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Seroprevalence of Hepatitis B Virus and Human Immunodeficiency Virus Infection among Students in Ahmadu Bello University, Zaria, Nigeria

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ABSTRACT

Hepatitis B virus (HBV) and Human Immunodeficiency Virus (HIV) are endemic in sub-Saharan Africa. Evidence on HBV co-infection rates with HIV infection among individuals remains conflicting. The study was conducted to determine the seroprevalence of HBV and HIV infections and the possible potential risk factors among students of Ahmadu Bello University (ABU), Zaria, Nigeria. Blood samples were collected from 600 consenting consecutive students aged between 16 and 40 years old at the University Health Services, ABU, Zaria. The sera were screened for HBsAg, anti-HBs, HBeAg, anti-HBe and anti-HBc using diagnostic kits and for Human Immunodeficiency Virus using Determine^{TM}HIV-1/2 kits. Reactive sera for HBsAg were further confirmed using ELISA kits. 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. Seroprevalence of HIV infection was 2.8% (17/600). One (0.2%) of the student was infected with both HBV and HIV. There was a significant association between age group (p=0.016), gender (p=0.049), family history of HBV infection (p=0.000), and seroprevalence of HBsAg. While for HIV, only menial jobs (p = 0.001) was significantly associated with the infection. The results showed close contact among family members to be a predisposing factor to these viral infections. A total of 314 students were ignorant of HBV and four of them were infectious. The seroprevalence of HBsAg obtained in this study indicates high endemicity according to WHO classification. However, seroprevalence of HIV and its co-infection rate with HBV were very low. This was encouraging and it indicates that the campaign on HIV is yielding the desired result. Therefore similar campaign should be extended to Hepatitis B.

KEY WORDS: ***Seroprevalence; HIV; HBsAg; Serological markers; Students; Nigeria***

INTRODUCTION

Hepatitis B Virus (HBV) is a DNA virus belonging to the family *Hepadnaviridae* with a very high transmissibility.[1] This virus has

been detected in peripheral mononuclear cells, tissues of pancreas, spleen, kidney, skin and fluids like saliva, semen, sweat, breast milk, tears, urine, vaginal secretion and faeces.[2,3] 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 health problem or risk, occurring endemically, in all areas of the world. Approximately one million persons die each year (2.7% of all death) from viral hepatitis related causes.[4]An estimated 57% of cases of Liver cirrhosis and 78% of cases of 1% liver cancer results from HBV or HCV infection.[4]However, 80% of countries identifies hepatitis as an urgent public health problem.[4] Hepatitis B Virus infection is widely referred to as a silent killer because many carriers do not realize they are carrying the virus[5] and hence fail to seek appropriate medical attention, therefore posed a high risk to its victim. It has been estimated that about 2 billion people have been infected with hepatitis B virus and 350 million have chronic lifelong infection.[6] About 50 million people are chronic carriers in Africa with the carrier rate ranging from 9 to 20% in sub-Saharan Africa.[6] Studies have shown that the prevalence of HBV infection in antenatal population is a reliable indicator of HBV prevalence rate in the general population.[7] 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 exposed to the risk factors.

Human immunodeficiency virus (HIV) on the other hand is a member of the Lentivirus genus and family *Retroviridae* that was unknown until first discovered in 1981 among homosexual men in the United States[8]and is responsible for the Acquired Immunodeficiency Syndrome (AIDS). Acquired Immunodeficiency Syndrome is marked by a steady decline in the capacity of the body to fight infections and has been adjudged the most significant emerging infectious disease of the last century and continues to create health, social and developmental problems particularly in Africa.[9] An estimated 35 million people are living with HIV infection worldwide with the African region accounting for two-thirds of the global HIV/AIDS burden and high HIV-HBV co-infection is expected.[4]About 3,229,757 people now live with HIV while it is estimated that 220,394 new HIV infections occurred in 2013.[10]

