British Microbiology Research Journal
11(3): 1-7, 2016, Article no.BMRJ.18201
ISSN: 2231-0886, NLM ID: 101608140

SCIENCEDOMAIN *international*
www.sciencedomain.org

Maternal Seroprevalence of Hepatitis B Virus Serologic Markers among Attendees of a Secondary Health Facility in Maiduguri, Nigeria

S. O. Oyinloye[1*], M. Osunkwo[1], B. Taki-Mohd[1], B. B. Ajayi[2] and M. A. Lawan[3]

[1]Department of Microbiology, Faculty of Science, University of Maiduguri, Borno, Nigeria.
[2]Department of Microbiology, Federal University of Technology, Akure, Ondo State, Nigeria.
[3]Department of Immunology, University of Maiduguri Teaching Hospital, Borno, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Authors SOO, MO and BTM participated in the design of the research and compilation of manuscript. Authors BBA and MAL supervised the analysis of sample, while author SOO serving as the corresponding author coordinated participation of all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BMRJ/2016/18201
Editor(s):
(1) Eggehard Holler, Cedars-Sinai Medical Center, Department of Neurosurgery, Los Angeles, USA AND University of Regensburg, Germany.
(2) En Tao Wang, Departamento de Microbiología, Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, México. AND State Key Laboratory of Agrobiotechnology and College of Biological Sciences, China Agricultural University, Beijing, China (invited professor).
Reviewers:
(1) Anonymous, Henry Ford Hospital System, MI, USA.
(2) Fouelifack Ymele Florent, Higher Institute of Medical Technologies, Cameroon.
(3) Christiana O. Oyewusi, University College Hospital, Ibadan, Nigeria.
(4) Anonymous, University of Cape Coast, Cape Coast, Ghana.
Complete Peer review History: http://sciencedomain.org/review-history/12040

Short Research Article

Received 9th April 2015
Accepted 2nd July 2015
Published 30th October 2015

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 envelop antigen (HBeAg)] among pregnant women (n=91), with mean age of 25.96 years, were determined using Enzyme linked immunosorbent assay kit. A significant (p=0.00001) overall sero-prevalence of 8.79%, 36.26%, 6.59% and 7.65% were observed for HBsAg, Anti-HBs, IgM anti-HBc and HBeAg respectively. 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 fetus. This result portrays the unreliability of using presence of HBsAg as the

**Corresponding author: E-mail: faisam26@gmail.com;*

sole marker for hepatitis B virus infection, high susceptibility to hepatitis B virus infection and the risk of transmission of HBV to fetuses.

Keywords: 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.

1. 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 B core antigen (HBcAg), Hepatitis B surface antibody (anti-HBs) and hepatitis B envelope antigen (HBeAg). The HBV genome harbors 3200 nucleotides and it can encode four groups of protein and their regular 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 [2-4]. The World Health Organization (WHO) estimates the burden of HBV infection to be approximately 2 billion, including more than 350 million chronically infected, 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 greater than 8% is 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]. The prevalence of Hepatitis B Virus Infection in Nigeria is estimated to be 18.4 – 24% of the population [7,8] and is classified among the group of countries endemic for HBV infection with a current infected population of 18 million [9,10].

Hepatitis B virus is transmitted primarily through parenteral and sexual exposure to HBsAg positive blood or other body fluid [11]. 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 [12,13]. 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 maker for patient at high risk for transmission of the disease, indicates that 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 is associated with a decline in viremia [14-17].

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.

2. MATERIALS AND METHODS

2.1 Study Design

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

2.2 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.

2.3 Ethical Issue

The Ethics committee of the hospital gave approval for the study.

2.4 Inclusion Criteria

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

2.5 Exclusion Criteria

Women who did not give their consent for the study were excluded from the research.

2.6 Sample Collection

A total of ninety one blood samples were collected. Three millitre of venous blood was taken aseptically in plain dry sterile vacutainer tubes and serum was separated by centrifugation at 4000 rpm for five minutes. The supernatant (serum) was collected in cryovials, labelled, and stored at -20ºC until needed for analysis as described by Obi et al., in 1993 [18].

2.7 Sample Analysis

The sera were brought out of the refrigerator for its equilibrating 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 manufacturer's recommendation.

