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SEROPREVALENCE AND RISK FACTORS ASSOCIATED WITH HEPATITIS B VIRUS INFECTION AMONG PATIENTS ATTENDING SUMAS MEDICAL CENTER, IGBO-ENO, ENUGU STATE, NIGERIA

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ABSTRACT

Hepatitis B virus (HBV) infection is a significant public health problem worldwide, particularly in sub-Saharan African countries like Nigeria. This study was aimed at determining the seroprevalence and risk factors associated with HBV infection among patients attending SUMAS Medical Center, Igbo-Eno, Enugu State, Nigeria. A total of 200 blood samples were collected from consenting patients and screened for HBV infection by detecting the presence of HBsAg. P-value < 0.05 was considered statistically significant. Eleven out of the 200 samples collected were HBV seropositive, giving an overall seroprevalence of 5.5%. A higher HBV prevalence (81.8%) was recorded among participants who were sexually active compared to those who were not (P= 0.002, χ^2=9.755, df=1). HBV prevalence was higher (63.6%) in the group of participants that usually share sharps compared to those who do not (P=0.003, χ^2= 8.570, df=1). Out of the eleven participants who were HBV seropositive, none of them was vaccinated for HBV, hence there was a zero prevalence of HBV in relation to vaccination (χ^2=1.012, P=0.314, df=1). Participants who were living with family members infected with HBV had a prevalence of 54.5% which was higher than the 45.5 % recorded in those who were not living with family members infected with HBV (χ^2 =67.838, P=0.000, df=1). The study revealed an intermediate seroprevalence of HBV infection, and highlighted variables such as sharing of sharps, being sexually active and living with a family member that has HBV infection as risk factors significantly associated with high HBV infection.

Keywords: Seropositive, Seroprevalence, Hepatitis B Virus, Infection, Participants

INTRODUCTION

Hepatitis B virus (HBV) infection is a significant public health problem worldwide, particularly in sub-Saharan African countries like Nigeria, despite the availability of effective vaccines for the prevention of HBV infection and substantial advances in antiviral treatments (Hsu et al., 2023). Chronic hepatitis B remains a significant public health concern in sub-Saharan Africa, where access to adequate diagnostic and treatment facilities is very limited (Spearman et al., 2017). This region has the second-highest prevalence of HBV infection in the world, with an estimated 80 million people living with CHB (Sheena et al., 2022) and 87,890 HBV-associated deaths occurring each year.

Hepatitis B infection is caused by Hepatitis B virus, a partially double stranded DNA virus of Hepadenaviridae family. The infectious virus consists of an outer envelope – HBsAg, the first seromarker and one of the most useful markers of active or chronic hepatitis B infection, and an inner core made up of Hepatitis B core Antigen (HBcAg), found in acute or chronic infections and the e-antigen (HBeAg), which serves as a marker of active viral replication (Jibrin et al. 2014).

Although the global plan to eliminate HBV has gained momentum, emerging evidence suggests that many countries in sub-Saharan African are not on track to achieve the 2030 targets of a 90% reduction in new infections and a 65% reduction in HBV-related mortality (WHO, 2024a). According to WHO, Nigeria bears the highest burden of HBV in sub-Saharan Africa (WHO, 2024b). Globally, WHO estimated that 254 million people were living with Chronic HBV infection (CHB), with approximately 1.1 million deaths in 2022 (WHO, 2024c). HBV infection poses a significant risk of both acute and chronic liver disease (He et al.,2005). CHB is associated with increased morbidity and mortality, primarily due to a high risk of death from cirrhosis and hepatocellular carcinoma (HCC) (Magalhães and Pedroto, 2015). Among patients with CHB, 15–40% develops cirrhosis, liver failure, or HCC throughout their lifetimes (Lin et al., 2013).

