Hepatitis B surface antigenemia (HBsAg) and risk factors of transmission among patients attending Universal Hospital, Ankpa, Kogi State, Nigeria

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Abstract: This study was carried out to determine Hepatitis B Surface Antigenemia (HBsAg) and risk factors of transmission among patients attending Universal Hospital, Ankpa, Kogi State, Nigeria. In order to estimate the prevalence rate of HBsAg and to evaluate the influence of subjects' demographics on HBsAg seropositivity, we used well-designed questionnaire to obtain data considered risk factors for contracting hepatitis B virus from consenting patients. Thereafter, 150 apparently healthy male and female patients (ages 2 - 80 years) were consecutively selected; blood samples of whom were screened by parallel diagnostic method using Dia Spot® HBsAg test kit and One Step Strip Style HBsAg test kit (ANTEC DIAGNOSTIC®) for HBsAg. With SPSS 13.0, we used Chi square statistical test to establish association between the risk factors and HBsAg seropositivity. Overall prevalence rate of HBsAg was 14.0%. Contrary to educational status (p = 0.041), history of blood transfusion (p = 0.001) and marital status (p = 0.001); sex (p = 0.501), age (p = 0.142), condom-use during sexual intercourse (p = 0.432) and occupation (p = 0.903) were not significantly associated with HBsAg seropositivity among the study patients. This study however confirmed the presence of Hepatitis B surface antigenemia among apparently healthy patients in Kogi State, Nigeria. General surveillance, mass immunization and public health education to stop the spread of the infection on Ankpa community and indeed the whole society is advocated.
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1.0. Introduction

One major viral hepatitis that has been documented as a global public health problem is hepatitis B. This health condition is caused by infection with hepatitis B virus (HBV); an enveloped virus with double-stranded circular DNA. The virus is a major cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma (HCC). Approximately 5.0% of the world's populations were reportedly seropositive for hepatitis B surface antigen (HBsAg) (Sharma et al., 2005). The latter is one of HBV antigens found in blood of infected humans; which serves as a veritable marker of HBV infection (Motta-Castro et al., 2003; HCSP, 2008). Using this marker, studies have estimated that approximately 2 billion people had HBV infection. More than 350 million people were chronic carriers of HBV (WHO, 1998). Consequently, the global disease burden of HB was considered substantial due to the high HBV-related morbidity and mortality (Lok, 2005).

HBV is present in the blood, saliva, semen, vaginal secretions, menstrual blood, and, to a lesser extent, perspiration, breast milk, tears, and urine of infected individuals. The virus is resistant to breakdown making it survive for sometime outside human body; hence it is transmitted through contact with infected body fluids (Lavanchy, 2004). Sexual activity, especially heterosexual, and injection-drug use account for the majority of HBV transmission in low-prevalence areas (Seeger *et al.,* 2000) while perinatal transmission account for the majority of the transmission in high-prevalence areas (Harry *et al.,* 1994).

Hepatitis B is highly endemic in developing nations with large population such as South East Asia, China, sub-Saharan Africa and the Amazon basin (Sharma et al., 2005), where at least 8.0% of the population were HBV chronic carrier (Alter, 2003). In Eastern and Southern Europe, the Middle East, Japan, and part of South America, mixed pattern of transmission exist, including infant, early childhood and adult transmission (Lok, 2005). The endemicity of HBV is low in most developed countries, such as North America, Northern and Western Europe and Australia. In these regions, HBV infects 5.0-7.0% of the population, and only 0.5-2.0% of the population represented chronic carriers. In these areas, most HBV infections occurs in adolescents and young adults in relatively well defined high-risk groups, comprising injection drug users, homosexual males, health-care workers, blood transfusion or hemodialysis patients (WHO, 1998).

In Nigeria, several reports have established the endemic nature of HBV by the presence of HBsAg in

different population groups from different parts of the country. Akani *et al.* (2005) reported a prevalence of 4.3% in pregnant women in Port Harcourt, Nigeria. The prevalence of HBsAg among blood donors was 5.4% in Benin City (Umolu *et al.,* 2005) and 14.3% in Jos, Nigeria (Uneke *et al.,* 2005). Among HIV-infected individuals in Jos, Nigeria 25.0% prevalence was reported, indicating a higher HBV infection among this group (Uneke et al., 2005). A 4.4% HBsAg seroprevalence was reported in Lagos among healthy pregnant women. A study carried out on 100 healthy blood donors in Benin City showed 11.0% prevalence, while another at Central Hospital, Warri in Delta State, Nigeria showed a seroprevalence of 12.0%.

