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Sero-prevalence and associated risk factors of Hepatitis B among adults attending selected government hospitals in Nigeria

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ABSTRACT: Hepatitis B virus (HBV) infection is one of the major public health problems globally. This study aims to determine the frequency of occurrence of HBV infection and associated risk factors for acquisition of the disease in clinically-ill adult patients attending selected government hospitals in Ondo State, Nigeria. Seven hundred and sixty-seven (767) ill adult individuals attending five medical out-patient Departments of the hospitals who consented to the study were recruited for the investigation. A structured questionnaire which covered sociodemographic characteristics and risk factors were used for primary information. Positivity for HBV was determined using a quality assured commercial enzyme linked immunosorbent assay (ELISA) kit for the detection of Hepatitis B surface antigen (HBsAg). Of the 767 patients, 11.0% were positive for HBsAg. The prevalence rate for HBsAg positivity was higher in the males (13.5%) than the females (9.3%) ($p = 0.043$). The study also revealed the highest prevalence rate of HBsAg infection among the age group 19 – 39 years with mean percentage of 17.5%. Alcohol consumption, history of HBV in the family, multiple sex partners, history of injections in road side chemist shops, and intake of traditional herbs showed significant association respectively ($p < 0.05$), however no significant association among individuals with history of HBV vaccination, blood transfusion and tattoo/tribal mark ($p > 0.05$). Conclusively, this study gives information on the prevalence rate of HBV in the community sampled to be 11.0%. This shows that HBV is endemic in Ondo State, Southwest Nigeria.

Keywords: Hepatitis B Virus; Hepatitis B surface antigen; Risk factors; Sero-prevalence; Socio-demographic data.

1. INTRODUCTION

Hepatitis B is a disease cause by Hepatitis B Virus (HBV) and it belongs to the genus Orthohepadnavirus in the family Hepadnaviridae. It contains deoxyribonucleic acid (DNA) as its major genetic material composed of a 27 nm nucleocapsid core which is coated by a surface antigen called the Hepatitis B surface Antigen (HBsAg) [1, 2]. As at 2015, preceding records showed that more than 2 billion people have been infected with HBV with almost 257 million people chronically infected with HBV [3, 4].

Annual estimate indicates that about 4.5 million new cases occurred, and about 887,000 people die globally from chronic HBV infection with major cause of mortality being liver cancer (38%) and cirrhosis (52%) [6, 7]. Globally, Africa records the second largest cases of chronic HBV carriers after Asia and therefore represents a region of high endemicity [8]. Seventy percent of chronic HBV infection is estimated to occur in low-income countries and the prevalence is highest in the sub-Saharan African countries including Nigeria with prevalence rate of 10-26% among the general population [7, 9-12].

The major routes of HBV transmission have been reported to include; sexual contact, infected blood transfusion, and usage of unsterilized equipment for medical procedures and sharing of sharp materials [13, 14]. Although, perinatal exposure to HBV constitutes the most predisposing mode of transmission among individuals in areas of medium to high endemicity [15]. Infected mothers who are positive for HBsAg and HBeAg markers have $\geq 90\%$ chance of transmitting the virus to their babies. Such babies have higher chance of becoming chronic carriers later in life [16]. Fifteen to 25% of these children have risk of dying from cirrhosis or liver cancer during adulthood [17, 18].

Most studies carried out in Nigeria on the HBV seroprevalence and risk factors are among pregnant women which are also at regional bases hence this study is aimed to determine the frequency of occurrence of HBV infection and associated risk factors for acquisition of the disease in clinically ill adult patients attending selected government health facilities in Ondo State, Nigeria.

2. MATERIALS AND METHODS

2.1. The study population

Blood samples were collected from sick individuals who sought medical attention at 5 selected government hospitals in Ondo State, Nigeria. The selected health facilities were; Government State Hospital, Ikare, Federal Medical Center, Owo, University of Medical Sciences Teaching hospital (UNIMED) Annex, Akure, UNIMED Teaching Hospital Complex Ondo and Government State Hospital, Okitipupa.