HBV infection is acquired through exposure to blood and blood products, other body fluids and usage of sharps objects. Factors that increase the risk of contracting HBV include; having unprotected sexual contact with an infected person, sharing needles, sharing personal items (e.g., toothbrushes, razors), direct contact with the blood of an infected individual, and exposure during childbirth (Ageely,2015). The global burden of HBV infection is particularly concerning for mothers, as transmission primarily occurs through unprotected sexual activity as well as the aforementioned risk factors.

In order to reduce the spread of HBV infection, it is imperative to identify the major risk factors associated with the disease, and create adequate public enlightenment and awareness. Therefore, this study was aimed at determining the seroprevalence and risk factors associated with hepatitis b virus infection among patients attending SUMAS medical center, Igbo-Eno, Enugu State, Nigeria.

MATERIALS AND METHODS

Study Area and Design

The study was conducted at the Medical Centre of State University of Medical and Applied Sciences (SUMAS), Igbo-Eno, Enugu State. Enugu State is located in the South Eastern part of Nigeria. It was a cross sectional study conducted over a period of 4 months from December 2024 to April 2025, among cohorts of subjects attending the Medical Centre of SUMAS who gave consent to participate in the study.

Study Population
The study population comprised mainly students of the State University of Medical and Applied Sciences and other patients within the community who visited the university Medical Centre during the period of the research.

Inclusion Criteria/Exclusion Criteria
All patients directed to the laboratory for blood test who accepted and gave consent were included in the research, patients directed to the laboratory for non-blood related test, cancer patients and patients already on course of chemotherapy or who had it in the last two weeks for treatment of an earlier diagnosed illness were excluded.

Ethical Approval
Ethical clearance was obtained from the Medical Centre of State University of Medical and Applied Sciences, Igbo-Eno, Enugu State. The study was done at no financial cost to the participants, and their information was kept confidential.

Administration of Consent Form and Structured Questionnaire
Consent forms and structured questionnaires were administered to consenting individuals who fell into the inclusion criteria. These were used to obtain consent for participation in the study, and baseline data (bio-data, demographic data, risk factors) and other information relevant to the research, and assess their previous exposure to HBV. Information about history of vaccination was obtained using questionnaire.

Sample Size
The sample size will be determined using a prevalence of 4.4% (Umeanaeto *et al.,* 2016) and the following formula as described by Naing *et al.* (2006):

$$n = \frac{z^2 p(1-p)}{d^2}$$

n= number of samples, p=prevalence rate of previous study =4.4%=0.044, z=standard normal distribution at 95% confidence limit=1.96, d=absolute desired precision of 5%=0.05, z=1.96

$$n = \frac{1.96^2 * 0.044(1-0.044)}{0.05^2} = 64$$

n= 64 samples
For this study, 200 blood samples were collected.

Sample Collection and Hepatitis B virus screening
Three milliliter (3ml) of blood was collected from each study participant by venipuncture technique and transferred into EDTA containers,
the samples were immediately screened for HBsAg using the HBsAg test kit (Premier Co. Ltd., India, and Transnational Technologies Inc., UK) as specified by the manufacturers. The samples were spun in a centrifuge to obtain the blood plasmas which were used for the HBsAg tests. Using a dropper that came with the test kits, 3 drops of plasma were transferred to the specimen area of the test dipstick and results were read in 15 minutes. A positive HBV test was indicated by the presence of two distinct coloured lines in the test (T) and control (C) regions. A single line in the control region and the absence of lines in both regions were read as negative and invalid results respectively.

Data Analysis
Results obtained and data from questionnaires were reduced to percentages and presented in tables in order to have a lucid representation of data. Statistical analysis was done using IBM SPSS Statistics version 21 (IBM SPSS 21), chi-square test was used to determine association and conclude the significance levels between the parameters, with the significant value set at 0.05 or 5%.