The prevalence of HBV varies between 2% in developed countries where the prevalence is low to about 8% in developing countries where infection is endemic with sex, age and socio-economic status as important risk factors for infection (Odusanya et al., 2005; Alikor and Erhabor, 2007). The prevalence of HBV infection also varies markedly from one region of the world to another. Racial differences between populations, cultural and economic differences in developing countries like Nigeria are factors considered responsible for the differences. The global burden of hepatitis B remains enormous, due largely to lack of universal HB vaccination (Alexander and Kowdley, 2006).

This study was therefore carried out in Universal Hospital, Ankpa, Kogi State, Nigeria to determine HBsAg antigenemia in apparently healthy patients. It also aimed at identifying some risk factors associated with HBV transmission.

2.0. Materials and Methods

2.1. Study area/population

This study was carried out in Ankpa, a town located in Kogi State, Nigeria. Ankpa, with a population of about 61,691, is the headquarters of one of the largest local government areas in Kogi state. The study population was a mixture of people from different parts of the country, but it largely comprised the indigenes - the "Igala" people.

2.2. Study design

Being one of the most utilized health facilities in the local government area, Universal Hospital, Ankpa was chosen as study site for this study; this was done to have more representative study patients (sample). Informed consent of the subjects and approval for the study were duly obtained from the patients and the hospital management respectively. A total of 150 apparently healthy patients attending the hospital were consecutively selected, their demographic data were obtained with well-designed questionnaire forms. The study participants' $\leq$ 12 years of age had the questionnaire forms filled in by their parents/care-givers. Only those $\geq$ 13 years were requested to respond to sexual section of the questionnaire form. The questionnaire data were used to categorize the patients into groups as shown in Table 1.

2.3. Serological analysis

About 5 ml of blood sample was aseptically collected by venepuncture from each patient into anticoagulant-free blood sample bottles. The blood samples were left to clot, after which sera were separated from the clot by centrifuging at 2000 rpm for 10 min. Sera were then separated from clots and stored at room temperature in labeled bottles until screened the same day. Parallel tests were carried out on each of the samples to determine the status. For the detection of HBsAg, one step immunoassay based Dia Spot® test strip for qualitative detection of HBsAg in serum (relative sensitivity and specificity of > 99% and 97.0% respectively with accuracy of 98.5%) and a rapid test kit - One Step Strip Style HBsAg Test (ANTEC DIAGNOSTIC®, UK) were used; the tests and result interpretations were done according to the tests kits' manufacturer's specifications. Discordant results were regarded as negative.

2.3. Data analysis

The data generated in the study were presented with descriptive statistics. In order to establish whether or not there were significant associations between the patients' demographic data and HBsAg seropositivity, we used Chi-square statistical test to analyze the data with $p \leq 0.05$ as indicator of statistical significance. SPSS 13.0 for Windows® was used for the analysis.

3.0. Results Analysis

One hundred and fifty apparently healthy patients aged 2-80 years (median age: 25 years) were screened for HBsAg. Of these 150 patients, 21 (14.0%) were positive for HBsAg. The overall seroprevalence rate of HBsAg was 14.0%. It is noteworthy to state that majority of the study patients; ages 40-80 years of age tested positive to HBsAg. Two of the 12 patients (ages 2 and 3 years) that tested positive to HBsAg in the less than 40 years of age group might have had exposure to HBV-infected maternal blood as these 2 patients had no history of previous blood transfusion (data not shown). This suggests that they may have contracted the virus from their mother, family members or peer groups. It has been shown that children can acquire HBV during delivery or post-partum through breast feeding or from chronic carrier mothers (Agbede et al., 2007) and through contact among siblings or children of poorer and larger families (Ugwuja and Ugwu, 2010). Also, a history of contact with jaundiced person has been identified as independent

risk factor for HBsAg seropositive status (Ugwuja and Ugwu, 2010).

From this study, the prevalence of hepatitis B surface antigen (HBsAg) among apparent healthy patients in Ankpa, Kogi State, Nigeria is 14.0%. This value is similar prevalence to 14.8% reported by Agbaji (2005) for HBV amongst HIV positive patients from Jos University Teaching Hospital (JUTH). These observations are similar to the findings in other African countries and the world in general (Ola et al., 2004; Agbaji, 2005).