2.2. Structured questionnaires

A total of 767 structured questionnaires which covers the demographic information and risk factors for HBV infection were administered to the participants that consented to participate in the study. The questionnaire covered age, sex, marital status, educational status, occupational status, history of blood transfusion, history of sexual partners alcohol consumption, history of injection at the road side chemist shop, history of liver disease in the family, history of pains on the right side of the stomach and HBV vaccination. The questionnaire did not include their identification particulars, thus safeguarding anonymity. Following the filling of the questionnaire and written consent form, they were then recruited for the study.

2.3. Blood sample collection

The collection of blood was done at the Medical Out Patient Department (MOPD) of all the hospitals. Five milliliter (5 ml) of blood sample was collected from each participant from their antecubital vein using a labelled plain vacutainer container (BD Vacutainer, Plymouth, PL6 7P. UK) after filling the questionnaire. The blood samples were transported to the laboratory in a cold chain after which they were retracted and centrifuged at 500 x g for 5 minutes using centrifuge 80-3 (Labsience, England). The serum was harvested into 2 ml cryovials and stored at -20°C until analyzed.

2.4. ELISA serological assay for HBsAg and HBV markers

The stored blood serum samples were brought out from the freezer where they were stored and allowed to thaw and attain room temperature before the assay. They were analyzed using third generation commercially-available sandwich enzyme linked immunosorbent assay (ELISA) kits for detection of HBsAg. The blood samples that were positive for HBsAg samples were further assayed for HBeAg, HBsAb and HBcAb (DIA.PRO Diagnostic Biopobes Sri Via G. Carducci n° 27 20099 Sesto San Giovanni (Milano) – Italy). The assayed samples were read at 450 nm filter via ELISA machine; Dynatec MR. 5000 ELISA reader.

2.5. Statistical analysis

Statistical analyses were performed using SSPS (version 16.0). The prevalence of HBV markers of the studied population was calculated at 95% confidence intervals (CI). The demographic and risk factors variables and prevalence of hepatitis B markers were evaluated using Chi-square.

3. RESULTS

Out of a total of 767 adult patients that were recruited for the study, 11.0% (84/767) were positive for HBsAg (Figure 1). Based on gender, 13.5% (41/303) of the male participants and 9.3% (43/464) of the females recruited were positive for HBsAg (Table 1, $p = 0.043$.) The age group of 19-29 years had the highest percentage positivity with 17.9% which was followed by the age range of 30-39 years with 17.0%, age range 50-59 years with 12.6% and the least was age range of 80 years and above with 0% (Table 1). Furthermore, the study showed that singles had the highest positivity with 19.1% (22/115) which showed a significant association ($p = 0.003$) while the married with 9.5% (62/652) positivity (Table 1). Significant association was found ($p = 0.042$) in the educational status with 15.3% (13/83) in those that did not have any form of education. This was followed by those with tertiary education with 12.0% (42/351) and then secondary education with 11.8% (21/178) (Table 1). Moreover, from the study, unemployed adults had the highest positivity for HBsAg with 13.6% (42/309) which was followed by retirees with 12.9% (8/62), house wives with 11.4% (5/44) and the self-employed (Farming, trading, tailoring and business) with 10.1% (21/207) and the least was observed in civil servants with 5.5% (8/145) (Table 1).

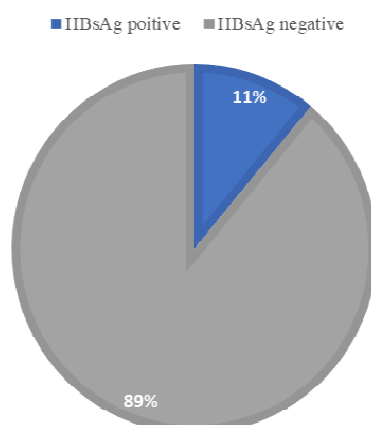


Figure 1. Seroprevalence of HBsAg among patients attending selected Health Institutions in Ondo State.

Table 2 showed that of the 84 patients positive for HBsAg, 37 (44%) were positive for HBeAg-while 47 (56%) were negative. Also, 15 (17.9%) were positive for HBsAb while 69 (82.1%) were negative. Furthermore, 18 (21.4%) were positive for HBcAb while 66 (78.6%) were negative respectively.

Table 1. Assessment of risk factors of HBV Seropositivity among patients attending Selected Health Institutions in Ondo State.

