DETECTION OF HEPATITIS B SURFACE ANTIGEN (HBsAg) AMONG INTENDING APPARENTLY HEALTHY BLOOD DONORS

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ABSTRACT: This study was carried out to detect the presence of hepatitis B surface antigen (HBsAg) among intending apparently healthy blood donors. In order to estimate the prevalence rate of HBsAg among these blood donors, 200 blood samples were screened by parallel diagnostic method using One Step Strip Style HBsAg test kits manufactured by Dia Spot® Diagnostics, USA and Global Diagnostics® Canada. The overall prevalence rate of HBsAg was 2.5%. Age group 40 years and above had the highest prevalence of HBsAg (4.2%) compared to age groups 18-39 years of age (2.0%). HBsAg seropositivity was more prevalent among females (3.2%) than their male counterparts (2.4%). This study however further confirmed that HBsAg is prevalent among blood donors. General surveillance, mass immunization and public health education to stop the spread of the infection among blood donors and the general populace is advocated.
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1. INTRODUCTION

One major viral hepatitis that has been documented as a global public health problem is hepatitis B. Hepatitis B is an infectious illness caused by hepatitis B virus (HBV) (Barker et al., 1996; Engy, 2011); 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 have HBV infection. More than 350 million people were chronic carriers of HBV (WHO, 1998). Consequently, the global disease burden of HBV was considered substantial due to the high HBV-related morbidity and mortality (Lok, 2005).

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). Plasma, blood transfusions, and repeated use of nonsterile needles were also identified as causes of hepatitis outbreaks, and the disease was shown to have a viral etiology (Bartholomeusz *et al*., 2004).

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 HBV vaccination (Alexander and Kowdley, 2006). 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. HBV has relatively higher prevalence in the tropics and an estimated 12% of the Nigeria total population being chronic carriers of HBsAg (Alao *et al*., 2009; Ugwuja and Ugwu, 2010).

In Nigeria, various studies have been carried out to determine the dynamics of the infection in different subpopulations including; doctors in Nigeria (Olubuyide *et al*., 1997), intending blood donors in Benin City (Umolu *et al.,* 2005), in Jos, Nigeria (Uneke *et al.,* 2005), in UCH, Ibadan, Nigeria (Lawal *et al*., 2009), blood donors attending Ahmadu Bello University Teaching Hospital (ABUTH) Zaria, Nigeria (Ado *et al*., 2010), and hepatocellular carcinoma patients in north eastern Nigeria (Ugwuja and Ugwu, 2010).

Detection of hepatitis B surface antigen (HBsAg) in blood is diagnostic for infection with HBV and in the blood banks screening for HBsAg is carried out routinely to detect HBV infection (Blattacharya et al, 2007; Olokoba et al., 2009).This study was therefore carried out to detect the presence of HBsAg among apparently healthy blood donors. It also compared the prevalence determined with those reported for blood donors and other subpopulations in developed and other developing countries.

2. MATERIALS AND METHODS

2.1. Study Area

The study area is the Blood Grouping & Serology Unit, University College Hospital (UCH), located at the municipal area of Ibadan, which is made up of five local government areas. Ibadan is the capital city of Oyo State located in the forest zone of southwestern Nigeria. Ibadan city lies on the longitude 3°5' East of Greenwich meridian and latitude 7°23' North of the Equator. Besides being the largest indigenous city in Africa south of Sahara, the city is an important trade and educational centre. It also houses one of the largest and foremost teaching hospitals in Africa. However, the city is characterized by low level of environmental sanitation, poor housing, and lack of potable water and improper management of wastes especially in the indigenous core areas characterized by high density and low income populations.

2.2. Samples collections

Two hundred blood samples were collected from Blood Grouping & Serology Unit, University College Hospital, Ibadan, South Western Nigeria.

2.3. Assay for detection of HBsAg

DiaSpot® HBsAg Test strips (manufactured by DiaSpot Diagnostics, USA), Global® HBsAg Kit (manufactured by Global Diagnostics, USA) and IND® HBsAg kits (manufactured by IND^R Diagnostica, USA) were used in a stepwise order for the detection of HBsAg in the blood. These methods which are immunochromatographic and qualitative in nature, detect the presence of HBsAg in human blood and can be read in-vitro having more than 99.9% sensitivity and 99.75% specificity. The interpretation of test results was performed according to the manufacturer's specifications.

