academicJournals

Vol. 9(3), pp. 171-179, 21 January, 2015
DOI: 10.5897/AJMR2014.7068
Article Number: 8FF965150249
ISSN 1996-0808

http://www.academicjournals.org/AJMR

African Journal of Microbiology Research

Full Length Research Paper

Seroprevalence of hepatitis B virus in a tertiary institution in North Western Nigeria

Isa I.[1]*, Aminu M.[2], Abdullahi, S. A.[1], Sani, M. A.[3] and Akafyi D. E.[1]

[1]Department of Biological Sciences, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.
[2]Department of Microbiology, Faculty of Science, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.
[3]University Health Services, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

Received 13 August, 2014; Accepted 12 January, 2015

Hepatitis B virus (HBV) is endemic in sub-Saharan Africa. The study was conducted to determine the seroprevalence of HBV infection and the possible potential risk factors among students of Ahmadu Bello University, Zaria, Kaduna State, Nigeria. A cross-sectional study was conducted between April and August, 2013. Structured questionnaires were administered to obtain socio demographic data and possible risk factors that might be associated with the viral infection. Blood samples were collected at the University Health Services (UHS) from 600 consenting consecutive students aged between 16 and 40 years old. The sera were screened for HBsAg using device kit and anti-HBs, HBeAg, anti-HBe and anti-HBc using one-step cassette style diagnostic kits. Reactive sera for HBsAg were further confirmed using ELISA kits. Of the 600 students tested for HBsAg, 9.2% (55/600) tested positive among which, none had detectable anti-HBs antibodies, indicating recent infection. About 7.3, 36.4 and 94.5% were positive for HBeAg, anti-HBe and anti-HBc respectively. There was a significant association between age group, gender, family history of the students and HBV infection (P=0.016, 0.049 and 0.000, respectively). Other risk factors studied were not significantly associated with the viral infection. The seroprevalence of 9.2% for HBsAg obtained in this study indicates high endemicity according to WHO classification. Four of the students were highly infectious. The study indicates that close contact among family members and economic disadvantages of some of the students might be predisposing factors to the infection. More than half of the students were ignorant about HBV.

Key words: HBsAg, Anti-HBs, HBeAg, Anti-HBe, Anti-HBc, prevalence.

INTRODUCTION

Hepatitis B virus (HBV) is a DNA virus belonging to the family *Hepadnaviridae* with a very high transmissibility (Dienstag and Isselbacher, 2005). This virus has been detected in peripheral mononuclear cells, tissues as pancreas, spleen, kidney, skin and fluids like saliva, semen, sweat, breast milk, tears, urine and vaginal secretion (Elgouhari et al., 2008), and faeces (Willey et al., 2011). It establishes a chronic infection especially in those infected as infants. There are high risk groups for HBV infection; these include parenteral drug users, institutionalized persons, health care personnel, organ transplant patients, haemodialysis patients and staff, highly promiscuous persons and infants born to infected mothers.

Hepatitis B virus has been described as a major public

*Corresponding author. E-mail: ibrothe1983@gmail.com. Tel: +2348065785902.

health problem or risk, occurring endemically, in all areas of the world. Approximately 1 million persons die each year (2.7% of all death) from viral hepatitis related causes (WHO, 2010). An estimated 57% of cases of liver cirrhosis and 78% of cases of 1% liver cancer results from HBV or HCV infection (WHO, 2010). However, 80% of countries identified hepatitis as an urgent public health problem (WHO, 2010).

It has been estimated that about 2 billion people have been infected with hepatitis B virus and 350 million have chronic lifelong infection. About 50 million people are chronic carriers of HBV in Africa with the carrier rate ranging from 9 to 20% in sub-Saharan Africa (Ballah et al., 2012). Studies done in Nigeria showed HBV carriage rate in the range of 9 to 39% (Emechebe et al., 2009).

A study in Nigeria showed that the hepatitis B vaccine coverage rate is 36.2% in those that received full coverage of three doses, while 64.5% had received at least one dose of HBV vaccine (Ogoina et al., 2014). The consequences of the problems of low pick up rate of HBV infection due to poor screening and the low vaccination rate are that vertical transmission of the virus has become the major route of transmission of the virus in Nigeria in addition to heterosexual relationship (Ahizechukwu et al., 2011).

Hepatitis B virus is 50-100 times more infectious than HIV and 10 times more infectious than hepatitis C virus and because it replicates profusely and produces high titer in the blood (10^8-10^{10} virions/mL) any parenteral or mucosal exposure to infected blood poses a high risk of HBV acquisition (Pennap et al., 2011).

