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Original Article

Studies on Prevalence and Risk Factors for Hepatitis B Surface Antigen among Secondary School Students in North-central, Nigeria

James A Ndako[1*], Obinna O Nwankiti[2], Georgebest ON Echeonwu[1], Surajudeen A Junaid[3], Onyeka Anaele[4] and Tiri J Anthony[1]

[1]Department of Virology, [3]Medical Microbiology,[4]Haematology and Blood Group Serology, Federal College of Veterinary and Medical Laboratory Technology, Vom, Nigeria, [2]National Veterinary Research Institute, Vom, Nigeria

ABSTRACT

Hepatitis B virus (HBV) Infection is one of the major global public health problems, with its attendant risks especially among the young adults. This study was therefore carried out to assess the sero-prevalence of hepatitis B surface antigen (HBsAg) and associated risk factors among students of a secondary school in Jagindi Tasha, Kaduna State, Nigeria. One hundred and ninety (190) apparently healthy students were screened and sera samples obtained were separated and analysed for HBsAg using a commercially available Enzyme Linked Immunosorbent Assay (ELISA)-based kit (Dialab). Information was obtained for risk factors using structured questionnaire. Out of the 190 samples screened, 35 (18.4%) were sero-positive. Subjects aged 13-15 years recorded 6.8% positivity (χ^2 = 1.084; p>0.05) and male subjects had 25.5% positivity compared to 10.9% positivity for females (χ^2 = 6.768; p<0.05). Risk factors such as blood transfusion was 32.0% among male subjects compared to 30.0% in females (χ^2 =18.07; p-value = 0.113). Furthermore, alcoholic consumption, the predominant lifestyle of the youths in this community was 20.0% among male subjects as compared to none in females. Unfortunately, the prevalence of HBV appears high among the studied population. This suggests that public awareness on the virus be accorded urgent attention, while vaccination programme should be improved in the community.

Keywords: HBsAg prevalence, Risk factors, Students, Nigeria

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INTRODUCTION

Viral hepatitis is a systemic disease primarily involving the liver (Ananthanarayan and Jayaram, 1997). Hepatitis B (serum hepatitis) is an important form of both acute and chronic viral hepatitis (Prescott *et al*., 2002). Globally, it is estimated that over 2 billion persons have evidence of past HBV infection; more than 350 million are chronic carriers and some one million deaths annually are attributed to HBV-related diseases (Zhang and Tepper, 2001). Hence, Hepatitis B virus (HBV) infection is a serious health problem worldwide. Once chronic infection is established, HBV may persist in the liver for lifetime (Jia and Zhuang, 2007), which not only causes severe HBV-related sequalae such as cirrhosis and hepatocellular carcinoma but also constitutes the reservoir of the virus (Zhang and Tepper, 2001).

The spectrum of the symptoms of HBV disease varies from sub-clinical hepatitis to icteric, hyperacute, acute and subacute hepatitis during the primo-infection phase and from an asymptomatic carrier state to chronic hepatic cirrhosis and hepatocellular carcinoma during the chronic phase. In the acute phase, the incubation period is 1-6 months. Anicteric hepatitis is a predominant form of expression for this disease, at this phase the majority of the patients are asymptomatic. Patients with anicteric hepatitis have a greater tendency to develop chronic hepatitis. Icteric Hepatitis B is associated with a prodromal period, during which a

*Corresponding author: Tel: +234 8029204984; E-mail: ndakoj@yahoo.co.uk

serum sickness-like syndrome can occur (Greenwood *et al*., 2000). The predominant routes of transmission vary according to the endemicity of the HBV infection. Generally, transmission is believed to be mainly by sexual, vertical and intra-familial routes (Bélec *et al*., 1988). In areas of high endemicity, perinatal transmission is the main route of transmission, whereas in areas of low endemicity, sexual contact amongst high-risk adults is predominant. The prevalence of chronic HBV infection shows wide regional variation; ranging from high rates greater than 8% in Africa, Asia and the Western Pacific to intermediate rates of 2-7% in Southern and Eastern Europe to low rates of less than 2%, in Western Europe, North America and Australia (Maddrey, 2001; Zaki *et al*., 2003). In Saudi Arabia, the average prevalence of hepatitis B surface antigen (HBsAg) in the asymptomatic population was 7% and about 70% had evidences of past exposure to hepatitis B virus (HBV) (Faleh *et al*., 1991; 1992). A survey of hepatitis B virus markers among students in Bangui, Central African Republic revealed an overall prevalence of 15.5% for HBsAg. Hepatitis B virus familial antecedents, sexual activity and socioeconomic conditions were considered as the main risk factors for acquisition of infection among the adolescents and young adults (Komas *et al*., 2010).

