Sierra Leone Journal of Biomedical Research
Vol. 2 (1) pp. 32-37, June, 2010

ISSN 2076-6270
Abstracted on AJOL
http://ajol.info/index.php/sljbr/index

Original Paper

Seroprevalence of Hepatitis B Surface Antigen (HBsAg) among Children of Primary School Age in a Community, North-Central, Nigeria

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ABSTRACT

Globally, Hepatitis B Virus has been identified as one of the most common infectious diseases and a major public health problem.This study was therefore carried out to assess the prevalence of Hepatitis B virus infection among primary school children attending LGE primary school, Sabon Pegi, Kuru, Nigeria. Three hundred and sixty (360) blood samples were collected from the pupils and sera separated and analyzed for HBsAg using one step Hepatitis B surface antigen test strip. Of the 360 samples screened, 35 (9.7%) were sero-positive. Pupils within the age 7-9 years had the highest prevalence of 3.9%. Male subjects recorded a prevalence of 6.1% compared to 3.6% for females. Risk factors such as blood transfusion recorded 1.6%. Furthermore, family history of HBV infection accounted for 3.6%, while male subjects that had traditional method of circumcision recorded a high prevalence of 3.3%. Unfortunately, the prevalence of this ravaging infectious agent appears to be high amongst the subjects studied. It is strongly suggested that public awareness be accorded urgent attention while socioeconomic development in these areas be given priority as a measure to preventing further spread of this virus amongst children, particularly the school age group.

Key words: Children, HBsAg, Primary school, Seroprevalence

Received 5 March 2010/ Accepted 26 May 2010

INTRODUCTION

The prevalence of hepatitis B virus (HBV) infection is high and constitutes a serious public health problem. There are approximately 350 million carriers of the virus worldwide (Kane, 1996). World Health Organization estimated that two billion people worldwide have evidence of past or recent infection; about 400million people are chronically infected and at risk of liver related disease while 600,000 people die each year from HBV related liver disease or hepatocellular carcinoma (WHO, 2006). The prevalence of HBV infection and the predominant mode of transmission vary greatly depending on the geographical region and epidemiologic factors (Margolis *et al*., 1991). Infections acquired in childhood are responsible for the majority of chronic HBV cases, with its related complications including cirrhosis and hepatocellular carcinoma (HCC) (Cisneros-Castolo *et al*., 2001).

Immunization remains the most effective way to control HBV infection (Chang, 2003; Yu, 2004). To evaluate the long-term efficacy of hepatitis B (HB) vaccination in newborns, one of the longest HB vaccine follow-up studies in the world was conducted in Shanghai, China (Ni *et al*., 2001) and a long-term efficacy of newborn vaccination of 85.42% was recorded.

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In countries such as Italy and the United States, the incidence of acute hepatitis B has declined dramatically during the past decade after vaccination program for HBV infection, particularly among persons in younger age group (Goldstein *et al*., 2002; Da Villa *et al*., 2003). In the USA, catch-up vaccinations have been given to children in the first grade since 1991. The program reduced the overall HBsAg prevalence rate from 9.8% in 1984 to 1.3% in 1994 among children <15 years of age (Chen *et al*., 1996). The HBV carrier population was further reduced through improved maternal screening (Chen *et al*., 1996).

In 1999, vaccination rates were 80–86% for young children and higher than 90% for older children; the prevalence of HBsAg was reduced to 0.7% for children younger than 15 years of age in Chung-Cheng District, Taipei City, Taiwan (Ni *et al*., 2001). This study is aimed at estimating the prevalence and identifying possible risk factors associated with the spread of Hepatitis B Virus among children in a community in North-Central, Nigeria.

MATERIALS AND METHODS

Subjects

The study targeted the low to middle socioeconomic population, in a community where there are inadequate infrastructures and other social amenities. Conventionally, the central indicator is largely evaluated by the life chances of individuals and families as a function of their position in the market and occupation. Blood samples were collected as stipulated by Medical Laboratory Science Council of Nigeria in accordance with the International Ethical Standard on Human Subjects. Consent was obtained from parents of the children before collecting blood samples and administering questionnaires. The samples were stored as recommended by Martín *et al*. (2006).

Selection of Subjects

For the purpose of this research, random sampling which is the purest form of probability sampling method was used with each member of the population having an equal and known chance of being selected. Subjects in our location of study were selected at random based on returned consent form while the entire arm of the primary schools were covered as fair representation of subjects were picked from each class.

Method of Assay

3ml of venous blood were collected in screw-capped glass containers. Hepatitis B surface Antigen test strip manufactured by Acon Laboratory Incorporated, USA was used to screen for HBsAg. The HBsAg test strip is a rapid chromatographic immunoassay for the qualitative detection of Hepatitis B surface antigen in serum or plasma, with a relative sensitivity, greater than 99%. Specificity and accuracy were 99.7% and 99.8% respectively.