Variables	Frequency	Percentage (%)	% HBsAg positivity	p-values
Gender				
Male	303	39.5	41 (13.5)	pv = 0.043
Female	464	65.5	43 (9.3)	
Age Range (years)				
18 - 29	106	13.8	19 (17.9)	
30 - 39	100	13.0	17 (17.0)	
40 - 49	127	16.6	15 (11.8)	
50 - 59	167	21.8	21 (12.6)	
60 - 69	140	18.3	6 (4.3)	
70 - 79	103	13.4	6 (5.8)	
≥ 80	24	3.1	0 (0)	
Marital Status				
Married	652	85.0	62 (9.5)	pv = 0.003
Single	115	15.0	22 (19.1)	
Educational Status				
Primary	153	19.9	8 (5.1)	pv = 0.042
Secondary	178	23.2	21 (11.8)	
Tertiary	351	45.8	42 (12.0)	
None	85	11.1	13 (15.3)	
Occupation				
Self employed (Farming, Trading, Tailoring and Business)	207	49.7	21 (10.1)	
Unemployed	309	6.8	42 (13.6)	
Retiree	62	15.3	8 (12.9)	
House wife	44	3.3	5 (11.4)	
History of blood transfusion				
Yes	75	9.8	12 (16.0)	pv = 0.170
No	692	90.2	72 (10.4)	
Tribal marks/tattoo				
Yes	166	21.6	22 (13.3)	pv = 0.325
No	601	78.4	62 (10.3)	
Experience pain on the right side of the stomach				
Yes	73	8.4	27 (37.0)	pv = 0.0001
No	694	91.6	57 (8.2)	
Alcohol consumption				
Yes	123	16.0	29 (23.6)	pv = 0.001
No	644	84.0	55 (8.5)	
No of sexual partners				
1	645	84.1	68 (10.5)	
2	55	7.2	7 (12.7)	
3	12	1.6	3 (25.0)	
4	55	7.2	6 (10.9)	
History of liver disease in the family				
Yes	26	3.2	12 (46.2)	pv = 0.0001

Variables	Frequency	Percentage (%)	% HBsAg positivity	p-values
No	741	96.8	72 (9.7)	
History of HBV vaccination				
Yes	98	12.8	18 (18.4)	pv = 0.057
No	669	87.2	66 (9.9)	
History of injection on roadside chemist shop				
Yes	98	12.8	18 (18.4)	pv = 0.057
No	669	87.2	66 (9.9)	
History of traditional herb usage				
Yes	426	55.5	61 (14.3)	pv = 0.016
No	341	45.5	23 (6.7)	

Table 2. Distribution of HBV markers among HBsAg positive patients in Ondo State tested (n = 84).

HBV Markers	Positive (%)	Negative (%)
HBeAg	37 (44.0)	47 (56.0)
HBsAb	15 (17.9)	69 (82.1)
HBcAb	18 (21.4)	66 (78.6)

Key: HBeAg - Hepatitis B antigen; HBsAb - Hepatitis surface antibody; HBcAb - Hepatitis core antibody. Show statistically significant difference 0.040.