Although literatures on HBV infection in Nigeria are growing, yet, there is paucity of information among the youths who are known to be a group that is highly at risk because of their sexually active stage. In addition, they also form the bulk of the group that is usually required when there is need for blood donation. Hepatitis B virus infection is widely referred to as a silent killer because many carriers do not realize they are carrying the virus within the sexually (Pennap et al., 2011) and hence fail to seek appropriate medical attention.

Studies have shown that the prevalence of HBV infection in antenatal population is a reliable indicator of HBV prevalence rate in the general population (Ahizechukwu et al., 2011). Screening students for HBsAg can also give a reliable prevalence of the disease in a population, since they fall within the sexually active group and are prone to the risks factors.

This work was therefore aimed at determining the seroprevalence and risk factors associated with hepatitis B viral infection among students of Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

MATERIALS AND METHODS

Study area and population

The study was carried out in Ahmadu Bello University (ABU), Zaria. This is one of the first Generation University in the Northern part of Nigeria. It is 81 km from the state capital, Kaduna and about 300 km from Abuja the federal capital of Nigeria. Zaria is in Northern Guinea Savanna and lies on longitudes 11°03′N; and 07°42′E. It covers a land area of about 7,000 hectares. The university has 12 faculties, a school of postgraduate studies and 95 academic departments. There are also six specialized centers and a division of four agricultural colleges. This is the largest and the most extensive of all universities in sub-Saharan Africa (School of Postgraduate Studies Handbook, 2011).

The target population included undergraduate and postgraduate students of Ahmadu Bello University, Zaria. The student body is over 30 thousand, majority of which are undergraduates but with a sizeable and growing body of postgraduate students.

Study design

This study was a cross-sectional study which involved male and female students from different faculties. The participants' consent was sought and blood samples were collected from consecutive consenting students aged 16 years old and above for examination. The University Health Services Centre was used as the collection point.

Ethical clearance/consent

Ethical clearance was obtained from the Medical Ethical and Scientific Research Committee of the Ministry of Health, before the commencement of work. Also, a consent form was given to each student after explanation to obtain permission.

Inclusion criteria and exclusion criteria

Some undergraduate and postgraduate students of ABU, Zaria gave consent to participate in the study and those excluded include non students and student who did not give consent to participate in the study.

Questionnaire administration

A structured questionnaire was administered to the consenting students in other to obtain information on their socio-demography, clinical data and potential risk factors that might be associated with HBV.

Sample collection and processing

The seroprevalence of HBsAg among students of Ahmadu Bello University, Zaria was determined between Aprils to August, 2013. Three milliliters of venous blood sample was collected from each of the consenting students using clean labelled sample bottles by the Laboratory Scientist. To obtain serum, each blood sample was separated out by centrifugation at 1000 rpm (revolutions per minute) for 10 min (Cheesbrough, 2006). The samples were stored in the Virology Laboratory of the Department of Microbiology ABU, Zaria at -15°C and analyzed.

Screening of samples

All samples were screened for HBsAg according to the manufacturers' protocols using rapid test immunochromatographic kits. Positive samples were confirmed using enzyme linked immunosobent assay (ELISA) kits.

Table 1. Distribution of HBsAg among student in ABU, Zaria.

Viral antigen (HBsAg)	Sample tested
No. positive (%)	55 (9.2)
No. negative (%)	545 (90.8)
Total no. of samples	600 (100)

Detection of HBsAg

The BioApex one Step HBsAg test kit manufactured by Richmond Hill, Ontario, Canada was used. It is a rapid immunochromatographic *in vitro* assay for the qualitative detection of HBsAg in serum.

Test procedure and interpretation of results

All the samples for HBV were brought to room temperature (18-25°C). The test device was removed from the foil pouch and labelled with the sample identifier. Fifty microliters of serum placed on the specimen pad on one end of the strip and was laid flat on a clean, dry and non-absorbent surface. A waiting time of 10 to 15 min was observed before the results were read and interpreted according to the manufacturer's instruction.

ELISA

Hepatitis B surface antigen ELISA Test is an ELISA test designed for the qualitative detection of HBsAg in human serum or plasma.

ELISA test procedures

All the HBV seropositive samples from the rapid test procedure were brought to room temperature (18-25°C) before use. The 25 mL wash buffer provided was diluted (30x) with 29 portions of distilled water making quantity of 750 mL and mixed well. A 96 well microplate was used, the wells were then labelled (one reagent blank well, two negative control wells, two positive control wells and sample wells). Fifty micro litters of negative control, positive control and samples were transferred to the wells. In addition, 50 µl Horseradish Peroxidase Enzyme (HRP) conjugate solution were dispensed into each well of the sample and control wells and mixed well. The plate was covered and incubated for 60 min at 37°C. The plate was then washed 5 times with the wash buffer after aspirating the content of the wells into a sink and blot dried on an absorbent paper. Exactly 100 µL substrate tetramethyl-benzidine was then added to each wells and incubated for 10 min at room temperature. One hundred microliters of the stop solution was then added to each well, and the plate shaken gently. The optical density (O.D) of each well was read by setting the microplate reader wavelength at 450 nm (Hepatitis B surface Antigen Visual Test Kit -Catalog Number: 4029). The ELISA result was interpreted according to the manufacturer's protocols.

