Original Research

Sero-prevalence of hepatitis B and C and HIV among students at the Federal University of Health Sciences, Azare

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Abstract

Background: Infection with the human immunodeficiency virus and hepatitis viruses B and C have been reported to be endemic in some Nigeria's institutions of higher learning. Several studies have reported varying prevalence rates for hepatitis B and C viruses and HIV among undergraduate students in Nigerian universities.

Methodology: A cross-sectional descriptive prevalence study of hepatitis B and C viruses and HIV among students at Federal University of Health Sciences, Azare conducted on the 2nd of December 2023. Screening for hepatitis B and C viruses and HIV was done using standard procedures. Ethical approval was obtained in addition to individual consent from all participants.

Results: Three hundred students with the mean age of 19.43±2.352 years were studied. 96.7% were aged 24 years or younger; females being the majority [185, 61.7%]. The majority of the participants were in their 200 level (190, 63.3%). Ten health-related programmes were represented in the survey. Twelve participants (4%) were positive for HBsAg; nine (75%) being males. One participant was positive for HBeAg, while only three (1%) of the participants had evidence of prior HBV vaccination, thus giving us a window of opportunity for vaccination. None of the participants had evidence of infection with HCV or HIV.

Conclusion: Screening students of health-related courses should be routinely done to ascertain their status to prevent occupational exposures and transmission in the healthcare setting. Results from this survey will inform formulation of policies that will protect our future healthcare force and safeguard the lives of patients.

Keywords: Seroprevalence Survey; Hepatitis; HBV; HCV; HIV; FUHSA.

Quick Response Code:

Introduction:

In the ever-evolving landscape of tertiary education, the health and well-being of students remain pivotal to the success and vibrancy of academic communities. Among the myriad challenges faced by today's undergraduate population, the complex interplay of HIV and hepatitis presents a critical nexus that demands our attention. This confluence of health concerns poses not only individual risks but also raises questions about the collective well-being of the tertiary education environment. Several studies have reported various prevalence rates for hepatitis B and C viruses and HIV among undergraduate students in Nigerian universities.[1-3] The triple infectious agents have shared transmission routes mainly through the sharing of needles, syringes, and other injection equipment; from mother to child and also through unsafe sexual practices.[4] In endemic areas HBV is mainly transmitted vertically from mother to child, in contrast to the horizontal spread which is more prevalent in western countries.[5] Sexual transmission of hepatitis B is more prevalent in unvaccinated persons with multiple sexual partners. In such situations, chronic hepatitis follows infections acquired in adulthood in less than 5% of cases; while early childhood infections lead to about 95% of cases.[6] This is the main driver for prioritizing infant and childhood vaccination.

In 2019, the global burden of chronic HBV infection stood at an estimated 316 million people, with an all-age prevalence of 4.1 %. In the same year, Nigeria's prevalence was 9.9%, more than twice the global average.[7] The Nigerian government introduced the hepatitis B vaccine into the National Program on Immunization (NPI) schedule in the year 2004.[7] Even with this progress challenges still exist in the control of hepatitis B infection in Nigeria; similar to what is obtainable in other resource-constrained environments due to limited access to diagnosis and treatment. The WHO reported that only 10.5% of those infected in 2016 were aware of their HBV status,[6] and only half of those eligible for treatment received it.[8] This implies that the majority of infections go unnoticed, and only a minority of those eligible for treatment access it; thus, constituting a high risk of progression to long-term complications such as liver cirrhosis and hepatocellular carcinoma.

In 2016, Nigeria produced its first National Guidelines for the Prevention, Treatment, and Care of Viral Hepatitis in the country as a response to a resolution by the World Health Assembly for member nations to take action in line with the global aspiration for eliminating viral hepatitis by 2030.[7] In clinical practice, surgeons, nurses, and dentists are especially more vulnerable to infection; while other healthcare workers, commercial sex workers, are also at higher risk of infection. In resource-constrained settings like Nigeria, additional routes of transmission of the triple agents include local practices such as circumcision, local uvulectomy, scarification, tribal marks, surgical procedures, body piercing, home birth, and receipt of blood transfusion. These viruses can be acquired both vertically and horizontally; with HBV and HCV being respectively up to 50-100 times and 10 times more infectious than HIV.[7]