The course of acute HBV may be modified in the presence of HIV infection, with a lower incidence of icteric illness and lower rates of spontaneous clearance of HBV. Persons with HIV and chronic HBV co-infection have higher levels of HBV DNA and lower rates of clearance of the hepatitis B e antigen (HBeAg). Human Immunodeficiency Virus increases the risk of cirrhosis and end-stage liver disease in HBV co-infection.[11] Since both the hepatitis B virus and the HIV virus share similar transmission routes, a high frequency of co-infection is expected. Sexual activity and/or injection drug use are the most common routes of transmission of the hepatitis B virus among those also infected with HIV. However, in Nigeria, screening of tertiary institutions students for HBV and HIV is not a routine practice. Also, routine vaccination of students with HBV vaccines is not widely available especially in low resource settings as Nigeria. Despite the availability of free vaccine through the National Program on Immunization (NPI), immunization coverage for Hepatitis B is still not optimal in Nigeria.[12] This study was therefore aimed at determining the seroprevalence of hepatitis B and Human Immunodeficiency virus

infections among students of Ahmadu Bello University, Zaria-Nigeria.

METHODOLOGY

Study Area and Population

The study was carried out in Ahmadu Bello University (ABU), Zaria. This is one of the first generation universities in the Northern part of Nigeria. It is 81 kilometers from the state capital, Kaduna and about 300 km from Abuja the Federal Capital of Nigeria. Zaria is in Northern Guinea Savannah and lies on $11^0 03^/$N and $07^0 42^/$E. It covers a land area of about 7,000 hectares. This is the largest and the most extensive of all Universities in sub-Saharan Africa.[13] The student body is over 35,000, majority of which are undergraduates but with a sizeable and growing body of postgraduate students.

Study Design and Population

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 of all ages for examination. The University Health Services Centre was used as the collection point. Ethical clearance was obtained from the Medical Ethical and Scientific Research Committee of Kaduna State Ministry of Health, before the commencement of work. Consent form was given to each student after explanation to obtain permission, after which they signed an agreement to participate in the study. All undergraduate and postgraduate students of all ages and sex of ABU, Zaria at the time of study who gave their consent to participate in the study were included in the study. Students who did not give their consent to participate in the study were excluded.

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

Sample Collection and Processing

Between April and August 2013, a Laboratory Scientist collected three milliliters of venous blood sample from each of the consenting students using clean-labeled sample bottles. Sera were separated out of the blood by centrifugation of each of the blood sample at 1000rpm (revolutions per minute) for 10 minutes.[14] The samples were stored in the Virology Laboratory of the Department of Microbiology, ABU, Zaria at -15^0C until analyzed.

Screening of Samples

All samples were screened for HBsAg and HIV according to the manufacturers' protocols using rapid test immunochromatographic kits. The BioApex one Step HBsAg test kit (Richmond Hill, Ontario, Canada) was used to screen for HBV and the World Health Organization (WHO) approved kit, Determine HIV 1 and 2 rapid test strips (Abbott Laboratory, USA) was used to detect HIV. Positive samples for HBV were confirmed using Enzyme Linked Immunosorbent Assay (ELISA) (Diagnostic Automation, USA). All results were interpreted according to the manufacturer's instructions.

Detection of other Serological Markers of HBV Infection

All samples that were HBsAg positive were further screened for other serological markers of Hepatitis B using the one-step HBV multi-5 test kit (Beijing easy sweet Biomedicine Science Tech Co., Ltd., China). The multi-5 in 1 Panel rapid test kit is a rapid test based on the principle of immunoassay combined with conjugated colloid gold technology that detect the 5 markers associated with hepatitis B

infection. These markers 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).

Data Analysis

The data obtained from the questionnaire and the result of the laboratory tests were analyzed using Statistical Package for Social Sciences version 17. The prevalence of each viral infection (HBV and HIV) and the co-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 HIV and HBV infection. P value of ≤ 0.05 was considered significant at 95% confidence interval.

RESULTS

Of the 600 students that participated in the study, 55 were positive for HBsAg, giving a prevalence of 9.2% while 17 were reactive to HIV antibodies giving a prevalence of 2.8% (**Table 1**). One of the 600 students enrolled in the study was co-infected with HBV and HIV, giving a prevalence rate of 0.2% (1/600). The characteristics of the study population are summarized in **Table 2**.