This value is higher than the 7.6% prevalent rate reported in primary school children in Nnewi, Anambra State, Nigeria (Chukwuka et al., 2004); the 12.0% reported among pregnant women attending ante-natal clinic at Central Hospital, Warri, Delta State (Ophori et al., 2004); the 7% among Taiwanes adolescents (Ni et al., 2001); the 12.4% reported by Alikor and Erhabor (2007) in children attending tertiary health institution in Niger Delta of Nigeria; and the 4.1% seropositivity reported Ugwuja and Ugwu (2010) among apparently healthy adolescents in Abakaliki, South Eastern Nigeria. However, this value is lower than the 42.7% reported by Motta-castro et al. (2003) for males and females (0-79 years) among Afro-descendant community of Brazil. The prevalence rate recorded in our study is also lower than the 44.7% HBsAg seroprevalence reported by Bukbuk et al. (2005) though among children in Borno state, Nigeria; the 25.0% reported by Uneke et al. (2005) among HIV-infected patients in Jos, Plateau State, Nigeria; and the 20.0% reported by Alao et al. (2009) among prospective blood donors in Otukpo, an urban area of Benue State. The differences in prevalence in these studies could be attributed to differences in patient selection.

Table 1 shows the demographic data of the study patients, group-specific prevalence rates and statistical association of each risk factor with HBsAg seropositivity.

3.1. Gender-specific prevalence

Gender-specific prevalence showed that female patients had higher seropositivity for HBsAg [14(15.6%)] than their male counterparts [7 (11.7%)] as shown in Table 1. The difference was however, not significant ($p = 0.501$); the reason for this difference might be due to larger number of females in our study. Uneke et al. (2005) earlier reported that more females than males visit hospitals for medical attention in Nigeria. This suggested that both sexes were equally susceptible to HBV infection and that gender might not necessarily be an important epidemiological determinant of HBV infection among the study patients. This observation however, contradicts report by Mehmet et al. (2005) in which males had higher prevalence rate than females in both rural and urban areas with observation that male sex was an important risk factor for HBsAg positivity.

The lack of statistically significant difference in HBsAg seroprevalence between males and females in the present study suggests that they were equally exposed to HBV in corroboration with earlier findings (Agbede et al., 2007; Ugwuja and Ugwu, 2010) but however contradicts the findings of other authors elsewhere (Saves et al., 1999; Odusanya et al., 2005; Inyama et al., 2005; Alikor and Erhabor, 2007). Our finding also deviates from the finding of Saves et al. (1999) in a study on the seroprevalence of hepatitis B virus in HIV-1 infected patients in Jamaica where the rates were 50% and 21% for the males and females respectively. It also disagrees with that of Inyama et al. (2005) in their work on HIV infected patients in Jos, Nigeria in which higher hepatitis B virus prevalence (31.8%) in males was reported compared with the females (22.1%). However, our finding is comparable to what was reported by Ugwuja and Ugwu (2010), who reported that males and females did not differ significantly in HBsAg seropositivity.

3.2. Age-specific prevalence

Age-specific prevalence showed that twelve patients (11.3%) tested positive to HBsAg among age group less than 40 years of age while 9(20.5%) tested positive to HBsAg among age group 40-80 years of age (Table 1). Statistically, this difference observed among these two age groups was not also significant ($p = 0.142$). Seropositivity of HBsAg was lower for age group less than 40 years than for age group 40-80 years but this difference was not statistically significant ($p = 0.142$). This similar to the report of Motta-castro et al. (2003) that age was not significantly associated with HBsAg seropositivity among Afro-descendant community in Brazil. However, the age of acquiring infection is the major determinant of the incidence and prevalence rates (Ezegbudo et al., 2004). Again serological evidence of previous HBV infections varies depending on age and socioeconomic class (Ugwuja and Ugwu, 2010).

3.3. Prevalence of HBsAg in relation to occupation

As regards occupation, 52.0% of the patients were unemployed (n=78), 16.7% were civil servant (n=25), 12.7% were business persons (n=19), 7.3% were unskilled workers (n=11) and 2.0% were farmers (n=3). We also observed that 74 (94.9%), 23 (92.0%) and 16 (84.2%) patients of the unemployed, civil servants and the business persons respectively reported having secondary – tertiary education. On this basis, we categorized the three groups together as shown in Table 1.

As shown in Table 1, prevalence of HBsAg in relation to occupation showed that unskilled workers and farmers [2(14.3%)] had higher prevalence rate than the unemployed, civil servants and business persons groups [16(13.1%)]. However, this differences observed among the occupational groups

were not significant ($p = 0.903$). The goal of determining association of occupation with HBsAg seropositivity is to advise on measures to prevent HBV infection in the group(s) at risk. The number of unemployed, civil servants and businessmen having HBsAg positivity were higher than that of the unskilled workers and farmers; but the difference in their prevalence rates was not significant ($p = 0.903$). This might be suggestive of little or no influence of occupation on HBV transmission among the study patients.

