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Co-infection of Hepatitis B among HIV-infected patients: A cross-sectional study from A University Teaching hospital in Anambra State, Nigeria

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Abstract

Hepatitis B and HIV infections are significant public health problems in sub-Saharan Africa, and research suggests that co-infected individuals with either HBV or HIV experience a higher rate of HIV progression. This study aimed at investigating possible HBV coinfection in relation to the sociodemographic traits of HIV-infected individuals, attending the HIV clinic at a University Teaching Hospital in Awka, Anambra State, Nigeria. Two hundred and fifty-five (255) HIV-infected individuals gave consent to participate in the study. Blood samples (about 5ml) were aseptically collected and tested for HBV using Monolisa HBsAg ULTRA kit. CD4 counts were measured using the Partec CyFlow. Plasma viral loads (PVL) were also determined using the Abbott Real-Time HIV-1 Assay US protocol. The results showed that the majority (72.5%) of the study participants had a CD4 cell count of 350 cells/ul. The virological assay revealed that the viral RNA was not detected (TND) in most (63.5%) of the patients. About 45 (17.7%) HIV-infected individuals were found to be coinfecting with HBV out of which the majority were of the female gender (18.7%). HIV-positive individuals within the age group 31-40(18.9%) were mostly affected. Results from this study showed a high HBsAg seroprevalence rate among the HIV infected individuals attending the HIV clinic in this tertiary hospital in Anambra State, Nigeria. The results obtained from the study also reveal that there are no significant associations found between the socio-demographic characteristics of the patients and HBV.

Keywords: HBV, HIV, Coinfection, Nigeria.

INTRODUCTION

Hepatitis B and HIV infections are significant public health problems in sub-Saharan Africa, and research suggests that co-infected individuals with either HBV or HIV experience a higher rate of HIV progression. A significant public health issue that still affects 36.7 (30.8-42.9) million people worldwide is HIV-1 (Nazziwa et al., 2020). According to WHO estimates, 37.7 million people globally had HIV as of 2020, with the majority residing in LMICs (low-and middle-income countries) (WHO, 2021). A disproportionate amount of the burden of the global HIV epidemic falls on Sub-Saharan Africa, which in 2017 saw 65% of new infections, 75% of HIV-related fatalities, and 71% of people living with the virus (Dwyer-Lindgren et al., 2019). Nigeria is home to nine percent (9%) of the world's HIV-positive people (Awofala & Ogundele 2018).

On the other hand, HBV which is one of the principal causes of recurrent liver disorders and chronic liver infections is a serious public health issue worldwide, infecting about a third of the world's population, resulting in 360 million chronic

infections and one million annual mortality (WHO, 2020). Approximately 80 million persons who are HBV carriers are documented in just sub-Saharan Africa (Feigin et al., 2021). HIV and the hepatitis B virus (HBV) are two blood-borne viruses that are often transmitted through sex and drug injection. As a result of these common transmission methods, a large population of individuals who are already at risk for HIV also run the risk of developing HBV.

According to epidemiological research, the seroprevalence of HBV/HIV co-infection ranges from 5 to 10% in the United States to 20 to 30% in some sub-Saharan African and Asian regions (Omatola et al., 2019). The prevalence of HIV/HBV co-infection in Nigeria is reported to range between 10% and 70 % (Omatola et al., 2019). In Nigeria, several publications have discussed HBV prevalence among subpopulations in tertiary healthcare settings, often in urban areas, with estimates ranging depending on the population investigated and methodologies utilized (Mustapha et al., 2020). Nevertheless, there is limited information on the incidence of HBV infection among HIV individuals in certain southeastern states in Nigeria.

This study was conducted to determine the prevalence of HBV coinfection among HIV-positive people attending HIV clinics in tertiary institutions in the southeast Nigerian state of Anambra.

MATERIALS AND METHODS

Study Area

Sampling was done in a reference hospital that provides health care services to HIV-1 patients in Anambra State, Nigeria; Chukwuemeka Odumegwu Teaching Hospital (COOUTH), Awka.