Table 1: Distribution of HBsAg and HIV and co-infection among student in ABU, Zaria

Viral antigen	No. Screened	No. (%) Positive	No. (%) Negative
HBsAg	600	55 (9.2)	545 (90.8)
HIV	600	17 (2.8)	583 (97.2)
HBsAg and HIV	600	1 (0.2)	599 (99.8)

There was a marked difference in the distribution of HBV and HIV by age. Individuals who were above 40 years had the highest seroprevalence of HBsAg (30%: 3/10) while no virus was detected among students 36-40 years age old (0%: 0/20) (χ^2 = 13.913, df =5, p=0.016). For HIV infection, students aged 16-20 years had the highest seroprevalence (4.3%:5/115) while no infection was reported for age groups 36-40 and those above 40 years.

The distribution of HBV infection was significantly associated with gender (χ^2 = 3.198, df=1, p=0.049; OR = 1.691; 95%CI= 0.946-3.02236). However, higher prevalence was recorded among male students (11.1%: 36/324) compared to females (6.9%:19/276). For HIV, the difference observed was not statistically significant (χ^2 = 0.339, df=1, p=0.367) with the highest seroprevalence recorded among females students (3.3%: 9/276) compared to male students (2.5%: 8/324).

There was no statistical significant difference between the seroprevalence of either HBsAg (χ^2 = 0.560, df=3, p=0.905) or HIV (χ^2 = 2.109, df=3, p=0.550) and marital status. However, for both HBsAg and HIV, the highest seroprevalence (9.5%:46/482 and 3.3%:16/482 respectively) was recorded among students who were single while none of the widowed or divorced student was infected (**Table 2**). The distribution of HBsAg in relation to family type for married students was not significant (χ^2 = 4.142, df=1, p=0.056; OR = 0.257; 95% CI = 0.064-1.028). The highest prevalence was recorded among students who were in polygamous marriages (16.1%:5/31) as against students in monogamous relationships (4.7%:4/85). For HIV, the prevalence among those in monogamous marriages was higher (1.2%:1/85) and none of the students in polygamous marriages was infected (χ^2 = 0.368, df=1, p=0.733; OR = 1.369; 95% CI= 1.225-1.530).

Table 2: Distribution of HBsAg and HIV infection by demographic factors among students of ABU Zaria

Demographic Factor	Total	Positive (%) *HBsAg	Positive (%) **HIV	P value ≤ 0.05	Odds Ratio
Age (years)					
16 – 20	115	16(13.9)	5(4.3)		
21 – 25	253	24(9.5)	6(2.4)	[H]0.016	
26 – 30	156	11(7.1)	5(3.2)	[HI]0.824	
31 – 35	46	1(2.2)	1(2.2)		
36 – 40	20	0(0.0)	0(0.0)		
Above 40	10	3(30.0)	0(0.0)		
Gender					
Male	324	36(11.1)	8(2.5)	[H]0.049	[H] 1.691
Female	276	19(6.9)	9(3.3)	[HI]0.367	[HI] 0.751
Marital Status					
Married	116	9(7.8)	1(0.9)	[H]0.905	
Single	482	46(9.5)	16(3.3)	[HI]0.550	
Widowed	1	0(0.0)	0(0.0)		
Divorced	1	0(0.0)	0(0.0)		
Family type Monogamy	85	4(4.7)	1(1.2)	[H]0.056	[H] 0.257
Polygamy	31	5(16.1)	0(0.0)	[HI]0.733	[HI] 1.369

Key: H: HBsAg; HI: HIV

The result was also analyzed according to other possible risk factors that might be associated with HBV and HIV (**Table 3**). There was no significant association between HBsAgseroprevalence and being injected by uncertified medical personnel (χ^2 = 0.859, df=1, p=0.250; OR=0.859; 95% CI= 0.213-1.749). Frequency of HBsAg was higher among those who did not receive injection from uncertified medical personnel (9.6%: 51/534) and lower among students who receive injection from quacks (6.1%:4/66). Similarly, for HIV, there was no statistically significant difference (χ^2 = 0.011, df=1, p=0.575; OR=1.083; 95% CI =0.242-4.846). However, the prevalence was higher in students who received injection from uncertified medical personnel (3.0%:2/66) than those who had not (2.8%: 15/534).