Detection of other serological markers of HBV infection

All samples that were reactive to HBsAg test were further screened to detect other markers of HBV infection. These include hepatitis B surface antibody (anti-HBs), hepatitis B envelope antibody (anti-HBe), Hepatitis B envelope antigen (HBeAg) and Hepatitis B core antibody (anti-HBc). Diagnostic kit for HBV infection marker was used for the qualitative detection of their presence.

Test procedure and interpretation for marker

The test kit was removed from the pouch and labelled with the specimen identifier. The samples were brought to room temperature (20-30°C). Two drops of serum was placed in each of the 5 sample wells and was read after 15 min and interpreted according to manufacturer's instruction.

Data analysis

The data obtained from the questionnaire and the results of laboratory test were analyzed using SPSS 17 (statistical package for social sciences version 17) and the results obtained were presented in tables, figures and graphs. The prevalence of HBsAg viral infection was determined from the proportion of seropositive individuals in the total population under consideration and expressed as a percentage. The Pearson Chi-square test was employed to determine the relationships between the demographic data and clinical information with HBsAg infection. P value of ≤ 0.05 was considered significant at 95% confidence interval.

RESULTS

Of the 600 students that participated in the study, the prevalence of HBV was 9.2% (55/600) (Table 1). The characteristics of the study population are summarized in Table 2. There was a marked difference in the distribution of HBsAg by age group. Individual who were above 40 years had the highest prevalence (30%: 3/10) of HBsAg while no virus was detected in the age group 36-40 (0%: 0/20). However, there was a significant difference (χ^2 = 13.913, df=5, p=0.016) observed between age group and infection with the virus.

The distribution of HBV infection according to gender was statistically significant (χ^2 = 3.198, df=1, p=0.049; OR = 1.691; 95%CI= 0.946-3.022 36). However, higher prevalence was recorded among male students (11.1%: 36/324) than female students (6.9%:19/276).

There was no observed statistical significant difference between HBsAg (χ^2 = 0.560, df=3, p=0.905) and marital status. However, highest prevalence was recorded among students who were single (9.5%:46/482) while none of the widowed or divorced student was infected.

The distribution of HBsAg in relation to family type for married students was almost significant (χ^2 = 4.142, df=1, p=0.056; OR = 0.257; 95%CI = 0.064-1.028). The highest prevalence was recorded for students who were in polygamous marriages (16.1%:5/31) as against students in monogamous relationships (4.7%:4/85).

The distribution of HBsAg according to geopolitical zones of origin is shown in Table 2. There was no observed statistical significant difference between the student's geopolitical zones of origin and presence of the infection (χ2 = 1.588, df=6, p=0.953). Students who were from the south-south zone had the highest prevalence (13.6%:3/22)

Table 2. Distribution of HBsAg infection by demographic factors among students of ABU Zaria, Nigeria.

Demographic factors	No. of samples examined	No. of positive HBsAg (%)	No. of negative HBsAg (%)	P value ≤ 0.05	Odd ratio
Age (years)					
16 – 20	115	16(13.9)	99(86.1)		
21 – 25	253	24(9.5)	229(90.5)	*p=0.016	
26 – 30	156	11(7.1)	145(92.9)		
31 – 35	46	1(2.2)	45(97.8)		
36 – 40	20	0(0.0)	20(100.0)		
above 40	10	3(30.0)	7(70.0)		
Gender					
Male	324	36(11.1)	288(88.9)	p=0.049	1.691
Female	276	19(6.9)	257(93.1)		
Marital status					
Married	116	9(7.8)	107(92.2)	p=0.905	
Single	482	46(9.5)	436(90.5)		
Widowed	1	0(0.0)	1(100.0)		
Divorced	1	0(0.0)	1(100.0)		
Occupation					
Civil Servant	29	3(10.3)	26(89.7)	p=0.298	
Student	552	48(8.7)	504(91.3)		
Farmer	11	2(18.2)	9(81.8)		
Others	8	2(25.0)	6(75.0)		
Family type					
Monogamy	85	4(4.7)	81(95.3)	p=0.056	0.257
Polygamy	31	5(16.1)	26(83.9)		
Geopolitical zone					
North West	223	20(8.9)	203(91.0)		
North East	88	10(11.4)	78(88.6)	p=0.953	
North Central	218	18(8.3)	200(91.7)		
South East	22	2(9.1)	20(90.9)		
South South	22	3(13.6)	19(86.4)		
South West	24	2(8.3)	22(91.7)		
Foreigners	3	0(0.0)	3(100.0)		

while HBV was not detected among foreigners (0.0%: 0/3).