Among primary school pupils in Nigeria, the sero-positivity of Hepatitis B surface antigen was 44.7% (Bukbuk *et al.,* 2005). The authors observed that increase in prevalence was proportional to age whereby 40.6% of children between 10-11 years were positive while children above 13 years old had 75% positivity. Similarly, of the 360 primary school pupils screened in a community in North-Central, Nigeria, Ndako *et al*. (2010) found that 35 (9.7%) of the children were positive for HBsAg. They inferred that blood transfusion, family history of HBV infection and male circumcision were the main risk for factors for the infection. This present study was embarked upon to determine the prevalence of hepatitis B surface antigen (HBsAg) carrier amongst adolescents at our study location and to further assess the knowledge and awareness of this virus in the community. In addition, the study is aimed at educating the target group on the risks associated with acquisition this infectious agent.

MATERIALS AND METHOD

Study Area

This study was conducted at the Central Secondary School in Jagindi Tasha, a community in Jema'a Local Government Area, in Kaduna State Nigeria. Jagindi Tasha is located about 23km from Gidan Waya. This School was selected to enable random sampling and coverage of the communities around Jagindi Tasha.

Ethical Issue

Ethical clearance was obtained from Plateau State Specialist Hospital, Jos, Nigeria after fulfilling all the requirements for using humans as study subjects. Informed consent was also signed and agreed upon by the recruited subjects after study has been explained to them. For those under the age of 18 years old, the college authority consented to the request after deliberations with the parents and guardians of the subjects.

Study Population and Questionnaire

This study involved a total of two hundred and forty (240) students between the ages of 10-24 years. The recruited subjects were given a well-structured questionnaire to assess demographic, clinical as well as social and other risk factors such as alcoholism, sexual promiscuity, probable history of blood transfusion, surgery, injury from sharp objects, sharing of sharp objects and tattoo. Administered questionnaires were crosschecked manually for correct data entry. Data from participants with incomplete questionnaire information was excluded from the overall analysis. The data was then analysed using the SPSS version 13. The critical level for statistical significance was set at p=5% (0.05) using the chi-square analysis.

Sample Collection

Blood samples were collected from one hundred and ninety (190) students who had duly filled questionnaires and signed the informed consent form. 3ml of venous blood samples was obtained from each of the subjects and the blood was allowed to clot. Sserum was carefully separated into cryovials, properly labelled and stored at -20^{0}C prior use.

HBsAg Testing

The Dialab - HBsAg ELISA Kit (Austria) was used for the detection of HBsAg in serum of the study subjects. The DiaLab HBsAg ELISA Kit uses polystyrene micro-well strips pre-coated with monoclonal antibodies specific to HBsAg and the test was performed as instructed by the manufacturer. Briefly, patient's serum or plasma sample was added to the micro well together with a second antibody conjugated with horse radish

peroxidase (HRP) directed against a different epitope of HBsAg. After incubation and washing, urea peroxide was added to the wells. In presence of the antibody-antigen-antibody (HRP) "sandwich" immune-complex, the colourless chromogens were hydrolysed by the bound HRP-conjugate to a blue colour product. The blue colour turned yellow after stopping the reaction with sulphuric acid. The intensity of the colour which was proportional to the amount of antigen in the sample was measured. Wells containing samples negative for HBsAg remained colourless.

RESULTS

Of the one hundred and ninety (n = 190) students (aged 10-24 years) screened for the evidence of HBsAg at our study location, thirty five (35) subjects were positive for HBsAg, giving a prevalence of 18.4% (χ^2=6.768; p<0.05). Twenty five (25) were males (25.5%) and ten (10) were females (10.9%). The statistical difference between male: female ratio was significant (p<0.05) (Table 1). Table 2 shows the age distribution with respect to number of positive subjects screened for HBsAg. Prevalence of 18.1% and 18.5% was recorded within the age group15-19 and 20-24 years of age respectively. The age distribution of male students shows that the highest number of positivity occurred among subjects aged 15-19 and 20-24 years, showing a prevalence of 23.7% and 8.2% respectively. The table also shows that amongst the female students screened, subjects within the age group 15-19 and 20-24 years recorded a higher prevalence of 4.3% and 5.4% respectively.