Table 3: Prevalence of HBV and HIV infection among ABU Zaria students, in relation to some risk factors

Risk factor	Total	Positive (%) HBsAg	Positive (%) HIV	P value	Odds ratio
Injection by uncertified medical personnel					
Yes	66	4(6.1)	2(3.0)	[H]0.250	*0.611
No	534	51(9.6)	15(2.8)	[HI]0.575	**1.083
Clothes Sharing					
Yes	45	5(11.1)	1(2.2)	[H]0.066	*1.263
No	555	50(9.0)	16(2.9)	[HI]0.631	**0.766
Sharing of bed space					
Yes	295	31(10.5)	8(2.7)	[H]0.164	*0.786
No	305	24(7.9)	9(2.9)	[HI]0.860	**0.917
Sharing of sharp unsterilized objects					
Yes	488	45(9.2)	14(2.9)	[H]0.546	*1.036
No	112	10(8.9)	3(2.7)	[HI]0.605	**1.073
Multiple sexual partners					
Yes	13	1(7.7)	0(0.0)	[H]0.662	*0.534
No	587	54(9.2)	17(2.9)	[HI]0.534	**1.023
Condom use					
Yes	138	11(7.9)	1(0.7)	[H]p=0.358	*0.823
No	462	44(9.5)	16(3.5)	[HI]p=0.69	**0.203
Blood transfusion					
Yes	7	1(14.3)	0(0.0)	[H]p=0.92	*0.982
No	593	54(9.1)	17(2.9)	[HI]p=0.817	**1.012
History of Infection in family					
Yes	42	11(26.2)	-	[H]p=0.000	
No	471	37(7.9)	-	-	
Do not Know	87	7(8.1)	-		
Engagement in menial jobs/petty trading					
Civil Servant	29	3(10.3)	0(0.0)	[H]p=0.298	
Student	552	48(8.7)	15(2.3)	[HI]p=0.001	
Farmer	11	2(18.2)	0(0.0)		
Others	8	2(25.0)	2(25.0)		

Prevalence of HBsAg was higher among students who shared clothes (11.1%: 5/45) than in those who did not (9.0%: 50/555) with no statistically significant difference (χ^2= 0.221, df=1, p=0.397; OR=1.083; 95% CI=0.477-3.344). Although for HIV there was also no observed statistical difference (χ^2 = 0.066, df=1, p=0.631; OR=0.766; 95% CI= 0.99-5.909), the prevalence was higher among those that did not share clothes (2.9%:16/555) compared to those who did (2.2%:1/45).

Students who shared bed space had higher seroprevalence of HBV infection (10.5%: 31/295) than those who did not (7.9%: 24/305) with no statistically significant difference (χ^2 = 1.255, df=1, p=0.164; OR= 1.375; 95% CI=0.786-2.404). For HIV, students who did not share bed space had higher seroprevalence of the infection (2.9%:9/305) compared to those who shared bed space (2.7%:8/295). There was no statistically significant association between sharing of bed space and HIV infection (χ^2 = 0.031, df=1, p=0.860; OR=0.917; 95% CI= 0.349-2.409).

Hepatitis B surface antigen was more prevalent among those who had a history of sharing utensils and cutleries (9.2%: 45/488) than those who did not (8.9%: 10/112) even though the difference was no significant (χ^2 = 0.009, df=1, p=0.546; OR=1.036; 95%CI=0.505-2.125). Similarly, HIV infection was higher in those who had history of sharing utensils and cutleries (2.9%: 14/488) than those who did not (2.7%:3/112) (χ^2 = 0.012, df=1, p=0.605; OR=1.073; 95% CI=0.303-3.799).

