Asian Journal of Immunology

4(4): 1-7, 2020; Article no.AJI.60522

Prevalence of Hepatitis B Virus among Women of Child-Bearing Age in Port Harcourt, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author IOO designed the study, performed the statistical analysis and wrote the protocol. Authors TIC, OLU and CCA managed the analyses of the study. Authors IOO and CCA managed the literature searches and wrote the first draft of the manuscript. Authors IOO supervised the whole study which. Author OLU used as part of her B.Sc. Project in the Department of Microbiology, University of Port Harcourt, Nigeria. All authors read and approved the final manuscript.

Article Information

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(3) Subhashish Das, Sri Devaraj Urs Academy of Higher Education and Research, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/60522

Original Research Article

Received 10 June 2020
Accepted 16 August 2020
Published 17 October 2020

ABSTRACT

Aim: Hepatitis B virus among women of child bearing age is a major determinant of perinatal hepatitis B transmission. The risk of developing liver-related complications, such as cirrhosis and hepatocellular carcinomas increases as patient progresses from acute to chronic stage of the infection. The aim of this study was to determine the prevalence of HBV among women of child bearing age in Port Harcourt, Nigeria.
Study Design: Cross-sectional study.
Place and Duration of Study: University of Port Harcourt, Nigeria, between June 2012 and July 2015.
Methods: A total of 89 women of child bearing age in Port Harcourt, Nigeria (ages 15-45 years) were screened for the presence of HBsAg. The presence of HBV was determined using third-generation enzyme linked immunosorbent assay (ELISA) (Bio-Rad, France).

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Results: The results showed an overall HBsAg prevalence of 12.4%. Married women (14.3%) were found to be more infected with the highest prevalence rate recorded among the non-students (14.6%) and those within the 25-45 years age group (14%).
Conclusion: This study has shown that the prevalence of HBV among women of child-bearing age is high. Health education on the possible mode of transmission and the introduction of routine screening of women in health facilities will grossly help in reducing the rate of infection.

Keywords: HBV; women; prevalence; Nigeria.

1. INTRODUCTION

Hepatitis B virus (HBV) is among the most common viral infections worldwide. Individuals infected with HBV that progresses to the chronic stage, have a 20–30% risk of early death from complications, including liver cirrhosis and hepatocellular carcinoma [1]. Recent estimates from the WHO reveal that around 325 million people worldwide are living with chronic HBV infection, most of whom come from East Asia or sub-Saharan Africa [2]. It constitutes a major public health problem as more than 2million people die annually from HBV related diseases [3,4]; [5]. Hepatitis B is spread when blood, semen, or other body fluids from a person infected with the virus enters the body of someone who is not infected. This can happen through sexual contact; sharing needles, syringes, or other drug-injection equipment; or from mother to baby at birth [6]. The occurrence rate of chronic hepatitis is increased in pregnant women, especially those in their last trimester, compared with non-pregnant women [7]. Some women of childbearing age may have advanced disease that reduces fertility while others especially those with complication of cirrhosis do have an increased risk for maternal and fetal mortality [8]. Transmission of HBV from carrier mothers to their babies can occur during the perinatal period, and appears to be the most important factor in determining the prevalence of the infection in high endemic areas [9]. Therefore, when pregnant women are infected, they constitute a serious health risk not only to their unborn child but also the society at large [10].

The rate of occurrence of HBV serologic markers reveals the HBV infection status in the specific populations studied. Hepatitis B surface antigen (HBsAg) is one of the serologic markers used in the diagnosis of HBV infection and it can be detected both in acute and chronic stages of the infection [1]. Previous reports about HBV infection among women of reproductive age in Nigeria indicated a HBsAg prevalence of 6.5% in Niger [11,12]. 7.3% in Lagos [13], 8.3% in Ibadan [14], 4.3% in Port Harcourt [15], 11.6% in Maiduguri [16], 8.3% in Zaria [9] and 23.3% in Kano [17].

Africa has been reported to be one of the highly endemic regions where at least 8% of the population are HBV chronic carrier [9]. Chronic carriers of HBV are main reservoirs for continued transmission of HBV and have a higher risk of hepatocellular carcinoma and liver cirrhosis [18]. Complications usually start to manifest in adulthood, often in the prime of an individual's life, and results in much personal and social distress [1]. The associated morbidity, mortality, and medical health expenditure are immense. Since a greater burden of CHB results from mother-to-child transmission [1,19], knowing the magnitude of HBV infection in women of child bearing age is very important in preventing the transmission of HBV to newborns, spouses, other household members and sexual partners. Therefore, the aim of this study was to determine the prevalence of HBsAg in women of child-bearing age in Port Harcourt, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

Sampling was done in a hospital that provided health care services to an entire University community. This sampling location was the O.B. Lulu Briggs Medical Centre, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria.