The global health sector strategies (GHSSs) of the World Health Organisation (WHO) for the period 2022–2030 aim to achieve the goals of ending HIV, viral hepatitis, and sexually transmitted infections by the year 2030.[9] If these laudable objectives are to be realised screening of vulnerable groups, such as undergraduate students, needs to be rigorously pursued synergistically under a universal health coverage and primary health care framework. As we delve into the dynamics of tertiary institutions, it becomes apparent that students are navigating more than just academic hurdles. The intersection of HIV, drug abuse, and hepatitis introduces a multifaceted dimension to the collegiate experience, influencing not

only individual lives but also shaping the broader health profile of these academic communities. This study sought to report on the prevalence of HIV, hepatitis B, and hepatitis C among students at

the Federal University of Health Sciences, Azare (FUHSA) and to generate baseline data that will inform health policy reforms in the institution.

Methods

Setting

This was a cross-sectional study of a representative sample of undergraduate students in Federal University of Health Sciences, Azare, Bauchi State, Nigeria, conducted on the 2nd of December

2023 following an enlightenment programme on HIV, and hepatitis, to commemorate the World AIDS Day (WAD), 2023, with the theme "Let communities lead".

Sampling procedure

Three hundred students were selected consecutively from the list of those who attended the enlightenment campaign after giving their consent.

Ethical approval

The study protocol was reviewed and approved by the Bauchi State Health Research Ethics Committee (BASHREC); with Protocol Registration No: BSMOH/REC/85/2023 and Protocol Approval No: NREC/040/11/19B/2021/085. A written informed consent was obtained from all participants before enrolment into the study and all ethical standards were observed.

Questionnaire survey

An online questionnaire was shared, via google form, with all the 300 students that consented to participate. Information such as biographic data, risk factors for the acquisition of hepatitis and HIV, and relevant medical history were collected. Hepatitis B vaccination history was also documented.

Laboratory methods

Hepatitis B Screening

Testing for hepatitis B was done using the rapid qualitative Micropoint five parameter [hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (HBsAb), hepatitis B e-antigen (HBeAg), hepatitis B e-antibody (HBeAb), and hepatitis B core antibody (HBcAb)] lateral flow chromatographic immunoassay using whole blood (Micropoint® Micropoint Biotechnologies Co., Ltd. China). This test utilises one drop of whole blood collected in EDTA bottles and allowed to settle at room temperature.

The pouch of the device was opened and was placed on a clean, flat surface. Each device was labelled to tally with the specimen ID number. After that, 2-3 drops of blood sample was introduced into the kit's well using a pipette dropper held vertically. Air bubbles were avoided in each step of dispensing.

A drop of buffer was added to each well. The test performance was interpreted after 15 minutes according to the manufacturer's instructions.

Quality control: A positive and negative controls were used to control the test performance.

Result Interpretation: When all control bands were visible but absent on the HBsAg, and HBeAg, regardless of the status of the HBsAb, HBeAb and HBcAb Test bands, the procedure was termed as a Negative result. Positive results occurred when visible bands appeared on HBsAg with or without HBeAg lines in addition to the control bands. Appearance of visible bands on any or combination of HBsAb, HBeAb and HBcAb reflects the host's immunity against the particular component of the virus detected. The procedure was termed invalid when no band appeared on the control bands regardless of presence or absence of bands on the test lines.

Hepatitis C Virus Screening

A Lateral flow immunoassay strip was used to screen for HCV. Whole blood was obtained in a clean anticoagulated ethylenediamine tetra-acetic acid (EDTA) container via venipuncture. The pouch was opened, and the test device was removed and placed on a clean, dry, flat surface. The device was then labeled with the specimen's ID number. Using the plastic dropper, about 10uL of the sample was drawn and dropped into the bottom of the strip as indicated by the arrow on the device. After which, 2 drops of the buffer were added in to the same spot. The result was read within 15 minutes, and the device was discarded safely.

Quality Control: A procedural control was included using a negative and positive control.

Result Interpretation: Red-coloured bands on both the control and the test band were regarded as positive results. Only a red-coloured band in the control region and none in the test region was regarded as negative. When no band is seen in the control region the test is regarded as invalid.

HIV Screening

The venipuncture method was used to collect about 3-5mls of blood from the study participants into a 1.5mg/mL EDTA-anticoagulated sample container and was allotted a number and tested immediately.

Sample Testing

Human immunodeficiency virus (HIV) screening was done using an immunochromatographic method on the Uni-Gold®HIV (Trinity Biotech) test kit which screens for both HIV-1 and HIV-2. After removing the test kit protective foil, about 50uL of whole blood was added to the sample pad on the test kit using the precision pipette and was allowed to settle for 1minute to be fully absorbed. Then 2 drops of wash solution were added to the sample port. The reaction was read after 10 minutes. All dispensing was done using the pipette and dropper vertically.