Statistical Analysis

Statistical analyses were carried out using SPSS 10.0. A p-value less than or equal 0.05 was considered significant. Chi-square test was used for the analyses of categorical variables.

RESULTS

Out of 360 samples analyzed, thirty-five (35) representing 9.7% of the study population was positive for HBsAg while three hundred and twenty five (325) representing 90.3% were sero-negative. The children aged 7-9 had a prevalence of 14(3.9%). However there exists no statistical evidence at 95% significant level to show that age of the subjects had effect on their HBV status (Table 1). With regards to sex distribution of the children screened, out of the 35(9.7%) positive subjects screened, 22(6.1%) were males while 13(3.6%) females were positive (Table 2).

Table 1: **Distribution of HBV Seropositivity According to Age**

Age Range	No Positive (%)	No Negative (%)	Total (%)
4-6	2 (0.6)	15 (4.2)	17 (4.7)
7-9	14 (3.9)	133 (36.9)	147 (40.8)
10-12	10 (2.8)	121 (33.6)	131 (36.4)
13-15	6 (1.6)	50 (13.9)	56 (15.6)
16-17	3 (0.83)	6 (1.7)	9 (2.5)
Total	35 (9.7)	325 (90.3)	360 (100)

^{2}=6.368 df= 4 P-value=0.173

The result of relationship between age group and HBV status of the sample showed a χ^2Value =6.368 with P-value> 0.05.

Table 2: Distribution of HBV Seropositivity According to Sex

Sex	No Positive (%)	No Negative (%)	Total (%)
Male	22 (6.1)	154 (42.8)	176 (48.9)
Female	13 (3.6)	171 (47.5)	184 (51.1)
Total	35 (9.7)	325 (90.3)	360 (100)

χ^2=3.027 df= 1 P-value=0.082

Relationship between gender and the status of the samples showed a χ^2Value =6.368 with P-value> 0.05. The result showed that there exists no statistical evidence at 95% significant level to show that gender has effect on HBV status.

Table 3: Distribution Based on Vaccination Status of Subjects Screened

Vaccination status	No. Positive (%)	No. Negative (%)	Total (%)
Vaccinated	8(2.2)	17(4.7)	25(6.9)
Non-vaccinated	27(7.5)	308(85.6)	335(93.1)
TOTAL	35(9.7)	325(90.3)	360(100)

χ^2=15.191 df= 1 P-value=0.000

Vaccination status and HBV status of the sample showed a χ^2Value =15.191 with P-value< 0.05.

Table 4: Prevalence of HBV among Blood Transfused Subjects

Blood transfusion	No. positive (%)	No. negative (%)	Total (%)
Transfused	6(1.6)	17(4.7)	23(6.4)
Non-transfused	29(8.1)	308(85.6)	337(93.6)
TOTAL	35(9.7)	325(90.3)	360(100)

χ^2=7.748 df= 1 P-value=0.005

Blood Transfusion status and the HBV status of the sample showed a χ^2Value =7.748 with P-value< 0.05.

Table 5: Prevalence of HBV among Subject with Family History of HBV Infection

Family history of HBV	No positive (%)	No negative (%)	Total (%)
Any family history	13(3.6)	31(8.6)	44(12.2)
No family history	22(6.1)	294(81.7)	316(87.7)
Total	35(9.7)	325(90.3)	360(100)

Table 6: Prevalence of HBV among Circumcised and Non-circumcised Males

Place of circumcision	No positive (%)	No Negative (%)	Total (%)
Clinic	7(1.9)	33(9.2)	40(11.1)
Health center	1(0.3)	32(8.9)	84(23.3)
Traditional	12(3.3)	72(20.0)	84(23.3)
Un-circumcised male	2(0.6)	17(4.7)	19(5.3)
TOTAL	35(9.7)	325(90.3)	360(100)

Considering the vaccination status of the individual screened, it was indicated that 8(2.2%) of the HBV positive children had been vaccinated against the virus (Table 3). When the medical history of the children were assessed, results obtained showed that out of 35(9.7%) positive subjects, 6 (1.6%) had blood transfusion previously while 29 (8.1%) had never been transfused (Table 4). Evaluation of the family history of the subjects revealed that 13(3.6%) of the positive children had family history of HBV infection (Table 5). 12(3.3%) positive cases of the male subjects screened had evidence of circumcision through traditional methods (Table 6) while 6(1.6%) of all the positive cases had shared toothbrush with family members and friends (Table 7).

Table 7: Prevalence of HBV among Subjects who Share Toothbrush

	No. Positive (%)	No. Negative (%)	Total (%)
Share toothbrush	6(1.6)	12(3.3)	18(5)
Do not share toothbrush	29(8.1)	313(86.9)	324(95)
Total	35(9.7)	325(90.3)	360(100)

χ^2=29.293 df= 1 P-value=0.000

Use of Toothbrush and HBV status of the subjects show a χ^2Value =29.293 with P-value< 0.05. There exists no statistical evidence at 95% significant level to show that use of toothbrush differ in their respond with test status.