2.2 Study Design

This was a cross-sectional study carried among women of child-bearing age in University of Port Harcourt located in Rivers State, Nigeria. It is among the several tertiary institutions in Rivers State, Nigeria. Its layout has three campuses which are located at Choba Park, Delta Park, and University Park (Abuja Park).

2.3 Determination of Sample Size for the Study

The sample size for this study was determined using the established formula [20]; Niang *et al*., 2006): N= $[Z^2 (PQ)]/d^2$. Where N is the desired sample size. Z = standard normal deviation at a 95% confidence interval (which was 1.96). p = proportion of target population. q = alternate proportion (1-p), which was calculated as: 1 – p. d = desired level of precision (degree of precision/significance). This was taken as 0.05. Then, the desired sample size (N) = 87. Hence, the estimated sample size was 87 individuals [20] Niang *et al.*, 2006), providing a total sample size of 89.

2.4 Study Population

The study population consists of eighty-nine women of child bearing age. The age range of these women examined was between 15 and 45 years.

2.5 Blood Sample Collection and Processing

The sampling technique used for drawing the samples in this study was the convenience sampling technique. Venipuncture technique was used for blood collection. Three milliliters (3ml) of blood were collected from 89 consenting women by venipuncture. The blood was allowed to clot and centrifuged at 3000 rpm for 5 minutes. The sera were carefully aspirated into plain bottles and taken to the Virus Research Unit, Department of Microbiology, UNIPORT, for the laboratory analysis. These samples were stored at -20^{o}C until analyzed.

2.6 Serological Analysis of HBsAg

The presence of HBV was determined using third-generation commercially available enzyme linked immunosorbent assay (ELISA) (Bio-Rad, France) according to the manufacturer's specifications.

2.6.1 Preparation of components

The microplate was allowed to reach room temperature (about 1hr) before opening container. Negative control and positive control which was ready to be used was mixed well on vortex use. The volume of ELISA grade water as reported on the label was added to the lyophilized powder to dissolve it, and it was gently mixed by vortexing. The 20x concentrated solution was diluted with EIA grade water up to 1200ml and was mixed gently end-over-end before use. The working solution was prepared diluting 20× concentrated reagent into conjugate and was mixed well on vortex before use. Ready to use chromogen and Sulphuric acid was well mixed by end-over-end before use.

2.6.2 Procedures

The number of require strips were placed on the plastic holder and was washed once to hydrate wells. The wells for controls, calibrator and samples were carefully identified. The A1 well was left empty for blanking purposes. Using the pipette, 150µl of the negative control was triplicated, 150µl of the calibrator duplicated and 150µl of the positive control in single, followed by 150µl of the samples. The presence of the samples in the well was checked for a marked difference between empty and full wells. About 100ml of enzyme conjugate was dispensed in all wells, except A1 used for blanking operations. Proper care was taken not to touch the inner surface of the well with pipette when the conjugate was dispensed, to prevent contamination. Colour from yellow to pink/red. Then the microplate was incubated for 120 minutes at 39□c. Strips were sealed. After incubation the microwells were washed according to the instruction guiding this method. About 200µl chromogen/substrate was transferred into all the wells using a pipette, including A1. The microplate was incubated protecting from light at 10-24□c for 30 minutes. About 100µl of Sulphuric acid was transferred into all wells to stop the enzymatic reaction using same pipetting sequence. The colour intensity of the solution in each well was measured using a 450nm filter, blanking instrument on A1.

2.7 Data Analysis

The seroprevalence was calculated. Chi-square test was used to establish relationships between demographic factors and HBV prevalence using Microsoft Excel spreadsheet (Microsoft Corporation). Significance level was set at $P \leq 0.05$.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Participants' characteristics

Tables 1-3 shows the socio-demographical characteristics of the participants used in this study. Ages of the participants screened ranged

Table 1. Prevalence of HBsAg according to different Age distribution

Age groups (years)	No. Tested (%)	No. Positive (%)	P value
15-24	39 (43.8)	4 (10.3)	0.59
25-45	50 (56.2)	7 (14.0)	
Total	89 (100.0)	11 (12.4%)	

Table 2. Prevalence of HBsAg in relation to occupation

Occupations	No. Tested (%)	No. Positive (%)	P value
Students	48 (53.9)	5 (10.4)	0.54
Non-Students	41 (46.1)	6 (14.6)	
Total	89 (100)	11 (12.4%)	

Table 3. Prevalence of HBsAg in relation to marital status

Marital Status	No. Tested (%)	No. Positive (%)	P value
Married	56 (62.9)	8(14.3)	0.47
Singles	33 (37.1)	3(9.1)	
Total	89 (100.0)	11(12.4%)	

from 15-45 years. Fifty (56.2%) of them were within the age range 25-45 years while 39 (43.8%) were in the age groups 15 - 24 years of age. In terms of occupation, 48 (53.9%) were students and 41(46.1%) were non-students. Their marital status revealed that 56(62.9%) of the participants were married while 33(37.1%) were singles.