3.4. Prevalence of HBsAg in relation to educational status

Prevalence of HBsAg in relation to educational status of the patients showed that secondary–tertiary education groups had lower prevalence rate [15(12.0%)] compared to their illiterate and primary education counterparts [4(33.3%)] as shown in Table 1. However, this difference was not statistically significant ($p = 0.041$). Though, there was a significant association between educational status of patients and HBsAg seropositivity ($p = 0.041$), this might be due to low level of public enlightenment/awareness on the carrier rates of HBV infection. Similar observation was made by Mehmet *et al.* (2005) that HBV seropositivity was higher in illiterate persons in urban areas. Ezegbudo et al. (2004) earlier reported that prevalence rates of infections such as HIV, HBV and HIV/HBV co-infection were inversely associated with in educational status.

3.5. Analysis of condom-use during sexual intercourse

Based on the analysis of condom-use during sexual intercourse, patients without use of condom [14(14.7%)] had higher prevalence of HBsAg than their counterparts with use of condom during sexual intercourse [4(9.8%)]. This shows no significant association ($p = 0.432$) between condom use and HBsAg seropositivity. Expectedly, those who reported "no" to use of condom during sexual intercourse had higher HBsAg prevalence as HBV can be sexually transmitted through unprotected sex, however, the difference in prevalence rate was not statistical significant ($p = 0.432$). Though, it has been reported that condom use during sexual intercourse was low in Nigeria (Van Rossem et al., 2001; Panchaud et al., 2002); this study did not observe a significant effect of non-use of condom during sexual intercourse on HBsAg seropositivity among the study patients. In deed, according to Ezegbudo et al. (2004), most Nigerian men prefer not to use condoms at all.

3.6. Prevalence of HBsAg in relation to marital status of the patients

Prevalence of HBsAg in relation to marital status of the patients showed that the married group had higher prevalence of HBsAg [15 (34.9%)] compared to the singles/divorced group [3(3.2%)]. There was significant ($p = 0.001$) association between marital status and HBsAg seropositivity as shown in Table 1. HBsAg seropositivity was significantly associated ($p = 0.001$) with marital status. Though the HBsAg serostatus of patients' spouses were not known, this observation might be due to sexual exposures; sexual transmission of HBV had been cited as relevant to adults (Mehmet et al., 2005). This is consistent with a report from Jos, Plateau State, Nigeria (Sirisena et al., 2002). Ezegbudo et al. (2004) reported that significant infection rates for HIV, HBV and HIV/HBV co-infection were associated with marital status. Our observation however, contradicted the report by Uneke *et al.,* (2005) that the risk of acquiring HBV was higher in single than among the married.

3.7. Prevalence of HBsAg in relation to history of blood transfusion

Table 1 also showed that patients with history of blood transfusion [11(42.3%)] had significant ($p = 0.001$) higher prevalence of HBsAg than their counterparts [10(8.1%)] without history of blood transfusion (Table 1). This shows that the history of blood transfusion was significantly associated ($p = 0.001$) with HBsAg seropositivity. Since only 26 patients reported history of blood transfusion, the observed significantly higher prevalence among this group might be due to exposure to unscreened blood or blood products in this part of the State or other practices such as tattooning, ear piercing, circumcision, face marking (tribal marks). This finding is in agreement with several epidemiological studies (Maddawa et al., 2002; Otegbayo et al., 2003; Agbede et al., 2007; Ugwuja and Ugwu, 2010) which have consistently demonstrated that unsafe injection from unqualified medical personnel using HBV contaminated needle and syringe, transfusion of blood and blood products and socio-cultural practices such as tribal marks, circumcision and scarification were important routes of HBV transmission.

Transfusion of blood/blood products is a very significant route of HBV transmission in the present study and calls for the strengthening of the national policy on blood transfusion with the view of curtailing transmission through this route (Ugwuja and Ugwu, 2010). This observation was similar to an earlier report in Anyigba, Dekina local government area of Kogi State in which pregnant women with history of blood transfusion had significantly higher HBsAg prevalence compared to those without such history (Sule et al., 2007) and Ugwuja and Ugwu (2010), who reported that the major routes of HBV transmission in the population used in their study were unsafe injection, tribal marks/circumcision/ scarification and blood/blood products transfusions. Percutaneous exposures to infected blood and blood products were

reported to be the major route of transmission of HCV. Cultural practices such as tattooing, ear piercing, circumcision, face marking (tribal marks) are widely practiced in underdeveloped countries including Nigeria (Odaibo et al., 2003).