Quality Control: A procedural control was done using positive and negative samples.

Result Interpretation: Red bars on both control and the test wells were regarded as positive and a red bar on the control pad and none on the test well was regarded as negative. A test was regarded as invalid when no bar appears on the control well.

Data analysis

Data were coded, validated, and entered into an Excel spreadsheet and later transferred and analyzed using the Statistical Package for the Social Sciences software (SPSS), version 29 (IBM®SPSS Inc., Chicago, IL, USA). Age was summarised as means (±standard deviation) and further grouped into four categories for analysis. Frequency tables and charts were used to summarize the sociodemographic characteristics. Analysis of variance (ANOVA) was used to study the association between the variables. The data are presented as frequencies, percentages, means, and modes. The chi-square test was used as the test of significance at a 5% level of significance.

Results

Characteristics of the study population

Three hundred participants took part in the study. Their mean age was 19.43±2.352 years. Most (96.7%) of the participants were in the age group 15-24 years. Females constituted majority of the participants [185, 61.7%]and had a younger mean age (18.77 ±1.954 years) than the males (20.50 ±2.549 years) p<0.001. There were more participants in the 200 level (190, 63.3%) than 100 level (110, 36.7%) (p=0.001). Table 1 shows the baseline characteristics of the study population. Figure 1 shows the age distribution of the participants with 233 (77%) of them aged between 17 and 20 years.

Participants across the various programmes

The participants cut across ten programmes; namely MB,BS (92), BDS (35), Nutrition and dietetics (17), Nursing sciences (86), Radiography (50), optometry (4), environmental health (3), audiology (4), epidemiology and biostatistics (3), and remedial studies (6). The male participants were older than their female counterparts (df=1, F=43.445, p=<0.001); however, their mean ages within and between programmes were not statistically significant (df=9, F=1.339, p =0.216). There was no association between gender and course level (p=0.485); however, a strong association existed between gender and course of study (p<0.001).

Sero-prevalence of hepatitis B markers among the study population

Twelve students were positive for the HBsAg, giving a prevalence of 4% or 40 per thousand; nine (75%) were males and 11 (91.7%) were aged between 15 and 24 years (p=0.008).

A further look at the result shows that six were positive only for HBsAg, while the remaining had additional reactions to HBcAb and HBeAb, twelve participants were positive for HBcAb only. Only one participant tested positive for HbeAg, while seven had positive Anti-Hbe (Table 2). Twenty-seven participants tested positive to at least one of the markers of HBV infection, giving an overall prevalence of 9%.

HBV vaccination status of the study population

Three (1%) of the participants, all females, were positive for HBsAb (p=0.170). The remaining participants were negative, indicating vulnerability to infection with HBV.

Table 1: Baseline Characteristics of the studied population

	Gender	
Age Group	Male n=115 (%)	Female n=185 (%)
15-19	43 (37.4)	143 (77.3)
20-24	66 (57.4)	38(20.5)
25-29	4 (3.5)	3(1.6)
30-34	2 (1.7)	1(0.5)
Level of Study		
100	45 (40.9)	65 (59.1)
200	70 (36.8)	120 (53.2)
Programme of Study		
MB,BS		
BDS	42 (45.7)	50 (54.3)
Nutrition and Dietetics	21 (60)	14 (40)
Nursing Science	5 (29.4)	12 (70.6)
Radiography	15 (17.4)	71 (82.6)
Optometry	23 (46)	27 (54)
Environmental Health	2 (50)	2 (50)
Audiology	0 (0)	3 (100)
Epidemiology and Biostatistics	1 (25)	3 (75)
Remedial Studies	2 (66.7)	1 (33.3)
	4 (66.6)	2 (33.3)