2.8 Data Analysis

Chi square statistical calculator was employed to compare the overall prevalence of four HBV seromakers, and the prevalences among different age distribution and trimester of pregnancy.

3. RESULTS

3.1 Distribution of Hepatitis Markers

From Table 1, this study obtained a seroprevalence of 8.79% for HBsAg, while 36.26% of the pregnant women had anti-HBs. IgM anti-HBc was positive among 6.59% of the tested individuals and 7.65% of them were seropositive for HBeAg. Comparism of the prevalence by chi-square analysis showed that they were significant (p=0.00001) at P<0.05.

3.2 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 three of them were negative for HBsAg, anti-HBs and IgM anti-HBc (Table 1).

3.3 Distribution of Hepatitis B Virus Markers According to Age of Pregnant Women

During the study period ninety one women aged 17- 46 years attending ante natal care were enrolled. The highest prevalence (31 individuals, 34.1%) of the pregnant women fell within the 17-21 year group with a significant (P=0.00001 at P=0.05) high proportion (54.84% or 17/31) positive to all the four seromarkers (Table 2). Other seroprevalences of hepatitis B virus serologic markers of the pregnant women according to age are also presented in Table 2.

3.4 Trimester Based Distribution of Hepatitis Markers

Out of a total of ninety one pregnant women, 53.8% of them were found to be in the first trimester of pregnancy. Those in the 2nd trimester were 26.4% while the least proportion of 19.8% was in the 3rd trimester (Table 3). A significant prevalence of the four sero-makers according to trimester was found (P=0.00001) (Table 3).

4. DISCUSSION

In the present study, ninety one subjects were tested for four hepatitis B virus serologic markers. The overall prevalence of HBsAg, anti-HBs 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 [19-21]. It is the first detectable serologic marker of infection to appear and is found in almost all infected persons [22]. The 8.79% seroprevalence obtained in this study at Maiduguri is comparatively lower than the earlier recorded

11.6% in 1994 and 15.8% in 1999 [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 the increased awareness of the disease which has led to improved medical and paramedical practices and 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.

While the high positive proportion (54.84% or 17/31) to all the four hepatitis B seromarkers was in the youngest group (17-21 years), the highest prevalence (37.5%) was found among the 32-36 year group. This is similar to the high frequency of HBsAg among 30-39 age group reported in Makurdi, Nigeria [30,31]. These results indicate that the vaccination program, besides the neonate targeted ones, should be extended to include young women within 17-21 years age bracket and perhaps even less in order to protect them against infection thereby forestalling any possible vertical transmission of the virus.

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.

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

Markers	No. tested	+ve (%)	-ve (%)	P-value
HBsAg	91	8(8.79)	83(91.21)	0.00001
Anti-HBs	91	33(36.26)	58(63.74)	
IgM anti-HBc	91	6(6.59)	85(93.41)	
HBeAg	91	1(7.69)	12(92.31)	

X^2=46.28; P<0.05

Table 2. Age seroprevalence of hepatitis B virus serologic markers

Age	N (%)	Positive HBV seromarkers				HBV seromarkers -ve	p-value
		HBsAg n=8 +ve(%)	Anti-HBs n=33 +ve(%)	IgM anti-HBc n=6 +ve(%)	HBeAg n=1 +ve(%)		
17-21	31(34.1)	1(12.5)	11(33.3)	4(66.7)	1(7.7)	14	0.00001
22–26	22(24.2)	1(12.5)	9(27.3)	1(16.7)	0(0.0)	11	
27–31	17(18.7)	1(12.5)	8(24.2)	0(0.0)	0(0.0)	08	
32–36	14(15.4)	3(37.5)	4(12.1)	1(16.7)	0(0.0)	06	
37–41	06(6.6)	2(25)	1(3.0)	0(0.0)	0(0.0)	03	
42–46	01(1.1)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	01	

X^2=138.126; P<0.05

Table 3. Trimester based distribution of HBV sero-markers

Trimester	No. tested (%)	Positive HBV seromarkers				p-value
		HBsAg n=8 +ve(%)	Anti-HBs n=33 +ve(%)	IgM anti-HBc n=6 +ve(%)	HBeAg n=1 +ve(%)	
1st	49(53.8)	2(25)	21(63.6)	4(66.7)	1(7.7)	0.00001
2nd	24(26.2)	4(50)	7(21.2)	2(33.3)	0(0.0)	
3rd	18(19.8)	2(25)	5(15.2)	0(0.0)	0(0.0)	

X^2=64.79; P<0.01

Of particular interest was the case of a 19 year old pregnant woman (one of the six IgM anti-HBc positive persons) 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 a 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 was positive for HBeAg. The HBeAg positivity further indicates a high level viremia and a high risk for transmission of the disease to the developing fetus. If this patient continued the same situation to the 3rd trimester, her fetus would be 80% - 90% prone to cirrhosis and hepatocellular carcinoma in adulthood [15,16].

