

Short Research Article

MATERNAL SEROPREVALENCE OF HEPATITIS B VIRUS SEROLOGIC MARKERS AMONG ATTENDEES OF A SECONDARY HEALTH FACILITY IN MAIDUGURI, NIGERIA

Abstract

The profile of four hepatitis B virus markers [Hepatitis B surface antigen (HBsAg), antibodies of the immunoglobulin M (IgM) class against the hepatitis B core antigen (IgM anti-HBc), Hepatitis B surface antibody (Anti-HBs) and Hepatitis B virus envelop antigen (HBeAg)] among pregnant women (n=91), with mean age of 25.96 years, were determined using Enzyme linked immunosorbent assay kit (Cortez diagnostic Inc., U.S.A). An overall sero-prevalence of 8.79%, 36.26% (X^2 cal = 738.01 // X^2 tab = 46.19, $P = 0.05$), 6.59% and 7.65% were observed for HBsAg, Anti-HBs, IgM anti-HBc and HBeAg respectively. Socioeconomic status was not a factor in infection with HBsAg (t-cal = 0.65//t-tab = 1.98, $P = 0.05$). Forty seven point three percent were susceptible (HBsAg^{-ve}, IgM anti-HBc^{-ve} and anti-HBs^{-ve}) to hepatitis B virus infection. One of thirteen pregnant women tested positive for HBsAg and HBeAg; this portends high risk of transmission to the foetus. This result portrays the unreliability of using presence of HBsAg as the sole marker for hepatitis B virus infection, high rate susceptibility to hepatitis B virus infection and the risk of transmission of HBV to fetuses.

Key words: Hepatitis B surface antigen, Antibodies of the immunoglobulin M (IgM) class against the hepatitis B core antigen, Hepatitis B surface antibody, Hepatitis B envelop antigen, sero-prevalence, Maiduguri, Nigeria.

INTRODUCTION

Hepatitis B Virus (HBV) is a member of the *hepadnaviridae* family; it is a DNA virus with partially double-stranded DNA and a core antigen surrounded by a shell containing hepatitis B surface antigen (HBsAg). HBV has numerous antigenic components such as HBsAg, hepatitis core antigen (HBcAg), Hepatitis B surface antibody (anti-HBs) and hepatitis B e antigen (HBeAg). The HBV genome harbors 3200 nucleotides and it can encode four groups of protein and their regularity components by shifting the reading frame over the same genetic matter (1).

Despite availability of a vaccine and antiviral treatment, HBV infection is still a major health problem causing considerable morbidity and mortality (2, 3, 4). The World Health Organization (WHO) estimates the burden of HBV infection to be approximately 2 billion, > 350 million chronically infected with HBV, and 500,000 – 700,000 patients die annually as a result of HBV related liver disease, or hepatocellular cirrhosis with most of these deaths in developing countries (5).

The endemicity of hepatitis B is defined according to the prevalence of the hepatitis B surface antigen (HBsAg) in the general population of geographical areas, and it varies considerably globally: HBsAg prevalence of > 8% are typical of highly endemic areas, prevalence of 2-8% are found in areas of intermediate endemicity, whereas in areas with low endemicity less than 2% of the population is HBsAg positive (6).

Hepatitis B virus is transmitted primarily through parenteral and sexual exposure to HBsAg positive blood or other body fluid (7). Perinatal transmission of HBV occurs if the mother has had acute HBV infection during late pregnancy, or if she is a chronic carrier. Neonatal infection does occur during labour and delivery. Vertical transmission from chronic carriers exceeds 90% and accounts for up to 40% of the world carriers in endemic areas (8, 9). If infected, the neonate becomes a chronic carrier himself in 50% to 90% of cases and is prone to cirrhosis and hepatocellular carcinoma in adult life. When the mother is positive for viral DNA in her serum, transmission rate is estimated at 90%, if the mother is negative for viral DNA in the serum, transmission rate is about 10% to 30%. Similarly, a positive test for HBeAg viral protein which is a marker for patient at high risk for transmission of the diseases indicates the individual has a high level of virus. However, the absence of HBeAg does not necessarily exclude active viral replication because some patients have mutated viruses that do not give rise to e-antigen. The disappearance of HBeAg and rise in anti-HBe antibodies is associated with a decline in viremia (10, 11, 12, 13).