Table 1: Sex Distribution of HBsAg amongst Students Screened

Sex	No of samples Screened	No. positive (%) for HBsAg	No. negative (%) for HBsAg	
Males	98	25(25.5)	73(74.5)	**χ^2 =6.768; *df*=1; *p*-value = 0.009**
Females	92	10(10.9)	82(89.1)	
Total	190	35(36.4)	155(163.6)	

Table 2: Age distribution of Students Screened in Relation to Carriage of HBsAg

Age group	No. of samples Screened			No. positive (%) for HBsAg			No. negative (%) for HBsAg		
	Male	Female	**Total**	Male	Female	**Total**	Male	Female	**Total**
10-14	11	9	**20**	3(27.3)	1 (11.1)	4(20)	8 (72.7)	8 (88.9)	**16(80.0)**
15-19	38	36	**74**	9(23.7)	4 (11.1)	**13 (17.6)**	29 (76.3)	32 (88.9)	**61(82.4)**
20-24	33	34	**67**	8 (24.2)	5 (14.7)	**13 (19.4)**	25 (75.8)	29 (85.3)	**54(80.6)**
25-29	13	12	**25**	5 (38.5)	0(0.0)	**5 (20.0)**	8 (61.5)	12(13.0)	**20(80.0)**
30-34	**3**	**1**	**4**	**0(0.0)**	**0(0.0)**	**0 (0.0)**	**3 (100)**	**1(1.1)**	**4(100.0)**

Table 3: Risk Factors Based on Clinical History and Lifestyle of Subjects Examined

Risk Factors	No. positive for various risk factors (%)		No. negative for various risk factors (%)		
	Males	Females	Males	Females	
Clinical History:					**χ^2 =18.076; *df*=12; *p*-value = 0.113**
Blood transfusion	8(32.0)	3(30.0)	17(68.0)	7(70.0)	
surgery	1(4.0)	3(30.0)	24(96.0))	7(70.0)	
Sexually transmitted diseases	6(24.0)	1(10.0)	19(76.0)	9(90.0)	
Infection in family	4(16.0)	1(10.0)	21(84.0)	9(90.0)	
vaccination	11(44.0)	0(0.0)	14(56.0)	10(100.0)	
Life style:					**χ^2 =25.043; *df*=6; *p*-value = 0.000**
Sexual	7(28.0)	5(50.0)	18(72.0)	5(50.0)	
Exposure/Sharing of sharp objects	16(64.0)	8 (80.0)	9(36.0)	2(20.0)	
Alcohol consumption	5(20.0)	0(0.0)	20(80.0)	10(100.0)	

Table 3 shows the various risk factors based on clinical history and lifestyle of the subjects screened. These include history of blood transfusion, with males recording 4.6% prevalence compared to females with 1.7%. Subjects with history of surgery recorded 0.6% in males while females recorded 1.7%. Based on the history of sexually transmitted infections (STIs) among subjects screened, male had a prevalence of 24.0% while female students recorded 10.0%. History of HBV infection in family showed that male subjects had 44.0% prevalence compared to none in females. The table also reflects risk factors based on life style amongst positive subjects to HBsAg such as sexual exposure, sharing of sharp objects and alcohol consumption. Alcoholic consumption is a predominant lifestyle of the youths in this community; hence increasing the chances of acquiring the HBV infection since the liver detoxifies and is the predilection site for the virus. Male had recorded history of practicing high risk behaviours such as sharing of sharp objects and tooth-brush. Exposure/ sharing of sharp objects had a prevalence of 64.0% in males compared to 36.0% in females.