2.4. DATA ANALYSIS

The prevalence for HCV infection was calculated by using patients with positive samples as numerator and the total numbers of patients enrolled in this study as denominator. The data generated from this study were presented using descriptive statistics. The data was subjected to statistical analysis using SPSS computer software version 17.0 for Windows to determine any significant relationship between infection rate, age and gender.

3. RESULTS ANALYSIS

A total of 200 samples were tested for HBsAg. The age range of the blood donors used in this study was 18 to 61 years. The age range of the blood donors used in this study was 18 to 61 years. The Standard deviation for the age is 8.4 with mean 32.4, median 32 (range 18 -61), standard error of mean 0.6 (Table 1). Majority of the blood samples were from males [169(84.5%)] while 15.5% (n = 31) were from females. The male:female ratio was 5.5:1 (Table 2).

3.1. Detection of HBsAg in relation to Age Groups

Of the 200 samples tested for HBsAg, only 5 tested positive giving HBsAg prevalence of 2.5%. In the age group 40 years and above, a total of 48 samples were tested of which 2 tested positive, thus, giving the highest prevalence of 4.2%. Age groups 18-39 years of age showed a prevalence of 2.0% as shown in Table 1.

Table 1: Detection of HBsAg in relation to Age groups

Age Group (Years)	No. Tested (%)	No. Positive for HBsAg (%)
18-39	152(76.0)	3(2.0)
40 and above	48(24.0)	2(4.2)
Total	**200(100.0)**	**5(2.5)**

3.2. Detection of HBsAg in relation to sex

Table 2 shows the prevalence of HBsAg in relation to sex. HBsAg was more prevalent among females [1(3.2%)] than their male counterparts [4(2.4%)].

Table 2: Detection of HBsAg in relation to Sex

Sex	No. Tested (%)	No. Positive for HBsAg (%)
Males	169 (84.5)	4(2.4)
Females	31(15.5)	1(3.2)
Total	**200(100.0)**	**5(2.5)**

4. DISCUSSION

From this study, the overall prevalence of HBsAg among intending blood donors is 2.5%. This is comparable to what was reported by some authors in Nigeria. Olokoba et al. (2009) reported a much lower prevalence of 2.4% for HBsAg in Yola, Nigeria. It is similar to the 2.2% found by Bhatti el al (2007) in Pakistani donors. This figure is higher than the 1.1% found by Ejele et al (2005) in their study in the Niger Delta region of Nigeria. It is also higher than the 1.2% found by Kagu et al (2005) in North-eastern, Nigeria and the 0.0% reported by Alli et al. (2010) among blood donors in Ibadan. Ejele and Ojule (2004) reported a prevalence rate of 1.57% among blood donors in Port Harcourt (1.57%). Oronsaye and Oronsaye (2004) reported 11.0% of donors positive for HBsAg among donors in UBTH, Benin City, Nigeria.

Studies from difference parts of Nigeria have reported varying prevalence rates among selected groups (Ejele and Ojule, 2004; Alao *et al*., 2009). The HBV infection rate in this study is however lower than the 4.0% in the work of Abdalla et al (2005) in Kenyan donors; the 8.3% in the work of Muktar et al (2005); and the 8.8% found by Matee el al (1999) in Tanzanian donors. Furthermore, the HBV infection rate of 2.5% is lower than the 10.0% found by Elfaki et al (2008) in Sudanese blood donors; the 10.6% in the work of Esumeh et al (2003) in South-south, Nigeria; and the 13.2% found by Fasola et al (2009) in Ibadan, South-western, Nigeria. The prevalence rate of 2.5% reported in this study is also lower than the 8.8% seroprevalence of HBsAg among blood donors at MNH in Dar es Salaam and the 8.7% for HBV seroprevalence among HIV-seronegative blood donors at MNH in Dar es Salaam respectively reported by Matee (2006).

This value of 2.5% HBsAg prevalence reported in this study is also lower than the 20.0% reported by Alao et al. (2009) among prospective blood donors in Otukpo, an urban area of Benue State; the 14.5% reported by Lawal et al. (2009) among blood donors in Ibadan and the 14.5% reported by Agbaji (2005) in Jos University Teaching Hospital (JUTH); and the 12.0% reported among pregnant women attending ante-natal clinic at Central Hospital, Warri, Delta State (Ophori et al., 2004). 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).