There was no significant association between infection with HBV and history of multiple sexual partners (χ^2 = 0.035, df=1, p=0.662; OR=0.823; 95%CI=0.105-6.448). Seroprevalence was however higher in students that did not have multiple sexual partners (9.2%: 54/587) than those who had (7.7%: 1/13). For HIV, there was no significant association in the seroprevalence (χ^2 = 0.387, df=1, p=0.534; OR=1.023; 95% CI=1.010-1.035) with higher prevalence observed among students that had no history of multiple sex partners compared to those with a history.

Hepatitis B surface antigen was detected with a higher prevalence in students that did not use condom (9.5%: 44/462) compared to those who did (7.9%: 11/138) with no significant difference (χ^2 = 0.308, df=1 p=0.358; OR= 0.823; 95% CI=0.413-1.640). Similarly, For HIV, there was no statistically significant association between infection and the use of condom. However, a higher seroprevalence of infection was obtained in students that did not use condom (3.5%:16/462) than those that used it.

There was no statistically significant association between history of blood transfusion and HBsAg (χ^2 = 9.926,df=1 p=0.92; OR= 0.982; 95%CI=0.947-1.018). There was a higher prevalence among students who had been transfused (14.3%:1/7) as against those who had never been transfused (9.1%:54/593). Similarly, there was no statistical significant difference in the seroprevalence obtained for HIV infection (χ^2 = 0.207 df=1 p=0.817; OR=1.012; 95% CI=1.003-1.021) for students with no history of blood transfusion (2.8%:17/600) and those who had been transfused (0.0%:0/600). In relation to family history of HBsAg, higher prevalence of HBsAg was observed significantly (χ^2 = 15.722, df=2, p=0.00) among students who had a history of infection (26.2%: 11/42) in their family compared to those who did not (7.9%:37/471).

The result was further analysed according to involvement of the students in menial jobs or petty trading. Two of the eight (25.0%) students who engaged themselves were HBV positive while 48 of the 552 (8.7%) who were not engaged were positive. The difference was however not statistical significant (χ^2 = 3.678, df=3,

p=0.298). For HIV the difference in seroprevalence was statistically significant (χ^2= 15.472, df=3, p=0.001) even though only two of the eight (25.0%) students who were engaged in other businesses were also positive.

Table 4 shows the distribution of HBV serological markers among the HBsAg reactive students. None of the HBsAg positive students had developed Anti-HBs, 7.3% (4/55) had HBeAg, 36.4% (20/55) had developed the envelop antibody (Anti-HBe) and 94.5% (52/55) had developed hepatitis B core antibody (Anti-HBc).

Table 4: Distribution of HBV markers in HBsAg reactive student in ABU, Zaria (N = 55)

Serological Marker	Positive (%)	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)

KEY: Anti-HBs – Hepatitis B surface antibody; HBeAg – Hepatitis B envelop antigen; Anti-HBe – Hepatitis B envelop antibody; Anti-HBc – Hepatitis B core antibody

DISCUSSION

This study was conducted to determine the seroprevalence of HBV and HIV infection and their co-infection among students of ABU Zaria. Results showed that 9.2% of the students were seropositive for HBsAg, a marker of HBV infection, 2.8% were seropositive for HIV and one student was infected with both viruses. The 9.2% seroprevalence of HBsAg reported in this study is regarded as high seroprevalence level of HBV infection according to WHO classification of HBV endemic countries. WHO defines low prevalence to be <2%, moderate prevalence as 2-8%, and high prevalence as >8% HBsAg positivity.[15]Thesestudents were potentially infectious.[16]The seroprevalence rate obtained in this study is lower than the 12.5% earlier reported amongst asymptomatic students in Ahmadu Bello University, Main Campus, Zaria, Nigeria[17] the 11.5% reported among students of Nasarawa State University, Keffi, Nigeria[5]and the 15.5% found among Medical students of UsmanDanfodiyo University, Sokoto, Nigeria.[18]In contrast, the prevalence was higher than the 4.7% reported among students in University of Uyo, Nigeria.[19]

The 2.8% seroprevalence obtained for HIV infection may be considered high as a similar study did not detect the virus among students in Tehran University among Medical Science students.[20]However, this rate is lower than the 9.9% found among students of tertiary institution in Malete-Ilorin Kwara State, Nigeria.[21]Only one student was found to be co-infected with the viruses. This rate is similar to the rate of 0.5% found among pregnant women, attending antenatal care in Kaduna, Metropolis[22]and 0.77% found among blood donors in Cameroon.[23]The reason for these variations may not be unconnected to the fact that infections tend to vary from one locality to another and from one country to another depending on the level of associated risk factors.