DISCUSSION

In this study, 35 (18.4%) of the participants were positive for HBsAg. This figure is alarming considering the future role of these youths in the economy of a developing country like Nigeria. Bukbuk *et al*. (2005) studied HBsAg among pupils in a primary school in in rural north-eastern Nigeria and recorded an overall high prevalence of 44.7%. The prevalence increased with increasing age of the pupils and antigenaemia was higher among males (47.2%) than females (38.1%). The authors adduced that the girl - child is not favoured in access to primary education in this area. In addition, the age and class increase with the dropout rate. Also, promiscuity is a habit occurring with greater frequency among males than females (Uneke *et al*., 2005) and they are known to be at increased risk of acquiring hepatitis infection than females (Mustufa *et al*., 2010).

In this present study, the significant difference in the number of male carriers compared to females could be attributed to the higher population of male students in the school. Consequently, this affected the number volunteers enrolled in this study. Similarly, a study that investigated hepatitis B and C virus prevalence among asymptomatic residents of a local community in Keffi, Nigeria recorded a higher percentage (24.1%) of HBsAg among male participants (Pennap *et al*., 2010) and the authors asserted that it could be as a result of the paucity of samples from the female participants.

Age at infection is one of the most important factors influencing the probability of developing chronic HBV infection (Zhang *et al.* (2001). Over twenty percent of HBsAg-positive carriers are known to develop cirrhosis with about 5% to 6% developing hepatocellular carcinoma after several decades (Van Damme *et al*., 1995; Zhang *et al.*, 2001). In a HBsAg sero-prevalence study among blood donors in Zaria, Nigeria, Ado and others showed that the prevalence rate was highest in blood donors within the age group 30-34 (Ado *et al*., 2010). Contrarily, high positivity was recorded among age group 15-19 in this study.

Hepatitis B virus is transmissible through several routes (Shulman, 1997). Percutaneous-injection drug use, exposure to contaminated blood or body fluids, heterosexual or male homosexual activities; vertical transmission from mother to infant, horizontal transmission among children and household contacts, have been recognised as major risk factors associated with HBV transmission in Canada (Zhang and Tepper, 2001). Other risk factors for HBV infection include lack of awareness, socioeconomic conditions, sexual activities and sharing of razor blades, syringes and tattooing needles (Khan *et al*., 2011). In this present study, sharing of sharp objects, blood transfusion and sexual exposure were possible predisposing factors observed in the population investigated. Roy *et al.* (1999) found that HBV is transmitted in young adults and adolescents mainly through unprotected sexual intercourse. We recorded a sexual exposure rate of 28% amongst male and 50% amongst female participants. This was however higher that the data presented from an assessment of HBV carriage amongst female sex workers in Nasarawa State, Nigeria (Forbi *et al*., 2007). They discovered that the prevalence of HBV was highest among female sex workers with “age-at-first-sex” below 10 years (28%).

Susman *et al.* (2003) explained that early exposure to social life and risk behaviours among males as well as early maturation among females may sometimes lead to increased self-consciousness resulting in increased sexual activities. Therefore, this needs serious consideration since early age of sexual activity increases the risk of HBV infection

(Vazquez *et al*., 2003) and could contribute to the spread of the virus. A study in Abakaliki, South-Eastern, Nigeria listed unsafe injection (28.1%), tribal marks/circumcision/scarification (12.5%) and blood/blood products transfusions (6.3%) as the major risk factors HBV infection among adolescents (Ugwuja and Ugwu, 2010). In our work however, sexually transmitted disease was the major risk factor encountered since history of sexually transmitted disease was 24% among male and 10% of the female participants. This is corroborated by reports from earlier researchers that high risk individuals have a higher probability of getting infected with HBV (Uneke *et al*., 2005; Dawaki and Kawo, 2006).

Transfusion of blood/blood products is a very significant route of HBV with this study highlighting a significant proportion. This calls for strengthening of the national policy with a view of curtailing transmission through this route. However, about 53.1% of these adolescents have no identifiable mode of acquiring HBV; suggesting that they might have contracted the virus from their mother at birth, 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 and through contact among siblings or children of poorer and larger families (Xuan *et al*., 2007). This is a cause for alarm especially with its attendant consequences.

CONCLUSION

From the results obtained in this work, it could be asserted that most of the subjects screened had no knowledge of Hepatitis B virus (HBV) risk factors. The high occurrence of HBV among this study population calls for an urgent intervention strategy and accentuates the need for all stakeholders to brace-up to the challenge of embarking on massive vaccination against the Hepatitis B virus.

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