Ethical standards

The study only proceeded after ethical approval was obtained from the Board of Research Ethics Committee for Chukwuemeka Odumegwu Teaching Hospital (COOUTH) Awka. All consenting HIV-infected individuals attending the HIV clinics at these hospitals were considered eligible for recruitment in this study.

Study population

The subjects of the study were HIV positive individuals attending HIV clinic at Chukwuemeka Odumegwu Teaching Hospital (COOUTH) Awka, in Anambra State, Nigeria. Exclusion criteria were based on “no consent to participate” in the study. Those whose HIV status was unconfirmed and are seronegative were also excluded. Plasma samples (n=255) collected from October 2021 to April 2022, were analyzed in our study. Questionnaires with information including sociodemographic (age, sex, occupation, education levels,

etc.) were administered to the study participants, and the demographic data information relevant to the study was collected by trained interviewers.

Sample collection/Preparation

The venous blood samples were collected from the study subjects in the EDTA vacuum tube and CD4+ T-cell counts were measured within 24 h after sampling. Meanwhile, plasma samples were obtained by centrifugation and stored at -80°C until further analysis was carried out.

Serological analysis

Serum samples were tested for detection of hepatitis B surface antigen (HBsAg) with the aid of an ELISA kit (DIA. PRO Diagnostic Bioprobes, Italy). The tests were carried out in line with the manufacturer’s instructions. The test results were computed using a cut-off value based on the mean OD450nm value of the negative control (NC), using the formula $\text{NC} + 0.050 = \text{Cut-Off (Co)}$. Calculated as the ratio of the sample OD450nm (S) and the Cut-Off value (Co), test results are interpreted as follows: 0.9 = negative, 0.9 - 1.1 = equivocal, and > 1.1 = positive. A negative result indicated that the patient is not infected by HBV.

Data Analysis

The data were recorded and analysed using a Microsoft Excel spreadsheet (Microsoft Corporation). Data were analysed using the Statistical Package for Social Science (SPSS) version 22.0. Chi-square or Fisher's exact was used where appropriate to test association. A p-value of <0.05 was considered significant.

RESULTS

HBV coinfection is compared to their sociodemographic data in Table 1. A total of 45 (17.7%) HIV-positive people were also discovered to have HBV infections; the majority of these people (18.7%) were female. Those with HIV who were between the ages of 18 and 30 (20.0%) were most commonly impacted. In terms of their educational background, patients with secondary (33.3%) and tertiary education (31.4%) had significantly higher hepatitis B surface antigenemia rates compared to those with primary (6.2%) and no formal (12.2%) levels of education. Marital status related seroprevalence showed higher HBV prevalence among widowed (18.2%) or separated (21.7%) compared to those who were single (17.8%) and married (17.0%). In terms of their occupational status, the unemployed and self-employed had a higher HBV prevalence rate of 20% and 19% respectively in comparison to the students (15.4%) and the employed patients (14.9%). Patients whose spouses were HIV positive were more coinfecting with HBV (20.4%) when compared to those whose spouses were negative for HIV (13.9%).

Table 1: HBV Status and Socio-demographic features of the study participants.

Variables	Number Tested	HBV +ve	%	Chi-Square test
Age groups (Years)				
Below 18	18	1	5.56	$\chi^2 = 2.228, p= 0.694$
18-30	40	8	20.00	
31-40	74	14	18.92	
41-50	72	12	16.67	
Above 50	51	10	19.61	
Sex				
Males	89	14	15.73	$\chi^2 = 0.346, p= 0.343$
Females	166	31	18.67	
Educational Status				
None	41	5	12.20	$\chi^2 = 26.785, p= 0.001$
Primary	113	7	6.19	
Secondary	66	22	33.33	
Tertiary	35	11	31.43	
Marital Status				
Married	165	28	16.97	$\chi^2 = 0.322, p= 0.956$
Single	45	8	17.78	
Separated/ Divorced	23	5	21.74	
Widowed	22	4	18.18	
Occupational Status				
Student	26	4	15.38	$\chi^2 = 0.695, p= 0.874$
Self-employed	137	26	18.98	
Employed	67	10	14.93	
Unemployed	25	5	20.00	
HIV Status of Spouse				
Positive	147	30	20.41	$\chi^2 = 0.177, p= 0.118$
Negative	108	15	13.89	
Total	255	45	17.65	