The prevalence of Hepatitis B Virus Infection in Nigeria is estimated to be 18.4 – 24% of the population (14, 15) and is classified among the group of countries endemic for HBV infection with a current infected population of 18 million (16, 17).

Although studies have been carried out on HBV serological markers in different part of Nigeria, there is dearth of information regarding HBV serological markers in a single study in North-eastern region of the country. This preliminary, simple descriptive study was therefore designed to determine the seroprevalence of four maternal HBV serological markers among pregnant women attending antenatal care at a secondary health facility in Maiduguri, Borno state, Nigeria.

Materials and Methods

Study design

A simple descriptive hospital-based design was utilized. A structured questionnaire was administered on each pregnant woman to obtain necessary demographic data which included age, pregnancy term, occupation/grade-level of husband, tribal mark and history of blood transfusion.

Exclusion criteria

Women who are not pregnant were excluded from the research.

Inclusion criteria

Only pregnant women, confirmed by routine pregnancy test, were included in the research.

Study Population

The population of the study constituted of pregnant women attending ante natal clinic at a secondary health facility in Maiduguri, Borno State, Nigeria. Ninety one of those whose consent was sought and obtained participated in the research. The Ethics committee of the hospital approved the study.

Sample Collection

A total of ninety one blood samples were collected from pregnant women at the study site. Three millitre of venous blood was taken aseptically in plain dry sterile vacutainer tubes and serum was separated by centrifugation at 4000rpm for five minutes. The supernatant (serum) was collected in cryovials, labelled, and stored at -20⁰c until needed for analysis as described by (18).

Sample Analysis

The sera were brought out of the refrigerator for it to equilibrate with room temperature before testing. After this, each sample was tested for HBsAg, anti-HBs, IgM anti-HBc and HBeAg using Enzyme Linked Immunosorbent Assay kit (Cortez Diagnostics Inc., U.S.A) for each marker. Positive and negative controls were run alongside test samples. The entire procedure with result interpretation was according to the manufacture's recommendation.

Results

Age distribution of pregnant women

During the study period ninety one women aged from 17- 46 years attending ante natal care were enrolled. Thirty four point one percent (34.1%) of the pregnant women fell within the 17-21years group, 24.2%, 18.7%, 15.4%, 6.6% and 1.1 were within the 22-26years, 27-31 years, 32-36 years, 37-41 years and 42-46 years groups respectively (Table 2)

Distribution of Hepatitis Markers

From Table 1, this study obtained a seroprevalence of 8.79% for HBsAg while 36.26% ($\chi^2 = 738.01$) of the pregnant women had anti-HBs. IgM anti-HBc was positive among 6.59% and 7.65% were seropositive for HBeAg

Susceptibility to Hepatitis B Virus Infection

The result of the assay revealed an alarming 47.3% susceptibility to hepatitis B virus infection among the pregnant women tested as forty five of ninety one of them tested negative for HBsAg, anti-HBs and IgM anti-HBc. (Table 1).

Trimester Based Distribution of Hepatitis Markers

Out of a total of ninety one pregnant women 49 (53.8%) among them were found to be in the first trimester of pregnancy. Those in the 2nd trimester were 24 (26.4%) while the least

frequency of 19.8% (18) was among pregnant women in the 3rd trimester (table 3). The prevalence of the four sero-makers according to trimester are also presented (table 3)

Relationship between Socio-economic Status and Hepatitis B Virus Infection

T-test analysis of the effect of the socio-economic status of the pregnant women on contracting hepatitis B virus revealed that it was not a significant predisposing factor to infection ($t_{cal} = 0.65$; $t_{tab} = 1.98$). Infection was not dependent on socio-economic status (Table 4).