The seroprevalence of HBsAg decreased with age and then significantly peaked in students who were above 40 years old, even though the participants in this age group were small. The result is similar to the findings of Okonko *et al*[24] who found higher prevalence in those above 40 years. This observation 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 prevalence hence a clear picture of the age related infection. 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 HIV negative partners who might be chronic carriers of HBV.

For HIV infection, higher seroprevalence was seen in students within age group 16-20 years; however, there was no significant difference between the infection and age. This observation differs from the findings of Ibadin and Enabulele[25] where a higher seroprevalence was obtained among participants in age group 25-29 years. However, most studies have found HIV infection to peak in these age groups, which are ranges where individual with higher sexual activities belong.

In this study, HBsAg was significantly associated with gender. Prevalence was higher in males, which agree with previous findings.[5,26] This observation may be explained by the male's preponderance. However, it might not be unconnected with the higher rate of promiscuity among males than females, which had been reported for Nigerians. These are behaviors characterized by casual and indiscriminate sexual intercourse, often with many people.[27] For HIV, prevalence was higher in females than males with no significant difference. This finding agrees with that of Otori*et al*[28] that found higher prevalence among females than males among blood donors in selected hospitals in Kaduna. The predominance of HBsAg among female students might be due to increase in vulnerability to HIV infection as a result of biological, social and economic disadvantages related to gender.[29] Many females involve themselves in unprotected sexual contact with men who may be infected with HIV. In sub-Saharan Africa, as well as worldwide, female population usually remains a key factor in the epidemiology of HIV and AIDS because 50% of all adults with HIV infection are women predominantly infected via heterosexual transmission. Furthermore, females are the most severely affected and this could be as a result of the anatomy of the female sex organs.[30]

The seropositivity of the viruses was not associated with marital status of the students although a higher prevalence was recorded among students who were single. This result is similar to the report of Okonko *et al*[30] In relation to family type, HBsAg seropositivity was higher among those in polygamy compared to those in a monogamous relationship. This may be because of the multiple sexual relationships in polygamous families as well as large population and a higher probability of person-person contact. Infection with HIV in this study was higher among students in monogamy than those in polygamy. This is contrary to the report by Otori *et al*[28] where a higher prevalence in patients in polygamous relationship was seen. This observation could be as a result of differences in study population or might be due to chance.

Infection with the viruses was not significantly associated with injection by uncertified medical personnel in this study contrary to the report of Adekanle *et al*[31] and Nwokediuko[32] who found a significant association. Uncertified medical personnel detected a higher prevalence of HBsAg among students that had no history of injection. This supports the fact that many cases of HBV infection are known to result from less apparent modes of non-percutaneous or covert percutaneous transmission.[5]

Seropositivity of HBsAg was higher among students who shared clothes and bed space. While higher prevalence of HIV was detected among those who did not. However, there was no statistical significant association between these potential risks

factors and the infections. This finding agrees with a previous report[33] where no significant association between the infection and these risk factors was found. Sharing of bed or clothes is a predominant lifestyle of students in this community which might increase their 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.[17]

Hepatitis B virus and HIV seropositivity was higher among those who engaged in sharing utensils such as cups and cutleries in this study but did not reach a statistically significant level. This finding is similar to that of Ndako *et al*[33] who reported no significantly association between sharing of sharp objects and tooth-brush and hepatitis B. This observation adds credence to the point of [34] that these risk factors are poorly associated with the infections. However, this practice can easily expose one to blood or other body fluids, which might leads to acquisition of infection.