The result was analyzed according to the possible risk factors that might be associated with HBsAg, and the result is presented in Table 3. There was no significant association between HBsAg and injection by quacks (χ^2 = 0.859, df=1, p=0.250; OR=0.859; 95%CI= 0.213-1.749). Infection was higher in those who did not receive injection from quacks (9.6%: 51/534) and was lower among students who received injection from quacks (6.1%:4/66).

Prevalence of HBsAg was higher among students who shared cloths with others (11.1%: 5/45) than those who did not (9.0%: 50/555). However, there was no statistical significant difference in the prevalence obtained (χ^2 = 0.221, df=1, p=0.397; OR=1.083; 95% CI=0.477-3.344). Similarly, students who shared bed space had higher prevalence of HBsAg infection (10.5%: 31/295) while those who did not, had lower prevalence (7.9%: 24/305). There was no significant association between the infection and sharing of bed space (χ^2 = 1.255, df=1, p=0.164; OR=1.375; 95%; CI=0.786-2.404).

Infection with HBsAg was more prevalent among those who confessed to engage in sharing of sharp unsterilized objects (9.2%: 45/488) than those who did not (8.9%: 10/112) although there was no significant association in the prevalence (χ^2 = 0.009, df=1, p=0.546; OR=1.036; 95%CI=0.505-2.125).

Table 3. Percentage distribution of HBsAg infection among students, in relation to some risk factors and lifestyle that might be associated with the virus.

Possible risk factor	No. of samples examined	No. of positive HBsAg (%)	No. of negative HBsAg (%)	P value ≤ 0.05	Odds ratio
Injection by quacks					
Yes	66	4(6.1)	62(93.9)	p=0.250	0.611
No	534	51(9.6)	483(90.4)		
Sharing of cloths					
Yes	45	5(11.1)	44(97.8)	p=0.066	1.263
No	555	50(9.0)	505(90.9)		
Sharing of bed space					
Yes	295	31(10.5)	264(89.5)	0.164	0.786
No	305	24(7.9)	281(92.1)		
Sharing of sharp unsterilized objects					
Yes	488	45(9.2)	443(90.8)	0.546	1.036
No	112	10(8.9)	102(91.1)		
Multiple sexual partners					
Yes	13	1(7.7)	12(92.3)	0.662	0.534
No	587	54(9.2)	533(90.8)		
Condom use					
Yes	138	11(7.9)	137(99.3)	p=0.358	0.823
No	462	44(9.5)	418(90.5)		
Blood transfusion					
Yes	7	1(14.3)	6(85.7)	p=0.92	0.982
No	593	54(9.1)	539(90.9)		
Infection in family					
Yes	42	11(26.2)	31(73.8)	p=0.000	
No	471	37(7.9)	434(92.1)		
Don't know	87	7(8.1)	80(91.9)		
Engagement in menial jobs/petty trading					
Civil servant	29	3(10.3)	26(089.7)	p=0.298	
Student	552	48(8.7)	504(91.3)		
Farmer	11	2(18.2)	9(81.8)		
Other engagement	8	2(25.0)	6(75.0)		

There was no significant association between infection with HBsAg and history of multiple sexual partners (χ^2 = 0.035, df=1, p=0.662; OR=0.823; 95%CI=0.105-6.448). Prevalence was however higher in those that had no history of multiple previous sexual partners (9.2%: 54/587) than those with a history (7.7%: 1/13).

There was no observed significant association between HBsAg and the use of condom (χ^2 = 0.308, df=1 p=0.358; OR=0.823; 95%; CI=0.413-1.640), however the virus was detected with a higher prevalence in those that did not use condom (9.5%: 44/462) than those who used condom (7.9%: 11/138).

There was no observed statistical significant difference in history of blood transfusion for HBsAg (χ^2 = 9.926 df=1

Table 4. Distribution of HBV markers in HBsAg reactive student in ABU, Zaria.

Serological marker	N = 55	
	No. of positive (%)	No. of negative (%)
Anti- HBs	0(0.0)	55(100)
HBeAg	4 (7.3)	51(92.7)
Anti-HBe	20 (36.4)	35(63.6)
Anti-HBc	52(94.5)	3(5.5)

Anti-HBs – Hepatitis B surface antibody, HBeAg – Hepatitis B envelop antigen, Anti-HBe – Hepatitis B envelop antibody, Anti-HBc – Hepatitis B core antibody.

p=0.92; OR= 0.982; 95%CI=0.947-1.018). The highest prevalence was observed among student who had been transfused (14.3%: 1/7) as against student who had not been transfused (9.1%: 54/593).