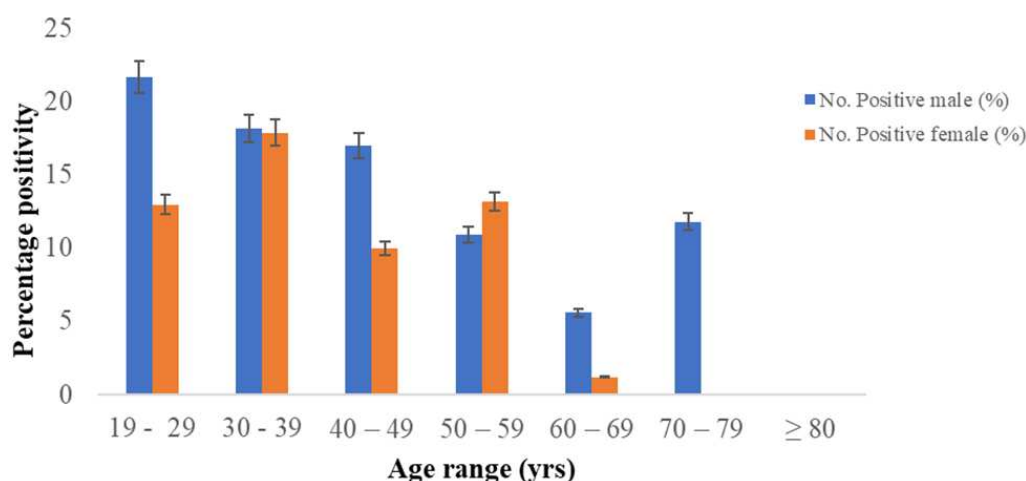


Figure 2. Age and gender distribution of Hepatitis B virus positive patients attending selected government hospitals in Ondo State.

Figure 2 shows, the highest percentage in the male participants were in the age range of 19-29 years with 21.7% (13/60) while age range of 30-39 years with 17.9% (12/67) in the female participants. This was followed by age range 30-39 years in the males with 18.2% (6/33) while age range of 50-59 years with 13.2% (16/121) in the females. Only the male participants within the age range of 70-79 years had positive HBsAg with 11.8% (6/51) while in the females it was 0%.

The study showed insignificant association among patients who had blood transfusion with 16.0% (12/75) and patients who had tribal marks/tattoos with 13.3% (22/166) (PV = < 0.05 respectively). However, the study further showed a highly significant association among patients who had right-sided stomach pains during the period of the study with 37.0% (27/73) (P = 0.0001).

A highly significant association was demonstrated ($P = 0.0001$) among those that consume alcohol with 23.6% (29/123). Furthermore, those with 3 sexual partners had significant association ($P = 0.042$) with 25.0% (3/12) while those that had history of liver disease in the family showed a highly Significant association ($P = 0.0001$) with 46.2% (12/26).

The study also showed that there was no significant association with those who had history of vaccination and history of injection in a chemist shop as risk factor for hepatitis positivity ($P = 0.179$) with 25.0%, (2/8) ($P = 0.230$) with 21.1% (4/19) and $P > 0.057$ with 18.4% (18/98). Table 1 also showed a significant association among patients who had history of traditional herbs usage with 14.3% (6 1/426) ($PV = 0.016$).

Table 2 showed that of the 84 HbsAg positive patients, 44.0% were also positive for HBeAg while 56.0% were negative. Also, 17.9 % were positive for HBsAb and 82.1% were negative. Furthermore, 21.4% were positive for HBcAb while 78.6% were negative. There was a significant association ($PV = 0.040$).

4. DISCUSSION

Hepatitis B virus (HBV) infection represents one of the major causes of global morbidity and mortality [19, 20]. The rate of Hepatitis B carriers varies widely from 0.01% to 20% all around the world [21]. Although safe and effective vaccines are available, HBV remains a substantial and devastating health problem with new cases still being reported throughout the world [22]. Given the capability of HBV elimination, one of the major health priorities is to find the routes of the transmission in order to access the risk factors responsible for its spread and to identify the target population of this great emphasis [23]. Finding the important transmission routes of hepatitis for the effective prevention of this disease in every country, most especially in endemic regions such as Nigeria is therefore necessary.

In this study, a cumulative HBsAg seroprevalence rate of 11.0% was observed among the adult individuals tested portraying the endemicity of hepatitis B in Ondo State, Southwest, Nigeria. This value falls within the prevalence values in different regions in Nigeria and in sub-Saharan Africa [24]. This further provides more and current information on the tenacity of Hepatitis B virus infection burden in southwest, Nigeria. The finding of this study is consistent with the report of a National survey carried out by Olayinka et al. [25] on the seroprevalence of HBV in Nigeria which is also in agreement with the prevalence in some Africa countries such as Ghana (5-10%), Cameroon (8-20%), Benin (12%) and Chad (12 %) [26-28].