Having multiple sexual partners was not significantly associated with HBsAg and HIV infection in this study. In contrasts, Mboto and Edet[19] reported multiple sexual partners to be significantly associated with HBsAg infection. In the present study, HBsAg and HIV were highest among students that did not have multiple sexual partners as previously reported.[33] Taking precautionary measures could be the reasons students with multiple sexual partners had lower seroprevalence while those infected could have gotten infected through means other than sexual intercourse.

This study found no significant association between HBsAg and HIV seropositivity and condom use. However, there were higher HBsAg and HIV infection rates among students that did not use condoms when compared to those that used condoms. This finding is similar to that reported by Otori *etal*[35] where the highest seroprevalence of HIV was reported among patients that did not use condoms prior to infection. This observation could be because when sex is unprotected, or a new condom is not properly used each time, the risk of HBsAg and HIV 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.[36] In couples, insistence on use of condom during sex may be a sign of lack of trust towards the partner, which may generate acrimony.[35]

In relation to history of blood transfusion for both HBsAg and HIV, there was no significant association with the viral infections. However, most of the students that were seropositive for HBsAg had a history of blood transfusion. This may be due to the transfusion of improperly screened blood, because not all Nigerian hospitals have the technology to effectively screen blood (especially for HBV markers). Therefore, there is a risk of using contaminated blood. For HIV, a higher seroprevalence was observed among students that have not been transfused. This finding is similar to the findings of Buseri *et al*[37] but contrasts that of Otori *et al*[35] who reported a significant association between HIV and blood transfusion. This could also be due to the fact that HIV transmission is mainly connected with the unprotected heterosexual relationship with an infected partner.[37] In addition,fewer numbers of participants only indicated having history of blood transfusion which might have affected the HIV seroprevalence hence the observed lack of association.

Higher seroprevalence of HBsAg was insignificantly observed among students who had history of infection in their family compared to those who did not. This could be due to close contact usually observed

among family members especially in Africa where sharing is a common characteristics.

There was no association between HBsAg and the students' involvement in menial jobs/petty trading. However, the infection was higher among students who usually engage in menial jobs/petty trading. This agrees with the finding of Bwogi*et al*[38] who found being in a professional or service occupation to be associated with lower risk of lifetime HBV infection in women compared to other occupational categories. Similarly, Ejele *et al*[39] reported that commercial sex workers had the highest prevalence of HBsAg among the occupational groups studied. Based on this study, individuals can get HBsAg by chance.

For HIV, there was a significant association between HIV and students' engagement in menial jobs/petty trading even though there were only two positive cases in this category. The low socio-economic status of this category of students might have led them to engage in some risk behaviours in other to improve their standard of living on campus hence predisposing them to the virus.

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 as recovery from and immunity to hepatitis B virus infection. It means that all the students were having recent infection and have not yet recovered from natural infection.[40]Anti-HBs also develop in persons who have been successfully vaccinated against hepatitis B. These students have not been vaccinated too even though they are at risk for continual exposure.

Furthermore, 4(7.3%) of the HBsAg reactive students had HBeAg, indicating that the virus is replicating and the infected person had high levels of HBV. This means that these four students were highly infectious. The prevalence was higher compared to the study by Otegbayo *et al*[41], who reported 2.3% positive for HBeAg. The result also shows that 36.4% of the individuals had developed the envelope antibody (anti-HBe). This antibody is generally produced by the immune system temporarily during acute HBV infection and it indicates lower levels of HBV or resolution of infection.

In addition, 94.5% of the individuals had developed hepatitis B core antibody. Anti-HBc is the first antibody to appear early in infection. Demonstration of anti-HBc in serum indicates current or past HBV infection. Anti-HBcIgM is present in high titre during acute infection and usually disappears within six months, although it can persist in some cases of chronic hepatitis.

CONCLUSION

The seroprevalence of 9.2% for HBsAg found among students in ABU, Zaria implies that the virus is highly endemic among the students based on WHO recommendation. The seroprevalence of HIV was found to be very low (2.8%) and only one student was co-infected with HBV and HIV. Of all the risk factors studied, only family history of hepatitis B and involvement in menial jobs were significantly associated with HBsAg and HIV infections respectively.

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