The remaining five women who tested positive for IgM anti-HBc were also negative for HBsAg. Such cases might result in 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. 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.

5. 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 remains of high endemicity in the study area. Also HBsAg positive 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. Therefore we recommend a more comprehensive research on prevalence of HBV serological markers in Nigeria. Routine screening and prevention of perinatal transmission is also recommended. Government should invigorate its vaccination campaign strategies.

Finally, we are grateful to members of staff at the department of Immunology, University of Maiduguri Teaching Hospital for helps offered during the analysis of the serum samples.

FUNDING INFORMATION

This research was self-sponsored by the authors. No external funding of any sort was received for prosecution of this research.

COMPETING INTERESTS

As authors, we declare that we have no competing interest.

REFERENCES

1. Gasim IG, Intisar AM, Ishag A. Hepatitis B and C virus infections among pregnant women in Arab and African countries. J Infect Dev Ctries. 2013;7(8):566-578.
2. Chaiba E, Coimbraa BG, Galva'oa FHF, Tatebea ER, Shinzatoa MS, D'Albuquerquea LAC, Massad E. Does anti-hepatitis virus vaccine make any difference in long-term number of liver transplantation? Clin Transplant. 2012;26: E590-E595.
3. Gasim IG. Hepatitis B in the Arab world: Where do stand? AJG. 2013;14:35-43.
4. Harkisoen S, Arends JE, Van Erpecum KJ, Van de Hoek A, Hoepelman AI. Hepatitis viral load and risk of HBV-related liver disease: From East to West? Ann Hepatol. 2012;11:164-171.
5. World Health Organization; 2008. Hepatitis B. World Health Organization Fact Sheet; 2004. Available:http://www.who./gb/ebwha/pdf
6. Sangare L, Sombie R, Ouedraogo T, Bambara A, Ouedraogo C, Guissou IP. Importance of the confirmatory assay for the detection of the HBs Ag in the epidemiological studies and in the diagnosis of the viral hepatitis B. Afr J Cln Exper Microbiol. 2011;12:44-48.