In relation to family history, higher prevalence of HBsAg was observed among students who had history of infection (26.2%: 11/42) in their family as compared to those who did not (7.9%: 37/471). There was observed significant association in family history and HBsAg (χ^2 = 15.722, df=2, p=0.00).

The result was further analyzed according to involvement of the students in menial jobs/petty trading or not. Although, there was no statistical significant association between HBV detection and involvement in petty trading or not (χ^2 = 3.678, df=3, p=0.298). Students who engaged themselves in other businesses had the highest seroprevalence of HBV (25.0%: 2/8), as compared to those who were not involved (8.7%: 48/552).

Table 4 shows the distribution of HBV markers in the HBsAg reactive student. None of the HBsAg positive students had developed Anti-HBs, 7.3% (4/55) had HBeAg, 36.4% (20/55) had developed Anti-HBe and 94.5% (52/55) had developed Anti-HBc.

DISCUSSION

The seroprevalence of 9.2% HBsAg reported in the present study is regarded as high seroprevalence level of HBV infection as per the WHO classification of assessing severity of HBV infection in HBV endemic countries. WHO defines low prevalence to be <2%, moderate prevalence as 2-8%, and high prevalence as >8% HBsAg positivity (WHO, 2010). These students were potentially infectious (WHO, 2012).

This seroprevalence rate is lower than the 12.5% earlier reported amongst asymptomatic students in Ahmadu Bello University, Zaria (Main Campus) (Aminu et al., 2013), 11.5% among students of Nasarawa State University, Keffi (Pennap et al., 2011) and 15.5% found among medical students of Usman Danfodio University, Sokoto (Alo et al., 2013). Also, 11.0% was reported among Makerere University Medical Student (Pido and Kagimu, 2005). In contrast, Ugwuja and Ugwu (2009) reported a lower seroprevalence of 4.1% among adolescents in Abakiliki, South Eastern, Nigeria and 4.7% among students in University of Uyo (Mboto and Edet, 2012).

The reasons for these variations may be related to the fact that infection tend to vary from one locality to another and from one country to another depending on the level of associated risk factors.

Higher seroprevalence of HBsAg was seen among students aged above 40 years, showing that the virus is significantly associated with increasing age. The result is similar to the findings of Okonko et al. (2012) who found higher prevalence in those above 40 years. This may be because older people might have obtained the infection in their younger age. However, the small number of participants in some of the age groups might have affected the clear picture of the age related prevalence of HBV infection obtained. It is also very possible that other than HIV, many people may not be aware of other sexually transmitted viral infections and so continue to have unprotected sex with fellow HIV negative partners who might be chronic carriers of HBV. It has been noted that in Africa, more than half of the population become HBV infected during their life time and about 8% of the inhabitants become chronic carriers (Pennap et al., 2011).

The rate of infection in male was significantly higher than that of female. This finding agrees with that of Kouassi-M'Bengue et al. (2011) and Pennap et al. (2011) which showed higher prevalence of HBsAg among male than female. The result however contrasts the report of Mustapha and Jibrin (2004) in which prevalence of HBsAg was higher in female than male. The finding in this study may be explained by the fact that male's preponderance is more obvious. However, it might not be unconnected with higher rate of promiscuity among males than females.

In relation to marital status, highest prevalence was recorded among students who were single. This result is similar to that of Ejele et al. (2004) who reported that single/unmarried patients constituted the highest proportion

of those with HBV/HIV co-infection. This may be explained by the fact that promiscuity and unprotected sexual behaviours among singles/unmarried might be higher than among the married therefore, increasing the risk of acquiring the viruses due to their inability to stick to only one sexual partner.

The highest prevalence was recorded for students who were in polygamous marriages. This could be because of the multiple sexual relationships in polygamous families as well as large population and person-person contact in polygamous homes.

Students who were from the south-south zone had the highest prevalence. This finding contrasts that of Aba et al. (2012) who reported higher prevalence of HBsAg among women in the south-east region. This finding has shown that there are wide geographical variations in the seroprevalence rates of HBsAg infection amongst students within Nigeria. The variations may be a reflection of the differences in sexual practices and behaviour, awareness of these viral infections and testing, as well as socio-cultural practices and accessibility to healthcare.

Infection with the virus was not significantly associated with injection by quacks in this study. It is contrary to report by Adekanle et al. (2010) and Nwokediuko (2010) who found a significant association. A higher prevalence of HBsAg was detected among students that had no history of injection by uncertified medical personnel. This supports the fact that it is becoming clearer now that many cases of HBV infection are known to result from less apparent modes of non-percutaneous or covert percutaneous transmission (Pennap et al., 2011). However, in developing countries, exposure to contaminated therapeutic injection equipment are common in many settings because of lack of awareness of infection control practices, lack of resources for sterilization and the purchase of new disposable equipment, and cultural preferences encouraging overuse of injections.