In Table 2, the HIV/HBV coinfection in relation to the virological and immunological markers is shown. In terms of viral load, participants whose target viral RNA was not detected had the highest seroprevalence of HBsAg (19.1%, $n = 31$), followed by 17.1% ($n = 6$) in those with viral loads above 1000 copies/ml, and the lowest seroprevalence (10.7%, $n = 3$) in those with viral loads less than 40 copies/ml. The viral load groups and HIV/HBV coinfection were not significantly different from one another ($2 = 3.4897, p=0.17$). In terms of their immunological markers, HIV-infected individuals with CD4 T cell counts under 200 cells/ μ l had a higher rate of HIV/HBV co-infection (20.8%), compared to those with counts between 200 and 350 cells/ μ l (8.9%) and

Table 2: HIV/HBV coinfection in relation to immunological markers and virological markers.

Viral Load (Copies/ml)	No Tested	HBV +ve	%	Chi-Square test
<40	28	3	10.71	$\chi^2 = 1.199, p= 0.753$
40-1000	30	5	16.67	
>1000	35	6	17.14	
TND	162	31	19.14	
CD4 (Cells/ μ l)				
<200	24	5	20.83	$\chi^2 = 2.916, p= 0.233$
200-350	45	4	8.89	
>350	186	36	19.35	
TOTAL	255	45	17.65	

over 350 cells/ μ l (19.4%).

DISCUSSION

In this study, about 45 (17.7%) HIV-infected individuals were found to be coinfecting with HBV, of which the majority were of the female gender (18.7%). More women observed to have participated in this study indicate that women consulted the ART clinic throughout the course of the study than their male counterparts. This is consistent with national statistics, which show that both in rural and urban parts of Nigeria, more than 50.0% of PLWHA are females (National Agency for Control of AIDS (NACA, 2017, 2019). A study conducted by Adesegun et al. (2020) in northern Nigeria yielded similar male-female distribution. However, some other researchers had a contrasting view. Seyoum et al. (2022) reported that HIV-HBV co-infection was twice as high in men than in women in the same age group. A similar significant difference between the sexes in HIV-HBV co-infection was reported in Ethiopia and other African countries by some other researchers (Seyoum et al., 2022).

The prevalence rate of HIV/HBV coinfection in this study yielded about 17.7% infection among the study participants. This result tallies with the findings by Adamu et al. (2022) who reported that HIV/HBV frequency in sub-Saharan Africa varied from 0.0% to 28.4%. The prevalence of HIV/HBV co-infection observed was very close to that of a study in Dar es Salaam, Tanzania, cited by Kamenya et al. (2017) which showed a prevalence of 17.0%. However, the HBsAg seroprevalence rate in this study is higher than those from previous studies (Babalola et al., 2013; Cooney et al., 2021, 2022; Okonko et al., 2012a, b, c; 2020a, b; 2022; 2023a, b, c). It is considerably higher than the 0.5%, 2.5% and 10.2%, respectively reported in Ibadan (Okonko et al., 2012a, b), 3.5% reported in Anyigba, Kogi State (Omatola et al., 2019), 6.3% in Uyo, Akwa Ibom State, (Innocent-Adiele et al., 2021), 6.1% and 5.2%, respectively, in Ogun State (Okonko et al., 2010; Babalola et al., 2013), 5.7% in Ikole-Ekiti, Ekiti State, Southwestern (Oluremi et al., 2014), 2.0% and 12.4%, respectively in Port Harcourt, Rivers State in 2020 (Okonko

et al., 2020a, b), 14.0% in Port Harcourt, in 2022 (Okonko et al., 2022), 7.8% (Nnakenyi et al., 2020) in south-eastern State, 1.0% in Warri, Delta State (Okonko et al., 2023a), 3.0% and 8.0%, respectively in Port Harcourt, Rivers State (Okonko et al., 2023b, c), all in Nigeria. Different prevalence rates have been reported in other African countries as well as across the globe by researchers. Boateng et al. (2019) reported 12.5% HBV/HIV coinfection in Kumasi, Ghana. Tasilo Kamenya et al. (2017) recorded a prevalence of 2.3% HBV/HIV coinfection in Northern Tanzania. Tassachew et al. (2022) recorded a frequency HIV/HBV rate of 46.7% of patients with liver disease in Ethiopia.