More females (60.5%) were engaged than males (39.5%) during the sample collection, but the prevalence rate for HBsAg positivity was higher in the males (13.5%) than the females (9.3%) which has significant association ($pv = 0.043$). This is consistent with the National survey carried out in Nigeria on HBV which demonstrated males with higher prevalence to HBV infection [25]. This could be attributed to some social vices which males are engrossed with, for example indiscriminate alcohol consumption and cult related activities. Moreover, the male gender mostly participates in blood transfusion exercises while females are generally occupied with house hold activities based on their social, cultural and religious preferences. This finding is also in agreement with the studies carried out in Uganda and some other sub-Saharan African countries, where chronic HBV infections were reported to be more in males [29-31]. It has also been reported in studies carried out in Greece and Taiwan that males are more prone to HBV infection [32, 33]. However, studies carried out in Croatian adult population and Cambodia reported that gender has no association with HBV seropositivity [31, 34].

This study also revealed the higher prevalent rate of HBsAg infection among the youthful age group which falls within the age range of 19-39 years with mean percentage of 17.5%. This could be attributed to

the fact that people in this age bracket are sexually active so the high risk of contracting HBV infection. They also get involved in drug abuse and tattooing. This is in agreement with the report of Koulentaki et al. [35], Khokhar et al. [36], Islam et al. [37], and Adoga et al. [38]. The findings of this study are also in agreement with a study carried out in Brazil and the Central-West Region [39]. This study however revealed that some of the known risk factors associated with HBV infections, for example, history of blood transfusion, tribal marks/tattooing and history of HBV vaccination were not having significant association for HBsAg positivity among adult individuals recruited. This finding is not the same with earlier findings on the risk factors on HBV carried out in Nigeria [40, 41].

In this study, it was observed that individuals without any form of education were mostly positive for HBsAg with 15.3% which has significant association ($P < 0.05$). This could be attributed to their unawareness of the preventive measures of HBV infection indicating the impact of education on HBV infection. The findings of this study corroborate with earlier studies in Nigeria on this [42, 43] but disagree with the findings of Okonko and Udeze [44] and Agarry and Lekwot [45].

This study indicates that alcohol consumption, history of HBV in the family, number of sexual partners, history of having injections in the chemist shop, history of taking of local traditional herbs concoctions or decoctions called “Agbo” by the Yorubas were all having significant association as risk factors for HBsAg infection respectively.

Regarding family size and family history of HBV, HBV is more frequently transmitted in the families with hepatitis B patients [46, 47]. This study also corroborates studies carried out in Australia and China which shows the history of HBV in the family to predispose people to the infection than those without such history in their family. The findings in this study however showed no significant association among individuals with history of HBV vaccination, history of blood transfusion and tattoo/tribal mark as risk factor for HBsAg positivity. This disagrees with some existing findings where they reported a significant association [48-51].

This study revealed multiple antigenic markers on HBV studied, for instance, out of the 84 positive patients for HbsAg, 44.0% were positive for HBeAg. This is an indication of active replication of HBV infection. Its association with other HBV markers is also an indication of chronic hepatitis B virus infection. This study also revealed 17.9% positivity for HBsAb which is a suggestion of protective immunity against HBV infection [52, 53]. However, 21.4% of the patients positive for HBsAg were positive for HBcAb. This suggest the presence of the genetic component of the HBV in the positive HBcAb which makes them very infective [54, 55].

5. CONCLUSION

The findings of this study suggest that Ondo State, Southwest Nigeria is endemic for HBV infection. The outcome of this research is useful for health officers and planners towards coming up with preventing strategies of hepatitis B infection among adults as well as providing a robust scientific basis towards control of hepatitis B infection. It is recommended that education of the population on modification of lifestyle and sexual behaviors will go a long way to help reduce the transmission of the virus. Further investigations however are required on those that tested positive and unable to produce immune response for treatment in order to prevent them from developing chronic liver disease.

Authors' Contributions: TTA and BBA developed the study. BBA designed the methodology and acquire the data, analyzed and interpreted the data. BBA wrote the first draft of the manuscript. TTA and MKO corrected and fine-tuned the

manuscript. BBA reviewed and revised the manuscript, provided technical and material support. TTA and MKO both supervised the study. All authors read and approved the final manuscript.

Conflict of Interest: The authors declare no conflicts of interest.

Ethical considerations: Ethical approval for the study was sought and granted from the Ondo State Ministry of Health (OSHREC/30/01/18/039) and Federal Medical Center Owo (FMC/OW/380/VOL. LV111/96).

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