Detection Of Hepatitis B Surface Antigen (HBsAg) Among Children In Ibadan, Southwestern Nigeria

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Citation

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Abstract

This study was carried out to detect hepatitis B surface antigen (HBsAg) and risk factors of transmission among children in Ibadan, Oyo State, Southwestern Nigeria. In order to estimate the prevalence rate of HBsAg and to evaluate the influence of children demographics on HBsAg seropositivity, well-designed questionnaire was used to obtain data considered risk factors for contracting HBsAg from consenting children. A total of 217 blood samples were collected from children attending the Oni Memorial Children Hospital, Ibadan. The male:female ratio was 1:1. One hundred and nine of the children were females [109(50.2%)] while males were [108(49.8%). Blood samples were screened by parallel diagnostic method using Dia Spot® HBsAg test kit and One Step Strip Style HBsAg test kit (Global Diagnostic® Canada) for HBsAg. Overall prevalence rate of HBsAg was 0.5%. It showed that HBsAg prevalence was higher among age group >1-12 years, a total of 184 samples were tested, of which one (1) tested positive for HBsAg, thus, giving the prevalence of 0.5%. All other age groups showed zero seroposivity. There was significant association (P>0.05) between age groups and HBsAg infection acquisition. HBsAg was only found among male children [1(0.9%)]. There was significant association (P>0.05) between sex and HBsAg infection acquisition among these population. HBsAg was higher among children with history of vaccinations [1(0.6%)] than their counterparts without history of vaccinations [0(0.0%)]. There was significant association (P>0.05) between history of vaccination and HBsAg infection acquisition among these population. This study however confirmed the presence of HBsAg among children in Oyo State, Nigeria. General surveillance, mass immunization and public health education to stop the spread of the infection on among children in Ibadan and indeed the whole society is advocated.

INTRODUCTION

Hepatitis B caused by the hepatitis B virus (HBV) has continued to be a global public health problem despite the large-scale efforts to eliminate this chronic viral disease via education, screening, and vaccination programs. It is currently estimated that 400 million people worldwide have chronic hepatitis B virus infection and over one million die annually of HBV-related chronic hepatic disease. These chronically infected persons are at high risk of death from liver cirrhosis and cancer (WHO, 2004). HBV also shares similar routes of transmission with HIV (Willey et al., 2008). 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 has been detected in peripheral mononuclear cells, tissues of pancrease, spleen, kidney and skin, and fluids like saliva, semen, sweat, breast milk, tears, urine and vaginal secretion (Chen et al., 2009). The virus is resistant to breakdown, and is easily transmitted through contact with infected body fluids. Sexual activity, especially heterosexual, and injection-drug use account for the majority of HBV transmission in low-prevalence areas while perinatal transmission account for the majority of the transmission in high- prevalence areas (Harry et al, 1994). Maternal acute hepatitis B in the third trimester is associated with a high likelihood of perinatal HBV transmission, but most perinatal infection occur in infants born to mothers with chronic HBV infection (Shepard et al, 2005). Transmission in-utero can occur, but accounts for less than 2% of perinatal transmissions (Alexander, 2006).

The prevalence of HBV infection varies widely, with rates ranging from 0.1% to 20% in different parts of the world (Lavanchy, 2004). The prevalence of HBV infection, according to the geographical area, may be high (8%), intermediate (2%-7%) or low (<2%) (Maddrey, 2000). In several studies from different regions of Nigeria, the prevalence of hepatitis B surface antigen (HBsAg) among normal population was reported from a minimum of 2% to a maximum of 14.3%-average 6.8 % (Mistik and Balik, 2001). In Europe and America, chronic HBV carriers are found in

<2% of the population (Kane, 1995). In endemic areas, most individuals are infected by vertical transmission (Wright, 2006). In Africa, more than half of the population becomes HBV infected during their life time and about 8% of inhabitants become chronic carriers; most of the infections take place during delivery or infancy (Kane, 1995).

The global burden of disease attributable to hepatitis B remains enormous, and this is due largely to the lack of universal vaccination (Alexander, 2006). Because of this, hepatitis B vaccine has been effective in reducing the incidence of infection in endemic areas where it has been adopted for universal immunization (Alexander, 2006). There should no longer be any reason to avoid vaccination especially among the people of the Northern part of Nigeria. In Taiwan, one of the earliest countries to adopt universal immunization, the prevalence of HBsAg positivity decreased from 15%-20% to 7% among children and adolescents (Chen et al, 2006). Furthermore, a reduction in the incidence of HCC was observed after initiation of large-scale vaccination against hepatitis B (Chen et al, 2006).

In Nigeria, following the adoption of universal infant vaccination in 1995, the incidence of acute hepatitis B in children and adolescents has decreased, and the ethnic possibility in the prevalence of chronic HBV infection have narrowed down (Umolu et al, 2005). Prevention of vertical transmission is extremely important because HBV infection in early life usually results in a chronic carrier state. HBV infection does not appear to be teratogenic. This study was carried out to determine the prevalence of HBsAg among children in Ibadan, Oyo State, Southwestern Nigeria in order to establish the percentage of perinatal infection in infants from mothers and recommend administration of appropriate hepatitis b vaccine and Hepatitis B immune globulin (HBIG) to all healthy infants born to HBsAg positive women and women with unknown status, at birth or at most during first year of life. It compares the prevalence determined with those reported for children and other subpopulations in developed and other developing countries.