Hepatitis B surface antigen seropositivity was higher among students who shared clothes and bed space. However, there was no observable statistical significant association between these potential risks factors and the infection. This finding agrees with that of Ndako et al. (2011), who found no significant association between these risks factors with the infection. Sharing of bed or clothes is a predominant lifestyle of students in this community; hence increasing the chances of acquiring HBV infection. Close personal contact has been reported among students of Main Campus, ABU, Zaria, where more than six students share a room in the hostel (Aminu et al., 2013). The implications of sharing of clothes if found associated with these viruses could be detrimental, especially HBV which could be found in saliva, sweat, tears, urine, breast milk and any body fluid (Elgouhari et al., 2008).

Infection with HBsAg was more prevalent among those who confessed to engage in sharing of cups and cutleries. This finding is similar to that of Mboto and Edet (2012), who found higher prevalence of HBsAg among students who shared unsterilized sharp object in University of Uyo. In addition, Ndako et al. (2011) reported, history of practicing high risk behaviours such as sharing of sharp objects and tooth-brush among students. However, the factor was not significantly associated with the infection and this support with the study of Dawaki and Kawo (2006) that these risk factors are poorly associated with the infection. However, this is a practice that can easily expose one to blood or other body fluids which might lead to acquiring of the viral infection.

Mboto and Edet (2012) reported that multiple sexual partnership practice was significantly associated with. HBsAg infection. The result of this study is similar to the findings of Adekanle et al. (2010) who reported higher HBsAg prevalence in those without multiple sexual partners than those who had. The finding of this study is contrary to that of Pennap et al. (2011) who reported higher prevalence of HBsAg among students of a Nigerian tertiary institution with multiple sexual partners. Reasons why those with multiple sexual partners had lower prevalence could be that the students might have been careful and usually take necessary precaution when negotiating new sexual partners. In addition, those infected could have gotten the viral infection through other route.

In relation to condom use, the virus was detected with a higher prevalence in those that did not use condom. It could be because when sex is unprotected, or a new condom is not properly used each time, the risk of HBsAg increases. Data on sexual behaviours indicated that risky behaviours are very common in Nigeria; while condom use remains low due to religious and cultural beliefs (Pauchaud et al., 2002). In couples, insistence on use of condom during sex may be a sign of lack of trust towards the partner, which may generate acrimony (Otori et al., 2013).

The highest prevalence was observed among student who had been transfused. This may be due to the transfusion of improperly screened blood. Because not all Nigerian hospitals have the means and facilities for effective screening for HBV including the markers. Therefore, there is a risk of using contaminated blood.

Higher prevalence was observed among students who had history of infection in their family. This could be due to close contact usually observed among family members especially in Africa where sharing is a common characteristics; any person that tends to isolate himself may be considered as social disregard, showing indifference or disunity, thereby, increasing the chances of contracting the viral infection through exposure to contaminated blood or body fluids. Other reason could also be due to vertical transmission from mother to infant.

However, the result of the study contrasts that of Bwogi et al. (2009) in which prevalence was significantly, associated with occupation of students. The infection was higher among students who usually engaged in menial jobs/petty trading. This is in agreement with the finding of

Bwogi et al. (2009) who found that being in a professional or service occupation was associated with lower risk of lifetime HBV infection in women as compared to other occupational categories. Similarly, Ejele et al. (2004) reported that commercial sex workers had the highest prevalence of HBsAg among the occupational groups.

The distribution of HBV markers in the HBsAg reactive students indicates that none of the students had developed anti-HBs. The presence of anti-HBs is generally interpreted to indicate recovery and immunity from hepatitis B virus infection. Anti-HBs also develop in a person who has been successfully vaccinated against hepatitis B. Since none of the student had developed anti-HBs, it means they have not yet recovered from natural infection (Shepard et al., 2006).

Furthermore, 7.3% (4/55) of the HBsAg reactive students had HBeAg. Its presence indicates that the virus is replicating and the infected students had high levels of HBV. The prevalence was higher as compared to the study by Otegbayo et al. (2003), who reported 2.3% positive for HBeAg. It means four (4) of the students were highly infectious. Traditionally, the presence of HBeAg in a host's serum is associated with much higher rates of viral replication and enhanced infectivity. Therefore, these four students could potentially transmit the virus through contacts of body fluids or blood. The presence of HBeAg in the students could increase the chances of spread of the infection to others, since sharing is common amongst the students of ABU main campus. In addition, there is a high risk of developing liver cirrhosis or hepatocellular carcinoma later in life as the virus keep on replicating. Most chronically infected individuals present with HBeAg-positive ten to thirty years after their initial infection (Fattovich, 2003).