Mean age = 19.43±2.352

- Key:
  - MB, BS = Bachelor of Medicine, Bachelor of Surgery
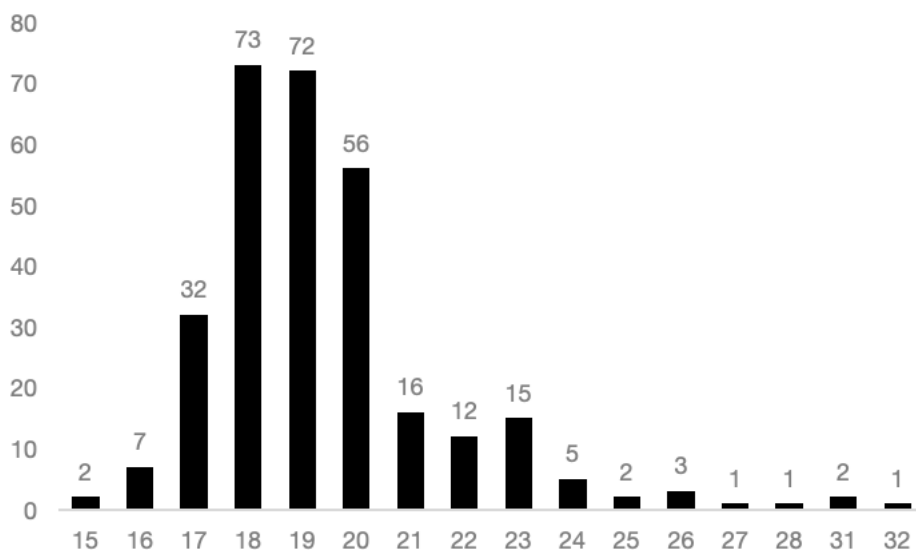 - BDS = Bachelor of Dentistry

Figure 1: Age distribution of the study population

Table 2: Age- and gender-related positivity rates for HBV, HCV and HIV

Age Group	Hepatitis B Panel					HCV	HIV
	HBsAg	HBsAb	HBeAg	HBeAb	HBcAb		
15-19	3	2	0	3	12	0	0
20-24	8	0	1	4	5	0	0
25-29	0	1	0	0	0	0	0
30-34	1	0	0	0	0	0	0
Gender							
Male	9	0	1	4	8	0	0
Female	3	3	0	3	9	0	0

Discussion

Infection due to HBV has been responsible for significant morbidity and mortality worldwide, especially in the developing world where many of the inhabitants lack access to life-saving vaccines.[10-12]Varying prevalence rates for HBV, HCV, and HIV have been reported from different parts of Nigeria, signifying their endemicity.[11] This study reports on the seroprevalence of these triple infections among 300 undergraduate students of the Federal University of Health Sciences, Azare. One hundred and fifteen males and 185 females were screened for the triple blood-borne viruses (BBV). Twelve participants tested positive for HBsAg (12/300), nine males and three females, giving a prevalence of 4%. None of the participants tested positive for hepatitis C and HIV, giving a prevalence of zero percent for the two infections.

The routes of transmission of HBV vary according to its endemicity; with perinatal and sexual routes playing major roles in areas of high and low endemicity, respectively. Despite several reports of high endemicity of these infections in some of Nigeria's tertiary institutions, [13-17] screening of undergraduate students at the time of admission is not a common practice; hence students do not know their status before admission. This can increase their chances of acquiring infection and spreading the same on campus. Varied prevalence rates have been reported from many tertiary institutions across Nigeria; with rates between 0.57% and 2.23% in the Southern states,[2][3] while rates up to 31.5% were reported from the some Northern states.[12-21] Our finding of 4% is among the lowest prevalence rates reported from northern Nigeria and falls within the intermediate endemicity range (2%-7%); even though Nigeria is considered to be hyper-endemic for HBV (>8%).[22] The average prevalence rate of HBsAg from a meta-analysis of 46 Nigerian studies was 13.5%, which is more than three times the rate from this study,[12] and higher than the 4.1% global prevalence reported in 2019.[23]

Twelve participants tested positive for HBsAg, giving an overall prevalence of 4%, with males having a higher prevalence than females; 9(75%) versus 3(25%), respectively, even though majority (61.7%) of the participants were females. The finding correlates well with those of Chinese,[24] Ghanaian,[25] Turkish,[26] and Nigerian [2,20,27-29] researchers. The male predominance in the prevalence of HBV remained consistent even when studies from different regions were pooled as reported in a global meta-analysis conducted among people who inject drugs. In the report, the prevalence of HBsAg was 7.8% (0–16.1) and 10.4% (0–21.6), with a RR of 0.75 [95% CI, .36–1.56].[30] However, Mboto and Edet,[31] and Ndako *et al*,[32] reported contrasting findings, with female predominance. The differences in these findings could be attributed to disparities in the studied populations, samples studied, and the different risk predispositions of the populations,[33] however, reported no gender differences among their patients.