MATERIALS AND METHODS

STUDY AREA

The study area is the Oni Memorial Children Hospital, 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.

STUDY POPULATION

Blood samples were collected from two hundred children at Oni Memorial Children Hospital, Ibadan, South-Western, Nigeria.

DEMOGRAPHIC INFORMATION

Demographic and clinical information of the subjects were obtained by chart abstraction and recorded on a prepared data collection form. The study groups were also stratified by Age and sex. Other relevant information of all participants were obtained using a preformed specially designed for this purpose. Table 1 summarizes the characteristics of Nigerian children used in this study.

Figure 1

Table 1: Demographical Characteristics/Parameters Of The Children

Parameters	No. Tested
Age Groups (Years)	
Less than 10	192(88.5)
10-17	25(11.5)
Sex	
Males	108(49.8)
Females	109(50.2)
History of vaccination	
Yes	176(81.1)
No	41(18.9)
Total	**217(100.0)**

SAMPLE COLLECTION

The method of sample collection employed was venepuncture technique (Cheesbrough, 2006). Soft tubing tourniquet was fastened to the upper arm of the patient to enable the index finger feel a suitable vein. The puncture site was then cleansed with methylated spirit (methanol) and venepuncture made with the aid of a 21 g needle attached to a 5 ml syringe. When sufficient blood had been collected, the tourniquet was released and the needle removed immediately while the blood was transferred into an EDTA bottle. This was centrifuged and the plasma was then pipetted into sterile ependorf tubes and stored at -20°C until ready for use.

ASSAY FOR 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.

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.

RESULTS

OVERALL PREVALENCE OF HBSAG AMONG CHILDREN

A total of 217 children were tested for HBsAg. One hundred and nine of the children were females [109(50.2%)] while 49.8% (n = 108) were males. The male:female ratio was 1:1 (Table 1, 2 and 3). Table 2 -4 shows the overall prevalence of HBsAg. Of the total of 217 samples tested for antibody to HBsAg, only one (1) tested positive giving HBsAg prevalence of 0.5%.

DETECTION OF HBSAG IN RELATION TO AGE GROUPS OF CHILDREN

Table 2 also shows the prevalence of HBsAg in relation to age groups. It showed that HBsAg prevalence was higher among age group less than 10 years, a total of 192(88.5%) samples were tested, of which one (1) tested positive for HBsAg, thus, giving the prevalence of 0.5%. Age group 10-17 years showed zero seroposivity for HBsAg. There was significant association (P>0.05) between age groups and HBsAg infection acquisition.

Figure 2

Table 2: Prevalence rates of HBsAg among children in relation to age of the subjects

Age groups	HBsAg Seroreactivity		
	No. Tested (%)	No. Positive (%)	P-value
Less than 10	192(88.5)	1(0.5)	P>0.05
10-17	25(11.5)	0(0.0)	
Total	**217(100.0)**	**1(0.5)**	

DETECTION OF HBSAG ANTIBODIES IN RELATION TO SEX CHILDREN

Table 3 shows the prevalence of HBsAg in relation to sex of children. HBsAg was only found among male children [1(0.9%)]. There was significant association (P>0.05) between sex and HBsAg infection acquisition among these population.

Figure 3

Table 3: Prevalence rates of HBsAg among children in relation to sex of the subjects

Sex	HBsAg Seroreactivity		
	No. Tested (%)	No. Positive (%)	P-value
Males	108	1(0.9)	P>0.05
Females	109	0(0.0)	
Total	**217**	**9(0.5)**	

DETECTION OF HBSAG IN RELATION TO HISTORY OF VACCINATIONS

Table 4 shows the prevalence of HBsAg in relation to history of vaccinations. HBsAg was higher among children with history of vaccinations [1(0.6%)] than their counterparts without history of vaccinations [0(0.0%)]. There was significant association (P>0.05) between history of vaccination and HBsAg infection acquisition among these population.

Figure 4

Table 4: Prevalence rates of HBsAg among children in relation to history of vaccinations

History of vaccinations	HBsAg Seroreactivity		
	No. Tested (%)	No. Positive (%)	P-value
Yes	176(81.1)	1(0.6)	P>0.05
No	41(18.9)	0(0.0)	
Total	**217(100.0)**	**9(4.1)**	

DISCUSSION

The HBsAg seropositivity of 0.5% among children was observed in the study. This shows that Ibadan, Oyo State is less endemic for HBV infection. In Nigeria, the prevalence of HBsAg in children population ranges from 2.7% to 13.3% (Awosere et al, 1999). The presence of HBsAg indicates

ongoing HBV infection, and in newly infected persons, HBsAg is the only serologic marker detected during the first 3-5 weeks after infection. In persons who recover from HBV infection, HBsAg is usually eliminated from the blood in 3-4 months, and anti-HBs develop (Mast et al., 2005).