Further analysis indicated 36.4% of the individuals had developed the envelop antibody (anti-HBe). This antibody is generally produced by the immune system temporarily during acute HBV infection; it indicates lower levels of HBV or resolution of infection. During the natural course of an infection, the HBeAg may be cleared, and antibodies to the 'e' antigen (anti-HBe) will arise immediately afterwards. This conversion is usually associated with a dramatic decline in viral replication. It indicates that the students are not infectious and may not transmit the virus. It also shows the process of recovery from the infection.

In addition, 94.5% of the individuals had developed hepatitis B core antibody. Anti-HBc is the first antibody to appear. Demonstration of anti-HBc in serum indicates HBV infection, current or past. The IgM anti-HBc is present in high titre during acute infection and usually disappears within 6 months; although it can persist in some cases of chronic hepatitis. IgG anti-HBc generally remains detectable for a lifetime (WHO, 2012). It is therefore difficult to determine the time point at which these students became infected with the HBV.

The HBeAg which is the representative of viremic stage occurs early in the incubation period, concurrently or shortly after the first appearance of HBsAg. High levels of IgM-specific anti-HBc are frequently detected at the onset of clinical illness. Antibody to HBsAg is first detected at a variable period after the disappearance of HBsAg. Before HBsAg disappears, HBeAg is replaced by anti-HBe, signaling the start of resolution of the disease. Low titres of IgM anti-HBc are found in the sera of most chronic HBsAg carriers.

Conclusions

This study found the seroprevalence of HBV infection among students in ABU, Zaria to be 9.2%, which implies that the infection is highly endemic among the students based on WHO recommendation. Gender was significantly associated with HBV infection in this study and the major risk factor found was a family history of HBV infection. Detection of HBV markers amongst the reactive students showed most of them to be in the early stage of infection; these students can therefore serve as potential reservoir for transmission of the virus.

Conflict of interest

The authors declared that there is no conflict of interest.

ACKNOWLEDGEMENT

We thank the Director, University Health Services, Dr. M. A. Usman, for granting permission to use the clinic as a point for samples collection and all the students enrolled in the study for their cooperation.

REFERENCES

Aba HO, Whong CMZ, Aminu M (2012). Co-Infection of human immunodeficiency virus and hepatitis B surface Antigen among pregnant women in Kaduna, Nigeria. J. Immunol. 137(1): 185-772.

Adekanle O, Ndububa DA, Ayodeji OO, Paul-Odo B, Folorunso TA (2010). Sexual transmission of the hepatitis B virus among blood donors in a tertiary hospital in Nigeria. Singapore J. Med. 51(12):944-947.

Ahizechukwu CE, Uzoamaka AE, Charles IO, Ifeanyichukwu UE, Chukwuanugo O (2011). Prevalence, correlates and pattern of hepatitis B surface antigen in a low resource setting. J. Virol. 8(1):8-12.

Aminu M, Okachi EE, Sani MA, Abdullateef Y (2013). Prevalence of hepatitis B virus surface antigen among healthy asymptomatic students in Nigerian university. Ann. Afr. J. Med. 12(1): 55-56.

Alo MN, Alhassan HM, Saidu AY, Ugah UI, Abdulahi H (2013) Seroprevalence of hepatitis B surface antigen (HBsAg) among the medical students of Usmanu Danfodiyo university, Sokoto, Sokoto State, Nigeria. Europ. J. Exper. Biol. 3(3):666-671.

Ballah AD, Babajide A, Abubakar UA, Abubakar AB, Cecilia A, Ernest E, Mohammed BA (2012). A survey of Hepatitis B and C virus prevalence in human immunodeficiency virus positive patients in a tertiary institution in north eastern Nigeria. Int. J. Med. Med. Sci. 4(1):13-18.

Bwogi J, Braka F, Makumbi I, Mishra V, Bakamutumaho B, Nanyunja M (2009). Hepatitis B infection is highly endemic in Uganda: findings from a national serosurvey. Afr. Health Sci. 9(2):98-108.

Cheesbrough M (2006). District laboratory practice in tropical countries. USA: Cambridge University, press: 2nd ed. pp. 295-297.

Dawaki SS, Kawo AH (2006). Seroprevalence of Hepatitis B Surface

Antigen (HBsAg) in pregnant women attending an urban maternity hospital in Kano, Nigeria. Nigeria. J. Microbl. 20: 705-709.

Dienstag JL, Isselbacher KJ (2005). Acute viral hepatitis. In: Hawison`s principles of internal medicine, Kaspar DL, Baunwald E, Frauci AS, Hawer SL, Longo DL, Jameson JL. 6th Ed. vol. II, the Macgraw-Hill companies inc., New York, pp. 1822-1838.