HBV prevalence was highest among HIV positive individuals that fell within the age range of 18-30 years (20%) followed by those above 50 years of age (19.6%). This agrees with previous results by Innocent-Adiele et al. (2021) in Uyo, Akwa Ibom recording 28.6% among those aged 6-30 years. Omatola et al. (2019) recorded an HBV prevalence rate of 13.3% among HIV patients of ages above 50 years old which is similar to our findings registering 19.6% of those within the same age range. Previous findings from Yemagoa, Bayelsa State, Nigeria (Okonko & Shaibu, 2023), North-West Ethiopia (Hou et al., 2005), Cameroon (Ymele et al., 2012), and Abuja, Nigeria (Ogundeji, 2018) are also in connivance with the findings from this study.

In relation to the educational background of the study participants, those with secondary and tertiary levels of education had higher HBV seroprevalence rates of 33.3% and 31.4% respectively compared to those with no formal education (12.2%) and primary level of education (6.2%). The reason for this is still unclear as it contrasts with findings from previous studies. The findings reported by Omatola et al. (2019) showed 25% and 12% HBV prevalence for those with no and primary educational levels respectively as to those with secondary (4.2%) and tertiary (1.2%) educational background attributing the high HBV/HIV coinfection among the uneducated and less educated to their limited educational background. A similar report was also made by Innocent-Adiele et al. (2021) who reported a higher HBV seroprevalence rate among those with primary educational status (8.3%) compared to other educational status (tertiary 6.9% and secondary 4.9%).

Data obtained from the marital status of the study participants revealed a higher HBsAg seroprevalence rate among the separated/divorced (21.7%) and the widowed (18.2%) when compared to the married (17.0%) and unmarried (17.8%). This supports partly the findings by Omatola et al. (2019) who revealed that their widowed patients significantly had higher HBsAg prevalence attributing this to the absence of family cover which could shield or restrain them from having multiple sexual partners.

This contrasts the findings by Adesegun et al. (2020) who reported that a large majority of their respondents with co-infection were married associating it with the cultural practice of the people that permits polygamy, the study being carried out in a rural community of the northern region of Nigeria.

In relation to their occupational status, the highest HBV/HIV coinfection was recorded amongst the unemployed (20%). This study agrees with the findings of Ikeako et al. (2014) who reported a higher prevalence of unemployed subjects and artisans. Ogundeji (2018) also reported a higher prevalence of HBV in unemployed subjects and artisans.

A high HBsAg seroprevalence rate was observed in the study participants whose viral loads were not detected (19.1%), followed by those with viral loads greater than 1000 copies/ μ l (17.1%). The reason for this high HBV seroprevalence rate is yet to be ascertained as it contradicts previous findings by other researchers. A study by Okonko et al. (2023) showed that a higher HIV/HBV (2.4%) was recorded for participants that had 20-999 copies/ml in Yenagoa, Bayelsa State. Geoffrey et al. (2021) reported a reduction in viral load of patients in Kenya at six months of ARV treatment and significant improvement noticed in HIV/HBV co-infected patients.

CONCLUSION

Results from this study showed a high HBsAg seroprevalence rate among the HIV infected individuals attending the HIV clinic in this tertiary hospital in Anambra State, Nigeria. This high HBV infection rate among study participants reveals the need for the enlightenment of the public to be fully aware of the necessity to get vaccinated against hepatitis B virus as well as receive adequate treatment for the infection where and when necessary, especially among HIV infected patients whose immune system is already compromised.

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