Several workers have detected different HBsAg antigenemia rates in children in different parts of the country. The 0.5% seropositivity reported for HBsAg in this study is far lower the 12.4% reported by Alikor and Erhabor (2007) in children attending tertiary health institution in Niger Delta of Nigeria; the 12.0% reported among pregnant women attending ante-natal clinic at Central Hospital, Warri, Delta State (Ophori et al., 2004); the 7.0% among Taiwanes adolescents (Ni et al., 2001); the 4.1% seropositivity reported Ugwuja and Ugwu (2010) among apparently healthy adolescents in Abakaliki, South Eastern Nigeria; and the 2•19% maternal seroprevalence reported by Onakewhor et al. (2001). Vardase et al. (1999) detected a prevalence of 10.4% HBsAg antigenemia in South African children in a pre-immunization, community-based investigation. Nasidi et al. (1986) found HBsAg prevalence of 10.3% in children from Lagos and Bauchi states while Akenami et al. (1997), in Calabar, detected HBsAg antigenemia of 20% and 26% in healthy and malnourished children, respectively. Bukbuk et al. (2005) found HBsAg antigenemia of 44.7% among pupils in primary school in rural Borno state. Onakewhor et al. (2001) reported the neonatal seroprevalence and the vertical transmission rate to be 0•96% and 42•86%, respectively. In a study by Guo et al. (2010), the intrauterine infection rate of newborns was 6.7% and the chronic HBV rate of children was 4.0%.The prevalence rates are not the same but they firmly place Nigerian children in the highly endemic group.

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). Awosere et al. (1999) suggested that vertical or perinatal transmission from mothers is the most understandable way of acquiring HBV infection. The exact mode of early childhood transmission is unknown, but is thought to occur via unapparent blood or body fluid exposures from parents, siblings, or playmates that inoculate HBV into cutaneous scratches, abrasions, or other lesions or onto mucosal surfaces (Francis et al, 1981).

In this study, the findings indicated that HBsAg positivity was higher among males 0.9% than females 0.0%. This is not consistent with findings of Harry et al (1994); from Northern part of Nigeria 22.0% and 11.6% respectively. Analysis of sex related seroprevalence of HBsAg showed that the male children were more infected than females. The gender related prevalence of HBsAg was 9.5% in females and 24.1% in males in a study by Pennap et al. (2010). The HBV carrying rate of pregnant women in Wuhan City, China has reportedly decreased in recent years (Yu et al., 2005). The survey by Guo et al. (2010) showed that from 2004 to 2006, the HBV carrying rate was 7.8% for in Wuhan City, China. This 0.5% rate was lower than that of developed countries, such as European countries and the United States (Denis et al., 2004) and that of many developing countries (Akani et al., 2005; Bertolini et al., 2006). This might be attributed, at least in part, to the increase in HBV screening (Guo et al., 2010).

Also from this study, it was observed that only children of age group less than 10 years had the highest prevalence of HBsAg 1(0.5%) which could be via perinatal infection, health workers, etc. Thus the administration of hepatitis B immune globulin (HBIG) to all healthy infants born to HBsAg positive women and women with unknown HBsAg status at birth or at most during 1 year of life is very important (Walley and Nicoll, 2001), before which the administration of hepatitis B vaccine should have been given to pregnant women for protection of their foetuses (Awosere et al, 1999). Also in this study, HBsAg was only detected in children with history of vaccination. Although HBV does not normally infect the foetus but the baby is at risk of infection during the birth process (Harry et al, 1994). However, this observation is inconsistent with the report of Motta-castro et al (2003) who reported no association of age with HBsAg seropositivity. This observation also is consistent the report by Uneke et al. (2005) who claimed that higher prevalence occurs among less than 30 years of age. Pennap et al. (2010) reported a higher age related prevalence for HBsAg among those aged 1 - 40 years (13.8%) and above 40 years (11.5%).

In this study, the prevalence of hepatitis B surface antigen (HBsAg) was low (0.5%) as observed. In conclusion, this study has contributed to the information on the burden of HBV infection among children in Ibadan, Oyo State, Nigeria. And in unison with previous findings, this study also found that this group having recorded HBsAg seroprevalence, gender was significantly associated with the

HBsAg seropositivity. The findings of this study have therefore revealed the need to further investigate the prevalence of HBsAg among children previously considered low risk and factors affecting HBV prevention and control in different geographical regions in Nigeria. Screening for possibility of the hepatitis B agent should be the first thing in all clinics and followed by confirmatory tests to patients positive of HBsAg these must be ensured prior to the administration of drugs to both the in-patients and out-patients in children emergency and welfare clinics. Hepatitis B vaccine and Hepatitis B immune globulin (HBIG) should be given to all healthy infants. The general populace should be well informed about the prevalence, incidence and prevention of hepatitis B infection. Development of newer HBsAg assays, with improved sensitivity, may help solve this problem in the future.

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