This sexual dimorphism of the liver has significant implications for disease susceptibility, drug metabolism, and therapeutic outcomes, particularly in hepatitis, cirrhosis, and liver cancer.[34] Several reasons have been thought to contribute to this disparity such as population sampling, presence of risky sexual behaviours, poor educational background with low awareness and vaccination rates, among others.[35] In addition to these social and environmental factors the gender disparity has also been attributed to the effects of sex hormones which are postulated to have a direct effect on HBV life cycle in addition to their involvement in modulating immune response to HBV infection and the progression of associated liver diseases.[36] The hormonal influence of androgens and oestrogen has been found to play an important role in the progression of HBV infection and in the development of HBV-related HCC.[37] Baig[38]reported that when patients with HBV-related liver disease were divided into groups according to age, the male to female ratio increased during the reproductive years; further stressing the influence of oestrogen in contributing to low viral loads and in the protection and defense of hepatic cells against the development of chronic liver disease and HCC.[39]

None of the participants in this survey tested positive to antibodies to hepatitis C virus (Anti-HCV) and human immunodeficiency virus (HIV). Due to the shared routes of transmission of these blood-borne viruses one would have expected similar prevalence rates of the HBV, as reported earlier. [3,30] Just like HBV there is a growing concern regarding the prevalence of HCV infection among university students, which can be influenced by behavioural, social, and environmental factors. Several studies have investigated the prevalence of HCV among university students in Nigeria, with varying results based on geographic region, study design, and sample size. A study by Ojo *et al*,[40] and Olusola *et al*,[41] from

southwest and southeast Okeke *et al.* [42] Nigeria reported prevalence rates of 1.3%, 2.1% and 1.5% among undergraduate students.

Our study revealed a zero percent HIV prevalence among the participants as compared to recent findings of rates among university undergraduates ranging from 1.3% to 2.5% depending on the region, study design, and the specific population sampled. The prevalence rates can vary depending on factors such as location, awareness, behavioural risks, and access to healthcare and prevention services. Despite the low prevalence concerns regarding their vulnerability to the acquisition of infections due to the blood-borne viruses such as HIV, HBV, and HCV exist, as university undergraduates constitute a unique group for seroprevalence surveys. [43-44]

Conclusion
Our results showed that even though infection with HIV and HVC were not detected, HBV infection was prevalent among the pioneer students at the Federal University of Health Sciences, Azare. The results have highlighted the male preponderance regarding hepatitis B viral infection, especially those in professions that will be providing clinical care to patients. The study has also brought out to the open the low vaccination rate against HBV among the studied population. This will open a window of opportunity for a quick intervention to protect these youths, to prevent transmission in the healthcare setting, and prevent long-term sequelae such as chronic hepatitis, cirrhosis and liver cancer.

What is known about this topic

- There are no formal HIV and hepatitis policies in place at Nigerian tertiary institutions.
- Youths, that populate Nigerian universities play major roles in the spread of HIV and hepatitis.
- There has been attempts at eliminating HIV and hepatitis in Nigeria, though efforts are more targeted towards HIV than hepatitis.

What this study adds

- We have studied the prevalence of HIV, HBV, and HCV among undergraduate students of the newly established tertiary health institution.
- This study has provided baseline data on the prevalence of the triple infections in an effort towards achieving Millennium development goals 4, 5, and 6 related to HIV and HBV in Nigeria and other sub-Saharan countries.
- The study has also revealed a low vaccination rate among youths admitted into our tertiary institutions, which is a representation of the general population.

Strengths and limitations

This study presents the first prevalence survey among students of FUHSA, a newly established tertiary institution solely for the training of future healthcare staff. The study has brought out deficiencies in our healthcare policies, where despite the existence of policies on the prevention of especially HBV infections through vaccination, the majority of the students were unvaccinated. This has provided a window of opportunity for mass vaccination of these future healthcare staff against HBV, in addition to providing baseline data on these infections to be used for future studies. The study has allowed us to know where we currently are regarding attaining one of the development goals. In addition to HBsAg,

this study has further provided other tests for hepatitis that will give us a guide in the management of the infection.

Limitations of this study include a lack of viral load testing on those that tested positive for HBsAg to make informed treatment decisions; a lack of genotypic testing to further characterise the viruses detected; this will be the next stage of our research. The study also did not provide results for IgM and IgG, which could have helped to categorise the infections as either acute or chronic.

Conflict of interest: None declared.

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