7. Olokoba AB, Salawu FK, Danburam A, Desalu OO, Olokoba LB, Wahab KW, Badung LH, Tidi SK, Midala J, Aderibigbe S, Abdulraman MB, Babalola OM, Abdulkarim A. Viral hepatitides in voluntary blood donors in Yola, Nigeria. Euro J Scientific Res. 2009;31:329-334.
8. Ugwuaja EI, Ugwu NC. Sero-prevalence of hepatitis B surface antigen and liver function tests among adolescents in Abakaliki, South-Eastern Nigeria. Internet J Trop Med. 2010;6:1-6.
9. Ojo OO, Anibijuwon II. Determination of antibodies to hepatitis B virus in pregnant women in Akure, Ondo state, Nigeria. Cont J Microbiol. 2009;3:6-10.
10. Oyinloye SO, Dahiru A, Ajayi BB, Lawan MA. A community based seroprevalence survey of hepatitis B surface antigen among pregnant women in Taraba State, Nigeria. Biol. Environ. Sci J Trop. 2012;9: 120-122.
11. Ndako JA, Echeonwu OO, Onovoh EM, Ujah A, Ikani PA, Paul GA. Hepatitis B virus sero-prevalence among pregnant women in Northern Nigeria. Res J Med Sci. 2012;6:129-133.
12. Tong S, Kim KH, Chante C, Wands J, Li J. Hepatitis B e antigen variant. Int J Med Sci. 2005;2:2-7.
13. Olokoba AB, Salawu FK, Danburam A, Olokoba LB, Midala JK, Badung LH. Hepatitis B virus infections amongst pregnant women in North-Eastern Nigeria-A call for action. Nig J Clin Pract. 2011;14: 9-13.
14. Yang HI, Lu SN, You SL, Sun CA, Wang LY, Hsiao CK. Hepatitis B e antigen and the risk for hepatocellular carcinoma. N Engl J Med. 2002;347:168-174.
15. Chen C, Chang M. Hepatitis B and pregnancy: The scientific basis for perinatal prevention. Cambridge J Online. 2010;21:89-113.
16. Pennap GR, Osanga ET, Ubam A. Seroprevalence of hepatitis B surface antigen among pregnant attending antenatal clinic in Federal Medical Centre, Keffi, Nigeria. Res J Med Sci. 2011;51: 80-82.
17. Utoo BT. Hepatitis B surface antigenemia (HBsAg) among pregnant women in Southern Nigeria. Afr Health Sci. 2013;13: 1139-1143.
18. Obi CL, Nnatu SN, Anyiwo CE, Agbonlahan DE, Esuneh FI, Karpos A. A comparison of HIV seropositivity and hepatitis B surface antigenaemia (HBsAg) among the same group pf apparently healthy pregnant women in Lagos, Nigeria: A preliminary report. Viral Immunol. 1993; 6:43-47.
19. Walz A, Wirth S, Hucke J, Gerner P. Vertical transmission of hepatitis B virus from mothers negative for HBV surface and positive for antibody to HBV core antigen. J Infect Dis. 2009;200:1227-1231.
20. Chatterjee S, Ravishankar K, Chatterjee R, Narang A, Kinikar A. Hepatitis B prevalence during pregnancy. Indian Pediatr. 2009;46:1005-1008.
21. Arfaoui D, Fkih M, Hafsa AE, Kaabia N, Azzouz M. Hepatitis B and pregnancy. Tunis Med. 2010;88:383-389.
22. Matin A, Rafiqul I, Roy RR, Mowla G, Shahidulalam ABM. Seropositivity of hepatitis B and C markers among non-icteric children attending a Tertiary Hospital in Dhaka City. Bangladesh J Child Health. 2012;36:11-15.
23. Harry TO, Bajani MD, Moses AE. Hepatitis infection among blood donors and pregnant women in Maiduguri, Nigeria. East Afri Med J. 1994;71:596-597.
24. Baba MM, Onwuka IS, Baba SS. Hepatitis B and C infections among pregnant women in Maiduguri, Nigeria. Central Eur J Pub Health. 1999;7:60-62.
25. Ndams IS, Joshua IA, Luka SA, Sadiq HO. Epidemiology of hepatitis B infection among pregnant women in Minna, Nigeria. Sci World J. 2008;3:5-8.
26. Onwuliri FC, Ndako JA, Olabode AO, Onwuliri EA, Echeonwu GON, Okeke IO, Maliki M. Sero-prevalence of hepatitis B surface antigen among pregnant women in Vwang district, Plateau State, Nigeria. Nig J Biotech. 2008;19:60-65.
27. Agbede OO, Iseniyi JO, Kolawole MO, Ojuowa A. Risk factors and seroprevalence of hepatitis B surface antigenemia in mothers and their preschool age children in Ilorin, Nigeria. Therapy. 2007;4:67-72.
28. Onakewhor JUE, Offor E, Okonofua FE. Maternal and neonatal seroprevalence of Hepatitis B surface antigen (HBsAg) in Benin City, Nigeria. J Obstr Gynaecol. 2001;21:583-586.

29. Akanni CI, Ojule AC, Opurum HC, Ejilemele AA. Seroprevalence of HBsAg in Port Harcourt, Nigeria. Nig Postgrad Med J. 2005;12:266-270.
30. Mbaawuaga EM, Enenebiaku MNO, Okopi JA, Damen JG. Hepatitis B virus infection among pregnant women in Makurdi, Nigeria. Afri J Biomed Res. 2008;11: 155-159.
31. Masset B, Cuevas M, Gerard JP. Analysis of serum mediated immunosuppression in normal pregnancy, abortion and contraception. Allergol Immunopathol (Madr). 1980;8:569-578.
32. Kwong SY, Lee CH. Epidemiology and prevention of hepatitis B virus infection. Korean J Hepatol. 2011;17:87-95.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/12040