DISCUSSION

Hepatitis B infection is a serious global health problem because of its hazard. It is believed that an estimated number of 2 billion people worldwide are infected with the virus, 350 million are chronic carrierrs, and consequently many may develop liver disease with significant morbidity and mortality. It has also been hypothesized that 25% of young children are infected at 1-5 years of age and about 1-5% of persons infected as older children (Goldstein *et al*., 2002) end up as carriers. The early childhood acquisition of HBV which remains typically asymptomatic with subsequent progression to chronic infection underscores the importance for early detection through screening (Ugwuja and Ugwu, 2010). Out of 360 samples screened in this study, 35 representing 9.7% of the total samples were positive. Age distribution in this study showed that subjects aged 7-9 had the highest prevalence rate of 3.9%, followed by those aged 10-12 with 2.8%.

Some studies conducted in Nigeria and Bangladesh (Sirisena *et al*., 2002; Bukbuk *et al*., 2005) corroborated the increasing prevalence with age and showed the overall prevalence to be above 9.7%. The age of acquiring infection remains a major determinant of incidence and prevalence rates. Furthermore, serological evidence of previous HBV infections varies depending on age and socioeconomic class (Ezegbudo *et al*., 2004). Thus, the prevalence recorded in this study was not unexpected since it has been shown that HBV is contracted in early childhood. The value obtained in this study is however higher than 7.6% prevalence reported in primary school children in Nnewi, Nigeria (Chukwuka *et al*., 2004) and 6.7% among Saudi Arabian children (Al-Faleh *et al*., 1992). Conversely, it is lower than reported prevalence in children attending a tertiary health institution in Niger Delta, Nigeria (Alikor and Erhabor, 2007) and among primary school aged children in Turkey (Kangin *et al*., 2009).

The work of Vryheid *et al*. (2000) showed that the association between vertical and horizontal transmissions in childhood was high with an estimated prevalence rate for HBsAg infection of 10 to 35% among children less than 5-year-old. The results of their study suggested that universal vaccination of infants in the first year of life and adolescents at 12 years of age has a greater efficacy on reducing the endemicity in the general population in comparison with selective vaccination. In this present study, responses to vaccination status of the children showed that unvaccinated children presented a higher prevalence of HBsAg infection. During 1995 and 1998, Ayoola *et al.* (2003) observed a decline in the prevalence of hepatitis B particularly amongst children as a result of inclusion of Hep B vaccine in the routine schedule of immunization. Report on the global overview of hepatitis B infant and adolescent immunization programmes also portrayed their observation. Vryheid and colleagues (2000) concluded that adopting universal immunization strategy may greatly reduced incidence and prevalence of the virus.

Considering the prevalence of HBsAg based on gender, the generated data in this study shows that gender is critical to the acquisition of HBV infection. 22(6.1%) of the males tested were positive for the infection compared to 13(3.6%) females. This similar to the work of Bukbuk *et al*. (2005) who found that the HBV antigenaemia was higher amongst the male subjects studied with 47.2 % positivity than females with 38.1%. In Greece, Gogos *et al*. (2003) concluded that male is known to increase the risk of serum hepatitis infection. This is corroborated by the results of this present study when risk factors in males were considered. The occurence of HBV among circumcised males was higher than those circumcised traditionally and those circumcised in clinics.

In this study, pupils with history of HBV infection in the family recorded 13(3.6%) positivity to HBsAg, compared to those without any history of HBV infection in the family. 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 (Toukan *et al*., 1990). Wolf (2003) concluded that HBV could be transmitted through infected family members while children without HBV history in the family could have contacted the virus from other predisposing factors. Exposure to risk factors such as blood transfusion, surgery, male circumcision, sharing of toothbrush, making of tattoos and giving of tribal mark were also studied and result observed showed a veritable predisposing factor among the children screened. This study generally has given an overview of HBV infection in our location of study.

CONCLUSION

This study shows that the prevalence of the infection is high among the children screened. Hepatitis B virus infection is considered a "silent killer" since when acquired by children; it is usually asymptomatic and can stay unrecognized for up to 2-3 decades.Hence, seroepidemiological studies of the infection are necessary, especially in endemic regions. There is also a need to massively educate the populace on the importance of hepatitis B vaccination which has been incorporated into the routine Expanded Programme on Immunisation. Children and pregnant mothers should be stimulated to go for the vaccination which is free. This will not only reduce the incidence of Hepatitis B antigen carrier rate and chronic hepatitis B virus infection among children but will also increase the utilisation of health services such as immunization schedules in Nigeria.

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