RESULTS AND DISCUSSION
The seroprevalence of HBV among patients attending SUMAS Medical Center, Igbo-Eno is shown in table 1. Eleven out of the 200 samples screened were HBV seropositive. A total seroprevalence of 5.5 was obtained.
Table 2 shows the prevalence of HBV in relation to sexual activity. The highest prevalence (81.8) was recorded among participants who were sexually active (P= 0.002, χ^2=9.755, df=1).
Table 3 shows the prevalence of HBV in relation to sharing of sharps/accidental injuries with sharps. Those sharing sharps had higher prevalence of HBV (63.6%) than those who were not ($p < 0.05$, χ^2= 8.570, df=1).
The prevalence of HBV based on vaccination status is shown in Table 4. Out of the eleven participants who were HVB positive, none of them had received the hepatitis B vaccine. (χ^2=1.012, p=0.314).
Association between HBV status and living with a family member that has HBV is shown in table 5. Those living with a family member that has HBV had a prevalence of 54.5% which was more than 45.5 % recorded in those who were not living with family members infected with HBV (χ^2 =67.838, p=0.000, df=1).

Table 1: Seroprevalence of HBV among Patients Attending SUMAS Medical Center

Hepatitis B Infection	Number examined (n=200)	% Prevalence
Positive	11	5.5
Negative	189	94.5

Table 2: HBV prevalence in relation to sexual activity

HBV status	Are you sexually Active?		Total	P value	χ^2	df
	Yes	No				
Positive	9 (81.8)	2 (18.2)	11	0.002	9.755	1
Negative	66 (34.9)	123(65.1)	189			
Total	75	125	200			

Table 3: Prevalence of HBV in relation to sharing of sharps/accidental injuries with sharps

HBV status	Do you share sharps?		Total	P value	χ^2	df
	Yes	No				
Positive	7(63.6)	4(36.4)	11	0.003	8.570	1
Negative	45(23.8)	144(76.2)	189			
Total	52(26.0)	148(74.0)	200			

Table 4: HBV prevalence based on vaccination status

HBV status	Have you been vaccinated for HBV in the past?		Total	P value	χ^2	df
	Yes	No				
Positive	0(0)	11(100)	11	0.314	1.012	1
Negative	16(8.5)	173(91.5)	189			
Total	16	184	200			

Table 5: Prevalence in relation to living with a family member that has HBV

HBV status	Do you live with a family member that has HBV?		Total	P value	χ^2	df
	Yes	No				
Positive	6(54.5)	5(45.5)	11	0.000	67.838	1
Negative	3(1.6)	186(98.4)	189			
Total	9(4.5)	191(95.5)				

Discussion

Just like many other sub-Saharan African countries, Nigeria has a high burden of chronic HBV infection with over 14% of its population exposed to the infection between 2000 and 2013 (Musa et al., 2015) and a national prevalence of 8.1% (Federal Ministry of Health, 2019). This study evaluated the seroprevalence of HBV infection among teenagers and adults in Enugu State Nigeria. Majority of the participants were undergraduate students of the State University of Medical and Applied Sciences, Igbo-Eno, Enugu State.

The seroprevalence and endemicity of active HBV infection is determined by the presence of Hepatitis B surface antigen (HBsAg), a primary marker. A prevalence range of 2% to 7% is classified as intermediate endemic (Hou et al., 2005). In this study, an overall seroprevalence of 5.5% was recorded. This falls within the intermediate endemic range and it is lower than the 8.1% national prevalence reported from a survey carried out in Nigeria (Federal Ministry of Health, 2019). However, the prevalence in this study is higher than the 1.1% and 2.4% reported in other parts of Nigeria by Ejele *et al.* (2005) and Olokoba *et al*. (2009) respectively, as well as the 4.3% prevalence from a study carried out at the University of Nigeria Nsukka, Enugu State (Uleanya and Obidike, 2015) which is located close to State University of Medical and Applied Sciences where this current study was done. This shows an increase in the prevalence of HBV infection in the study area.