A similar observation was also made by Motta-Castro et al. (2003) among Afro-descendant community in Brazil. Awole and Gebre-Selassie (2005) however, reported no association of blood transfusion with HBV infection among pregnant women of Ethiopia. In Nigeria, studies on the prevalence of HBsAg among blood donors have been documented. Opaleye et al. (2010) reported a prevalence rate of 5.4% among blood donors in Benin City, Nigeria. These showed that transfusion of HBV-infected blood was possible in Nigeria.

The high prevalence rate of HBV among relatively older people in this study indicates that most of these subjects may have acquired the infection through sex and transfusion of unscreened infected blood while others may have acquired any of these infections prior to transfusion. However, the incidence of HBV transmission through sex and transfusion of unscreened infected blood could be reduced with the introduction of HBV vaccines, screening of blood donors and better sterilization procedures for all blood products (Hollinger and Liang, 2001).

The value reported in this study is quite high compared to other studies in Nigeria and outside Nigeria. Also, high prevalence of HBsAg has been reported among hepatocellular carcinoma patients in north eastern Nigeria (Mustapha et al., 2007). Inability to identify risk factors for viral acquisition among higher proportion of HBsAg seropositive patients in our study population may be partly attributable to lack of accurate reporting by the participants as majority may not have given accurate information of past contacts.

Table 1: Demographic data of the study patients, group-specific prevalence rates and statistical association of each risk factor with HBsAg seropositivity among patients attending Universal Hospital, Ankpa, Kogi State, Nigeria

Risk factors	No. tested (%)	No. positive (%)	*p-value*
Sex			
Males	60 (40.0)	7 (11.7)	
Females	90 (60.0)	14 (15.6)	*0.501*
Age groups (year)			
Less than 40	106 (70.7)	12 (11.3)	
40 – 80	44 (29.3)	9 (20.5)	*0.142*
History of blood transfusion			
Yes	26 (17.3)	11 (42.3)	
No	124 (82.7)	10 (8.1)	*0.001*
Condom use during sexual intercourse			
Yes	41 (30.1)	4 (9.8)	
No	95 (69.9)	14 (14.7)	*0.432*[1]
Educational status			
Illiterate & primary	12 (8.8)	4 (33.3)	
Secondary & tertiary	125 (91.2)	15 (12.0)	*0.041*[2]
Marital Status			
Married	43 (31.6)	15 (34.9)	
Singles/divorced	93 (68.4)	3 (3.2)	*0.001*[3]
Occupation			
Unemployed, civil servants, and business persons	122 (89.7)	16 (13.1)	
Unskilled workers and farmers	14 (10.3)	2 (14.3)	*0.903*[4]
Total	**150 (100.0)**	**21(14.0)**	

Note:

1. 14 children that were ≤ 12 years of age were excluded from the condom use analysis.
2. 13 children that had ≤ primary school education were excluded from education analysis as formal education corresponds with awareness on health matters.
3. 14 children that were ≤ 12 years of age were excluded from marital status analysis
4. 14 children that were ≤ 12 years were not working; consequently they were excluded from the occupation analysis.

The limitation of this work is that we used one step rapid test kits for the detection. Though, several studies have been performed on a representative of the population consisting blood donor, healthy females and children (Nasidi et al., 1986; Sirisena et al., 2002; Ezegbudo et al., 2004). The differences between these studies are in the objectives and method used and further evaluation for its clinical use and elaboration is needed to clarify these differences. However, we believe that our findings represent the endemic HBV situation in Ankpa, Kogi State, Nigeria.

4.0. Conclusion

This study showed an overall seroprevalence of HBsAg to be 14.0% (n = 21) among the study patients attending Universal Hospital, Ankpa, Kogi State, Nigeria. Hepatitis-B virus infection is endemic in the population of the Ankpa, Kogi State, Nigeria. This study however, confirmed the presence of Hepatitis B surface antigenemia among apparently healthy patients in Kogi State, Nigeria. Majority of them might have been infected at earlier stage of their life. Possibility also exists of an ongoing horizontal spread of the infection.

In line with the assertion of Ugwuja and Ugwu (2010), asymptomatic HBV infection among apparently healthy patients and adolescents without proper identifiable risk factors or mode of acquisition calls for general surveillance, mass immunisation, and public health education to curtail the spread of the virus and its sequalae.

General surveillance through mass screening to identify those with infection and instituting appropriate treatments, mass immunization of the uninfected population against the virus and public health education to enlighten the people of Ankpa of the possible risk factors and routes of infection are advocated. We also recommend transfusion of blood certified free of HBV markers and use of condom among adults when HBV infection status of sexual partner is doubtful or unknown.

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