3.1.2 Prevalence of HBsAg in relation to age

This study shows that the prevalence of HBsAg in relation to age was higher among the age-groups 25-45 years (14.0%, n=7) compared to age groups 15-24 years of age (10.3%, n=4). This difference was not statistically significant (P=0.59) (Table 1).

3.1.3 Prevalence of HBsAg in relation to occupation

Prevalence of HBsAg in relation to occupation was higher among the non-students (14.6%) when compared to the students (10.4%). This difference was not statistically significant (P=0.54) (Table 2).

3.1.4 Prevalence of HBsAg in relation to marital status

Married women (14.3%) had higher prevalence when compared with the single women (9.1%), however, this was not statistically significant (P=0.47) (Table 3).

3.2 Discussion

HBV infection is a serious disease of humanity and constitutes a global public health problem [21,22]. The recognition of hepatitis B virus (HBV) infection as a disease of public health importance came into existence when it appeared as an adverse event associated with a vaccination program [23]. The literature review revealed that prenatal transmission of HBV is strongly a major means of spreading the virus. Women who are positive for HBsAg are likely to infect their babies [11].

The result of this study revealed an HBV seroprevalence rate of 12.4% among women of child bearing age in Port Harcourt, Nigeria, indicating that HBV is highly endemic in Port Harcourt, Nigeria. This result is in agreement with an earlier report that sub-Saharan Africa has HBV carrier rate range of 9 – 20% [24], 11.0% in Papua, New Guinea [25], and 17.3% in Burkina Faso [26]. Findings of similar studies in other parts of the world revealed 10.0% in Hong Kong [27]. Similar findings have been reported to be 11.5% in Ibadan [28] and 11.6% in Maiduguri [16]. However, it was much higher than the prevalence of 9.5%, 8.3%, 7.3%, 6.5% and 4.3% reported in Abuja, Zaria, Lagos, Niger and Port Harcourt respectively [29,9,11,13,15] and lower than 16.3% reported in Ibadan [30]. The result of this study is also higher than 3.7 reported in Ethiopia [31] and the 7.0% reported in Abuja, Nigeria [21]. The 12.4% is also higher than the prevalence of 2.89% and 4.3% earlier reported

respectively in Port Harcourt [15,22]. It is also higher than 6.08% reported in Lagos, [32], 2.1% in Benin [33] and 5.7% in Ilorin [34], all in Southern Nigeria. This rate is also higher than 11.6% reported in pregnant women in Maiduguri Nigeria [35]. The variation in the results of this study and the previous studies may be attributed to the difference in the endemicity of the virus, lack of basic knowledge on the possible route of transmission of the virus, poor immunization coverage and negligence on the part of the women.

The distribution of HBsAg by age groups shows that women in the age group 25-45 years have the highest prevalence of 14.0%. This corroborates findings of previous work [36] which reported that the exposure to HBV infection increased with age in both rural and urban areas [37,36]. This is similar to the findings reported in Brazil [38], that age was not significantly associated (P=0.59) with HBsAg seropositivity among afro-descendant community.

Prevalence of 14.3% obtained among the married women was much higher than the 9.1% obtained among the single women. This difference was not statistically associated (P=0.54). This was in agreement with the findings of Yakasai et al. [39] and Rabiu et al. [32] and the work conducted in Lagos by Adegbesan-Omilabu et al. [13], who suggested that acquisition of HBV may not be based on the marital status of women. This is consistent with a report from Jos, Plateau state [40]. However, it is at variance with the study by Ezegbudo et al. [41] who reported that significant infection rate from HBV-HIV co-infection were associated with marital status. Our observation also contradicted the report by Uneke *et al.* [42] that the risk of acquiring HBV was higher in singles than among the married. Higher prevalence among the married women could be due to the fact that HBV is sexually transmitted and the duration of sexual activity, number of sexual partners, and history of sexually transmitted infections determine the prevalence of HBV infections [22].

Furthermore, this study revealed that women who were students had lower seroprevalence (10.4%) compared to the non-students (14.6%). This finding is in conformity with previous works [35,39], indicating the positive influence of education and public enlightment/ awareness on the carrier rate of HBV infection [39]. However, occupations was not statistically associated (P>0.05) with HBV prevalence among these women of child-bearing age in Port Harcourt, Nigeria.

4. CONCLUSION

From the study, 12.4% of the women had Hepatitis B infection at the time of data collection, implying that the virus is endemic in the study area. In order to reduce the burden of the disease, there is a need to educate the women about HBV infection, targeting the less educated and those with positive contacts. Vaccination programmes should also be implemented not on infant and children alone but also on adults. Furthermore, the routine maternal HBsAg screening should be complemented with immunoglobulins injections, which would help to prevent mother-to-child transmission.

CONSENT

All authors declare that written informed consent was obtained from the patient for publication of this study. Consented volunteers were included in this study while individuals who decline involvement in the study were not included in the study.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the University Research Ethics committee of University of Port Harcourt and have, therefore, been performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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