Comparing the HBV prevalence in this study with those reported in other African countries, on one hand, the prevalence in our study population is lower than those reported across countries in studies involving students in Chad (14.87%), Ghana (14%), Ethiopia (7.6%) and Central African Republic (CAR,15.5%) (Tadewos et al., 2024; Easterbrook et al., 2021; Debsikréo et al., 2024; Banach , 2022.). On another hand, it is higher than those in Benin (3.0%) and Togo (4.6%), but much comparable to the neighboring countries, reporting prevalence rates of 5.6% in Cameroon and 6.0% in Republic of Congo (Ekouevi et al., 2015; Alassan et al., 2021, Mongo-Onkouo et al., 2021). Looking at the reported student-based prevalence figures, they did not differ much between neighboring countries, including regions of Gabon-Cameroon- Republic of Congo, Togo-Benin, or Chad-CAR. That elucidates the similarities across borders, neighboring countries often have the same tribal/ethnic groups, thus sharing similar cultures, behaviors and lifestyles. Also, the variations in the prevalence mentioned could be as a result of the study populations, as studies have shown varying HBV prevalence among diverse groups and regions and in fact across sub Saharan Africa (Price *et al*., 2017).

This study found a statistically significant association between sexual activity and HBV infection. Participants who were sexually active had higher HBV prevalence than those who were not sexually active ($P < 0.05$). This may be because perinatal and sexual transmissions of Hepatitis B virus are the main routes of infection in HBV endemic countries like Nigeria (Nejo et al., 2018). In their study from 2013 to 2018, Roberts et al. (2021) reported that an estimated 47,000 or 38.2% of acute HBV infections in the United States were attributable to sexual transmission.

Our study found a statistically significant association between HBV infection and sharing of sharps and accidental injuries with sharps ($p<0.05$). Participants who were sharing sharps or have had accidental injuries with sharps had higher prevalence than those who were not. This is in agreement with Bhattarai et al. (2014) who reported high exposure rates to HBV among their student subjects due to needle-stick and sharps-related Injuries. This may be so because the use of sharps is the most common possible modality of HBV transmission (Maddo et al. 2018).

The current study recorded zero prevalence in relation to vaccination. None of the participants who were HBV positive had received hepatitis B vaccine in the past i.e. they had no history of HBV vaccination. This shows that they had no protection from hepatitis B virus infection. The chi square result did not show significant association ($p>0.05$).

In this study, living together with a family member that has HBV was significantly associated with hepatitis B infection ($P<0.05$). A higher prevalence was recorded among those living with a family member that had HBV. Family members of HBV infected people are considered as high-risk groups due to frequent household transmission of HBV among contacts of HBsAg carriers (Athalye et al., 2023). A number of factors like close contact with carrier, sharing of towels, toothbrushes, shaving kits, combs, food items, and utensils are reported to be responsible for intrafamilial transmission of HBV, though the observations vary according to the geographic and cultural practices among different regions of

the world (Salkic et al., 2009; Rakesh et al., 2014). Some studies have also observed that first degree relations, siblings, female gender and HBeAg status of the carrier can affect the transmission of HBV among household contacts, either overt or occult. The underlying mechanisms of intrafamilial transmission of HBV are not clearly understood, despite having many epidemiological studies from different countries that have looked into identifying the risk factors.

One limitation of this study was that the test kit used was specific only for detection of HBsAg. The test could not detect occult hepatitis B, a condition where the virus is present in the liver and HBV DNA is detectable in the blood, but HBsAg is negative. Also, HBsAg is not detectable immediately after infection (the incubation period, typically 4–6 weeks). A negative result during this "window period" does not rule out infection.

Another limitation was that the data about risk factors are reliable only to the extent that participants were willing to provide factual information. The sociocultural characteristics of the participants may have had an effect on their answers.

CONCLUSION

This study has shown that the seroprevalence of HBV infection is within the intermediate endemicity range and below the national prevalence previously reported by the Nigerian Federal Ministry of Health, therefore, HBV remains a public health concern within the study area. The study also revealed that sharing of sharps, being sexually active and living with a family member that has HBV infection were significantly associated with HBV infection. In order to promote safe practices and reduce the likelihood of contracting HBV, preventive programs or control strategies should focus on creating awareness on risk factors such as sharing of sharps, being sexually active and living with family members that have HBV infection. This should be considered particularly for university-based or youth center groups across the whole country.

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