Elgouhari HMTI, Tamimi AR, Carey WD (2008). Hepatitis B virus infection: understanding its epidemiology, cause and diagnosis. Clevel. J. Med. 75(12):881-889.

Ejele OA, Nwauche CA, Erhabor O (2004). The prevalence of hepatitis B surface antigenaemia in HIV positive patients in the Niger Delta Nigeria. Nig. J. Med. 13(2):175-179.

Emechebe GO, Emodi IJ, Ikefuna AN, Ilechukwu GC, Igwe WC, Ejiofor OS, Ilechukwu CA (2009). Hepatitis B virus infection in Nigeria. A review, Nig. Med. J. 50(1):18-22.

Fattovich G (2003). Natural history of hepatitis B. J. Hepatol. 39(1):50-58.

Kouassi-M'Bengue A, Boni CC, Ouattara D, Berthé K, Doumbia M, Sévédé D, Saraka D, Méité S, Dosso M (2011). Co-infection of HIV and HBV in voluntary counseling and testing center in Abidjan. Asian Pac. J. Trop. Dis. 1(4):275-278.

Mustapha SK, Jibrin YB (2004). The prevalence of Hepatitis B Surface Antigenaemia in patients with Human Immunodeficiency Virus (HIV) infection in Gombe Nigeria. Ann. Afr. Med. 3(1):10-12.

Mboto CI, Edet EJ (2012). Prevalence and risk factors of Hepatitis B Virus infection among students in university of Uyo. Int. J. Mod. Biol. Med. 2(2): 101-111.

Ndako AJ, Obinna ON, Georgebest, ON, Echeonwu, SA, Junaid OA, Tiri JA (2011). Studies on prevalence and risk factors for Hepatitis B Surface Antigen among secondary school students in north-central, Nigeria. Sierra Leone J. Biomed. Res. 3(3):163-168.

Nwokediuko SC (2010). Risk factors for hepatitis B virus transmission in Nigerians: A case-control study. Int. J. Gastroenterol. 10(1):10-11.

Ogoina D, Pondei K, Adetunji B, Chima G, Isichei C, Gidado S (2014). Prevalence of hepatitis B vaccination among health care workers in Nigeria in 2011-2012. Int. J. Occupat. Environ. Med. 5(1):51-56.

Okonko IO, Anugweje KC, Adeniji FO, Abdulyekeen RA (2012). Syphilis and HIV, HCV and HBsAg co-infections among sexually active adults. Nat. Sci. 10(1):66.

Otegbayo JA, Fasola FA, Abja A (2003). Prevalence of hepatitis B surface antigens, risk factors for viral acquisition and serum transaminase among blood donors in Ibadan, Nig. Trop. Gastrol. 24(4):196-197.

Otori MO, Aminu M, Mukhtar HM, Okojokwu OJ (2013). Predominant blood group antigen and risk factors associated with HIV infection among HIV positive patients in Zaria, Kaduna state, Nigeria. Int. J. Pharm. Chem. Biol. Sci. 3(4):1052-1060.

Pauchaud C, Woog V, Singh S, (2002). Issues in measuring HIV prevalence: the case of Nigeria. Afr. J. Reprod. Health, 6(3):11-29.

Pennap GR, Nwachukwu O, Ishaleku D, Ombugadu RJ (2011). Hepatitis B virus carriage among student of a Nigerian tertiary institution: A cohort of eligible blood donor. Research J. Med. Sci. 5(2):90-93.

Pido B, Magid K (2005). Prevalence of hepatitis B virus (HBV) infection among Makerere university medical students. Afr. Health Sci. 5(2):93-98

School of Postgraduate Studies Handbook (2011). Postgraduate student's handbook, Ahmadu Bello University, Zaria. ABU press limited, Zaria. pp. 12-13.

Shepard CW, Edgar P, Simard LF, Anthony EF, Beth PB (2006). Hepatitis B virus infection: epidemiology and vaccination. Oxford J. Med. Epideml. Rev. 28(1):112-125.

Ugwuja E, Ugwu N (2009). Seroprevalence of hepatitis B surface antigen and liver tests among adolescents in Abakaliki, south eastern Nigeria. Int. J. Trop. Med. 6(2):50.

Willey JM, Sherwood LM, Woolverton CJ (2011). Prescotts microbiology, (8th Edition). Mcgraw Hills Intern. Ed. Publ. U.S.A. pp. 919-920.

World Health Organization (2010). Prevalence of hepatitis B virus infection in the world by country. http://www.who.int/csr/disease/hepatitis/en/.

World Health Organization (2012). Hepatitis B: Global alert and response.Www.Who.Int.14-03-2012. Center for Disease Control. Hepatitis: Www.Cdc.Gov/Hepatitis/Statistics.Htm