This HBsAg prevalence of 2.5% is far 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. Among HIV-infected individuals in Jos, Nigeria, 25.0% prevalence was reported, indicating a higher HBV infection among this group (Uneke et al., 2005). While 28.4% prevalence was reported among HIV positive subjects in LASUTH, Ikeja, Lagos, Nigeria (Balogun et al., 2010). A 4.4% HBsAg seroprevalence was reported in Lagos among healthy pregnant women. The overall seroprevalence of HBsAg in study by Buseri et al. (2009) among blood donors in Osogbo, Nigeria was found to be 18.6%. The differences in prevalence in these studies could be attributed to differences in population selection.

It is noteworthy to state that 4.2% of the blood donors; ages 40 years and above had the highest prevalence of HBsAg than their counterparts in age group 18 to 39 years of age 3(2.0%). This study has further confirmed that HBV is efficiently transmitted by the parenteral route (Lawal et al., 2009). The high prevalence rate of HBV or HIV 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 (Lawal et al., 2009). The classification of high endemicity from HBV infection has been defined as HBsAg greater than 7% in an adult population (Uneke *et al,* 2005; Okonko and Udeze, 2011). 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 (Soriano et al., 1997; Hollinger and Liang, 2001; Lawal et al., 2009).

Gender-specific prevalence showed that female blood donors had higher seropositivity for HBsAg [1(3.2%)] than their male counterparts [4(2.4%)]. The difference was however, not significant ($p > 0.05$); the reason for this difference might be due to larger number of male blood donors used in this study. However, it is comparable to what has been previously reported by some authors. 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. Balogun et al. (2010) in their study reported higher prevalence of HBsAg among males than females in Lagos, Nigeria. A similar study also reported a higher HBsAg seroprevalence in males than females among patients attending Dental Clinic at the University College Hospital (UCH), Ibadan and this was due to shorter HBsAg carrier rate in females than males (Olubuyide et al., 1997; Ola et al., 2004; Lawal et al., 2009). This closely resembles 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. Similar finding was also reported by Inyama et al. (2005) in study among HIV infected patients in Jos, Nigeria in which higher HBV prevalence in males was reported. The reason for the high infection rate among the males may be due to habits such as multiple sexual partnership and polygamy which may be higher among the males (Lawal et al., 2009).

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). 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, this 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.

Age-specific prevalence showed that 3 blood donors (2.0%) tested positive to HBsAg were among age group less than 40 years of age while 2(4.2%) tested positive to HBsAg among age group 40 years and above. Statistically, this difference observed among these two age groups was not also significant ($p > 0.05$). Seropositivity of HBsAg was lower for age group less than 40 years than for age group 40 years and above but this difference was not statistically significant ($p > 0.05$). 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. Higher HBV prevalences among older age groups have been reported previously in studies elsewhere in Nigeria and outside. This is in consonance to the findings of Mustapha and Jibribn (2004), who noted that the highest rate of HBsAg seropositivity was in the 40–49 year-old age group. Also, Luka et al. (2008) in their study, reported higher HBV prevalence among older age group (30-34 years). Alao et al. (2009) reported also highest HBsAg prevalence among age group 41-50 years. Pennap et al. (2011) also reported higher HBV prevalence among older age group (40-44 years) while Buseri et al. (2009) found HBV prevalence to be highest among blood donors aged 18 to 27 years old, the most sexually active age group. 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 (Ugwuja and Ugwu, 2010).

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. However, we observed that HBsAg positivity was not limited to any particular age group but was more common among the age group 40 year-old and above, although, 18-29 year-old age group constituted the bulk of the blood donors. This suggests that HBV infection is endemic in this environment (Buseri et al., 2009).

The higher 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; Lawal et al., 2009).

5. CONCLUSION

This study showed an overall seroprevalence of HBsAg to be 2.5% (n = 200) among the intending blood donors. It also showed that highest prevalence of HBV infection was observed within the older age group (40 years and above) and among females. This study however, confirmed the presence of hepatitis B surface antigen among apparently healthy blood donors. Majority of them might have been infected at earlier stage of their life. Others may have acquired the infection through sex and transfusion of unscreened infected blood. Possibility also exists of an ongoing horizontal spread of the infection. 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 blood donors in Ibadan of the possible risk factors and routes of infection are indeed advocated.

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