		
Yes	82	44.3
No	103	55.7

Table 4. Association between sociodemographic factors and Hepatitis B (HBV) status.

Variable	HBsAg status			
	Positive	Negative	Test statistic	p-value
Age (years)				
15-24	4 (22.2)	14 (77.8)	3.793**	0.224
25-34	9 (7.6)	110 (92.4)		
35-44	4 (9.1)	40 (90.9)		
45-54	0 (0.0)	4 (100.0)		
Marital status				
Married	16 (9.2)	157 (90.8)	0.11*	1.000
Unmarried	1 (8.3)	11 (91.7)		
Highest level of education				
No formal education	1 (50.0)	1 (50.0)	9.868**	0.40
Primary	2 (18.2)	9 (81.8)		
Secondary	6 (13.0)	40 (87.0)		
Tertiary	8 (6.3)	118 (93.7)		
Occupation				
Health worker	1 (9.1)	10 (90.9)	5.005**	0.332
Other civil servant	2 (5.1)	37 (94.9)		
Trader	6 (7.5)	74 (92.5)		
Student	1 (9.1)	10 (90.9)		
Unemployed	3 (25.0)	9 (75.0)		
Others	4 (12.5)	28 (87.5)		
Parity				
Nullipara	8 (10.0)	72 (90.0)	1.328*	0.578
Primipara	2 (4.8)	40 (95.2)		
Multipara	7 (11.1)	56 (88.9)		
Booking GA				
≤13 weeks	3 (4.2)	68 (95.8)	3.460*	0.184
14-27 weeks	11 (12.6)	76 (87.4)		
≥28 weeks	3 (11.1)	24 (88.9)		

*t-test. **Man-Whitney U Test. GA, Gestational Age.

will develop chronic infection, which can progress to life-threatening complications.[5,9] The primary objective of this study, therefore, was to find out the prevalence of hepatitis B viral infection among pregnant women accessing antenatal care at the University of Benin Teaching Hospital and to identify the associated risk factors.

Seventeen of the 185 women who participated in this study tested positive for the Hepatitis B surface antigen (HBsAg), which put the prevalence of hepatitis B infection in pregnancy at 9.2%. This is lower than the national prevalence of 13.6% for the general population and 14.1% for pregnant women attending antenatal clinics, as reported in a systematic review.[11]

However, the prevalence of HBV infection among pregnant women from this study was much higher than the prevalence in developed countries such as Canada (0.34% to 1.1%)[18] and the USA (0.3%)[7] where the endemicity is said to be low (<2%). This is partly because these countries adopted mandatory screening of all pregnant women and universal vaccination of newborns against hepatitis B virus as far back as the early nineties (over 30 years ago).[7,19] This led to a dramatic decline in the incidence of new HBV infections.[7] In Nigeria, universal vaccination of newborns was introduced in 2004 (18 years ago) when the hepatitis B vaccine was added to the Expanded Program on Immunization (EPI) schedule.[18] Therefore, participants in this study who were above 18 years old did not benefit from the routine immunization coverage. This was reflected in the low hepatitis B vaccination coverage in this study of 14.1%.

While the prevalence of HBV in this study was the same as findings from another West African country, the Gambia (9.2%),[21] it was higher than the prevalence reported from an East African study in Ethiopia (5.9%).[22] This is in keeping with the WHO report on the African region as being characterized by high endemicity.[6]

The prevalence of HBV infection among pregnant women in this study (9.2%) was higher than findings from studies in some parts of the country where intermediate level of endemicity was noted in Port Harcourt (4.3%),[12] Ekiti (6.8%),[8] Kano (7.9%)[16] and Lagos (7.3%),[23] and high level of endemicity observed in Ibadan (8.3%)[13] and Zaria (8.3%).[15] A higher prevalence (11.0%) was reported in a Makurdi study.[14] Summarily, it is evident from these studies that the prevalence of HBV among pregnant women in Nigeria is still at an intermediate to a high level, which shows that more needs to be done to achieve the WHO Global Health Sector Strategy (GHSS) on viral hepatitis which proposes the elimination of HBV as a global health threat by 2030.[6]

Compared to a similar study done in our centre, there was a decline in the prevalence of HBV infection from 12.5%, as reported in 2011[11] to 9.2%, as shown in this study. This may be a reflection of safer sexual practices among indigenes due to the increased awareness about sexually transmitted diseases like HIV and improvements in blood screening practices before blood transfusion. However, the endemicity remains at a high level.

There was a steady decline in the prevalence of HBV infection with an increasing level of education among participants in the study, from 50% among those with no formal education to 6.3% among those with a tertiary level of education. Even though this association was not statistically significant, it is suggestive of a positive impact of girl child education in efforts to combat disease and infections, as educated women are more likely to have healthy sexual practices and better health-seeking behaviour. This trend was not the case in studies conducted in Ibadan, Lagos, and Ethiopia, where the prevalence was similar across different levels of education and even reversed.[13,22,23]

Like the studies done in Lagos,[23] Ibadan,[13] and other African countries – Gambia[21] and Ethiopia,[21] hepatitis B viral infection was common among unvaccinated pregnant women (10.1% *vs* 3.8%), those who had more than one lifetime sexual partner (13.0% *vs* 4.7%), those who shared sharps (16.7% *vs* 7.0%) and those who had a previous spontaneous or induced miscarriage (12.2% *vs* 6.8%). Notably, the prevalence was lower among women who had a previous blood transfusion than those who had never been transfused (4.3% *vs* 9.9%). This pattern was also reported in Lagos and Ibadan studies.[13,23] While the reason for this is unclear, it may suggest appropriate blood screening practices in the country before blood transfusion. Overall, there was no statis-

Table 5. Association between risk factors and (Hepatitis B) HBV status.

Variable	HBsAg status		Test statistic	p-value
	Positive	Negative		
Hepatitis B vaccination				
Vaccinated	1 (3.8)	25 (96.2)	1.035*	0.474
Unvaccinated	16 (10.1)	143 (89.9)		
Lifetime sexual partners				
1	4 (4.7)	81 (95.3)	3.788*	0.052
>1	13 (13.0)	87 (87.0)		
Blood transfusion				
Yes	1 (4.3)	22 (95.7)	0.738*	0.487
No	16 (9.9)	146 (90.1)		
Scarification marks				
Yes	4 (8.0)	46 (92.0)	0.116*	0.786
No	13 (9.6)	122 (90.4)		
Sharing of sharps				
Yes	7 (16.7)	35 (83.3)	3.641*	0.070
No	10 (7.0)	133 (93.0)		
Previous spontaneous or induced miscarriage				
Yes	10 (12.2)	72 (87.8)	1.595*	0.305
No	7 (6.8)	96 (93.2)		

*t-test.

tically significant relationship between any of the risk factors identified in this study and the hepatitis B status of the participants.

Conclusions

The prevalence of Hepatitis B infection among pregnant women in Benin City is high according to the WHO classification of Hepatitis B viral endemicity. Access to a robust antenatal care service will ensure all pregnant women have an opportunity to be screened for HBV routinely so that appropriate treatment and preventive measures can be instituted for those who are positive and for their babies. These measures have drastically reduced the incidence and prevalence of HBV infections in developed countries. They are critical to achieving the WHO goal of eliminating HBV as a global health threat by 2030.

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