Discussion

In the present study, ninety one subjects were tested for four hepatitis B virus serologic markers. The overall prevalence of HBsAg, anti-HB_s and IgM anti-HBc was 8.79%, 36.26% and 6.59% respectively (Table 1). Subjects who tested positive for HBsAg and IgM anti-HBc were re-tested for presence of HBeAg. We recorded one of thirteen positive for HBeAg (7.69%) (Table 1)

HBsAg is the main serologic marker recommended by the guidelines for the detection of maternal HBV infection (19, 20, 21). It is the first detectable serologic markers of infection to appear and is found in almost all infected person (22). The 8.79% seroprevalence obtained in this study at Maiduguri is comparatively lower than 11.6% in 1994 and 15.8% in 1999 earlier recorded (23, 24). It is also lower than 12.3% and 16.6% prevalence among pregnant women in Minna and Vom respectively (25, 26). Our record is however higher than the prevalence of 6.0% in Taraba state (17), 5.7% in Ilorin (27), 2.19% in Benin City (28) and 4.3% in Port Harcourt (29). With particular reference to the observed decline of prevalence in Maiduguri from 15.8% in 1999 to 8.79% in the present study, this can be attributed to increased awareness of the disease which has led to improved medical and paramedical practices which in turn has reduced likelihood of exposure to the predisposing risk factors. Also, the inclusion in the national immunization program by the government, albeit partial, of immunization of neonates and children against hepatitis may have contributed to the observed reduction.

Age stratification of HBsAg prevalence among pregnant women shows that the highest prevalence (37.5%) was found among the 32-36 age groups. This is similar to the high frequency of HBsAg among 30-39 age group reported by (30) who attributed it to anaemia, effect of oral

pills as well as unanalysed factors such as malaria and HIV. Oral pills have been reported to suppress activities of lymphocytes: T-lymphocytes thus consequently impairing antibody production (31). The aforementioned reasons may be applicable also in our study area although this has yet to be proven scientifically. First, in order for many a woman to remain relevant in the polygamous setting, she must strive to fulfill her conjugal obligation to the husband even though with no pregnancy in view. The use of pills becomes inevitable in such scenario. Second, frequent child birth with the resultant blood loss coupled with poor nutrient intake can predispose to anaemia. One limitation of this study is that the malaria and HIV status of the pregnant women were not determined.

Antibodies to HBcAg (anti-HB_c) have been reported to be indicative of infection: IgM anti-HBc signifies recent infection and usually disappears within six months whereas IgG anti-HBc persists for life and indicates past infection (32). In this study we recorded 6.59% (6/91) IgM anti-HBc positive cases. This might as well indicate recent infection and signifies that the populace in the study area is still being infected with hepatitis B virus.

Of particular interest was the case of a 19 years old pregnant woman (one of six who were IgM anti-HBc positive) in the first trimester (Table 3) whose serum sample tested positive for IgM anti-HBc, negative for HBsAg but had high titre of anti-HBs. The result is of dual importance. Firstly, it demonstrates the unreliability of using HBsAg positivity as sole indicator for hepatitis B virus infection. Secondly, since the presence of antibody against HBsAg (anti-HBs) appears after clearance of HBsAg or after immunization (1) and the subject had no history of any recent immunization, we hypothesize that the patient is undergoing window period of re-infection. It is also pertinent to state that serum of the patient under searchlight was positive for HBeAg. The HBeAg positivity further indicates a high level viremia and a high risk for transmission of the disease to developing fetus. It follows that had this patient been in the 3rd trimester, her fetus **had** been 80% - 90% prone to cirrhosis and hepatocellular carcinoma in adulthood (12, 11).

The remaining five women who tested positive for IgM anti-HBc were also negative for HBsAg. Their eventual fate is liver cirrhosis, hepatocellular carcinoma and possibly eventual

death. Also, the unreliability of dependence on presence of HBsAg as sole marker for infection is once again brought to the fore.

In this study, we report an alarming 47.3% susceptibility rate to HBV infection in the study area. Forty three of ninety one (43/91) pregnant women examined tested negative to all four markers. This implies that should they all contract the virus at the same time, then a 47.3%, seroprevalence had been possible. The high susceptibility rate might explain why Africa, Nigeria in particular remains endemic for hepatitis virus. This is because the result we present being a microcosm of the larger society indicates that there might yet be more uninfected persons than the infected.

Based on the socioeconomic status, we found that infection with the virus knows no bounds. The HBV could infect irrespective of socioeconomic divide (table 4). This finding is contrary to expectation of having infection influenced by, especially, low socioeconomic status of pregnant women since it would be expected that such women would be more prone to exposure to factors which predisposes to HBV infection as enumerated by (33).

Conclusion

The seroprevalence of HBV serologic markers reported in this study is various, as discussed earlier. However, the 8.79% HBsAg seroprevalence obtained shows that hepatitis B infection is of high endemicity in the study area. Also HBsAg positively status alone should not be relied upon as the only marker for HBV infection. The result of study has equally demonstrated that the number of people yet susceptible to HBV infection remains high, and this indicates a potential source of economic loss due to the debilitating effect of infection with hepatitis.

It is imperative to state that due to financial constraint, hepatitis B virus DNA and IgG anti-HBc were not assayed. Also, small sample size is a limiting factor in this study. This is occasioned by general apathy to blood donation by pregnant women in the study area. Therefore we recommend a more comprehensive research on prevalence of HBV serological markers in the study area in particular and Nigeria in general. Routine screening and prevention of perinatal

transmission is also recommended. Government should invigorate its vaccination campaign strategies.

Table 1: Overall prevalence of hepatitis B virus markers among pregnant women

Markers	No. tested	+ve(%)
HBsAg	91	8(8.79)
Anti-HBs	91	33(36.26)
IgM anti-HBc	91	6(6.59)
HBeAg	13	1(7.69)

Table 2: Age seroprevalence of hepatitis B virus serologic markers

Age		Positive HBV seromarkers				HBV seromarkers –ve
		IgM				
		HBsAg	Anti-HBs	anti-HBc	HBeAg	
		n =8	n =33	n =6	n =1	
n		+ve(%)	+ve(%)	+ve(%)	+ve(%)	
17–21	31	1(12.5)	11(33.3)	4(66.7)	1(7.7)	14
22–26	22	1(12.5)	9(27.3)	1(16.7)	0(0.0)	11
27–31	17	1(12.5)	8(24.2)	0(0.0)	0(0.0)	08
32–36	14	3(37.5)	4(12.1)	1(16.7)	0(0.0)	06
37–41	06	2(25)	1(3.0)	0(0.0)	0(0.0)	03
42–46	01	0 (0.0)	0(0.0)	0(0.0)	0(0.0)	01

Table 3: Trimester based distribution of HBV sero-markers

Trimester		Positive HBV sero-markers			
		HBsAg	Anti-HBs	IgM anti-HBc	HBeAg
		n =8	n =33	n =6	n =1
		+ve(%)	+ve(%)	+ve(%)	+ve(%)
No. tested (%)					
1 st	49 (53.8)	2(25)	21(63.6)	4(66.7)	1(7.7)
2 nd	24(26.4)	4(50)	7(21.2)	2(33.3)	0(0)
3 rd	18(19.8)	2(25)	5(15.2)	0(0)	0(0)

Table 4: Association between socioeconomic status and HBV infection

S/E status	T-test	
	n	Mean of variance
Low	n ₁ =33	x ₁ =1.04, s ₁ ² =5.11
High	n ₂ =58	x ₂ = 0.76, s ₂ ² =1.67
S/E= socioeconomic; t-cal=0.65//t-tab=1.98; p=0.05 *No association*		

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