# COINFECTION OF HEPITITIS B VIRUS AND HUMAN IMMUNODEFICIENCY VIRUS IN PERSONS AT A HOSPITAL IN JALINGO, TARABA STATE

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**Abstract:** Hepatitis B virus (HBV) and Human Immunodeficiency Virus (HIV) are highly endemic in Nigeria and are important causes of morbidity and mortality. Co-infection of HBV and HIV commonly occur as both viruses share common modes of transmission. The goal of the study was to determine the presence of HBV in HIV positive persons at Specialist Hospital, Jalingo, Taraba State. A total of 218 HIV positive persons (60 males and 158 females) between the ages of 15-65 years were recruited for this study. Enzyme-linked immunosorbent assay was used to screen participants for the presence of HBsAg. A high seroprevalence was observed for HIV/HBV co-infection. The demographic characteristics of participants were obtained using a structured questionnaire. Twenty-four (24) people tested positive for HBV, resulting in an 11% overall prevalence. No significant association was found to exist between HIV/HBV co-infection and the demographic characteristics of the study population ($p>0.05$). However, knowledge, attitudes and practices shared significant association between HIV/HBV co-infection ($p<0.05$). There is urgent need for a provider-initiated routine counseling and screening for viral hepatitis with adequate follow-up and treatment for co-infected individuals and Hepatitis B vaccination for those without co-infection to reduce morbidity and mortality in this group.

**Keywords:** Infection, hepatitis B, HIV, endemic

## Introduction

Viral hepatitis is an acute or chronic inflammation of the liver caused by viral infection (CDC, 2019). According to UNAIDS (2021) viral hepatitis infection is a major global public health problem with approximately 1.4 million fatalities per year—more than the annual number of AIDS-related deaths. Ninety-six per cent of these deaths are from liver cirrhosis and hepatocellular carcinoma due to hepatitis B and C viruses, which are transmitted via blood and body fluids (UNAIDS 2021). About 1% (2.7 million) persons living with Hepatitis B Virus (HBV) infection are also infected with Human Immunodeficiency Virus (HIV). Conversely, the global prevalence of HBV infection in HIV-infected persons is 7.4%, with substantial regional variation and with higher prevalence (11.8%) among people who inject drugs (Platt *et al*., 2019, WHO, 2020). In Western Europe and North America, the prevalence of HIV/HBV co-infection is reported to be 5%, whereas in developing countries it ranges from 2% to 30.6% (WHO, 2021). Hepatitis B virus co-infection is an increased cause of morbidity and mortality among people living with HIV (Benhamou and Salmon 2005). Moreover, many people living with HIV are unaware that they are also infected with HBV and at high risk of developing liver-related disease (Alter *et al.*, 2006; WHO, 2021). Hepatitis B virus co-infection is not routinely tested prior to Anti-retroviral therapy (ART) initiation despite the strong recommendation for routine screening of HBV co-infection particularly in resource-scarce settings (Lacombe and Rockstroh, 2004; WHO 2016; UNAIDS, 2020). After HBV infection, HIV infected individuals become six times more likely to develop chronic HBV than HIV negative individuals (Bodsworth *et al.*, 1991; Gatanaga *et al.*, 2000). There is a heavy burden of HIV – HBV and HIV – HCV co-infections in many regions of the developing world (Cooper *et al.*, 2009).

Human immune deficiency virus and hepatitis B virus are both endemic in Nigeria (Forbi *et al.*, 2007; Balogun *et al.*, 2012). Nigeria, with an estimated population of 190 million people, has a hepatitis B prevalence of 8.1% in adults aged 15-64 years and Hepatitis C at 1.1% in adults aged 15-64 years while the prevalence of HBV infection among HIV-positive adults aged 15-64 years was 8.9% (NAIIS, 2018). Therefore, the World Health Organization (WHO) has recommended that all HIV-infected patients should be tested for the presence of HBV prior to initiation of therapy (WHO, 2015). This is rarely carried out in Nigeria and some parts of sub-Saharan Africa due to high costs or partly due to neglect of the disease and concentration on HIV treatment (Belyhun *et al.*, 2017; Chambal *et al.*, 2017).

In Nigeria, only a few centers carryout routine screening for HBV in HIV positive patients, as it is not yet adopted as a national policy by the government. This lapse may continue to expose a lot of HIV/HBV co-infected patients to Highly Active Anti-Retroviral Therapy (HAART) related hepatotoxicity and other HBV associated hepatic disorders (Bojuwoye *et al.*, 1997; Rodriguez-Rosado *et al.*, 1998; Sheng *et al.*, 2004). There is paucity of epidemiological information within North Eastern Nigeria, especially in Jalingo, Taraba State on the seroprevalence of HBV co-infection among HIV/AIDS patients attending Anti-Retroviral Therapy (ART) clinics. Therefore, this study sets out to determine the prevalence of Hepatitis B co-infection among HIV positive persons attending the ART clinic in Specialist Hospital Jalingo, Taraba State, Nigeria. There is a need for a routine screening to reduce the rate of morbidity and mortality among HIV positive persons due to infection with HBV.

## Materials and Methods

### *Study Area*

The study was conducted at Specialist Hospital Jalingo, Taraba State, Nigeria. Taraba State lies roughly between latitude 60º 30″ and 90º 36″ North and longitude 90º 10″30″ East. Situated in the North Eastern part of Nigeria, it occupies 54,473 $Km^2$. Taraba state is bounded to the West by Plateau, Nassarawa and Benue states, on the eastern border by Adamawa State and the Republic of Cameroon, and on the northern border by Gombe State. The major occupation of the people of Taraba State is Agriculture (Taraba State Government Gazette, 1992). Jalingo Local Government Area is the capital of Taraba State. Jalingo is located at latitude 8º 54' 00' North and longitude 11º 22' 00" East. Jalingo lies about 25miles (40km) South-East of the Benue River. It is bounded to the East by Yorro Local Government Area and to the North by Zing Local Government. Economically, the People of the Area are predominantly farmers; however, a few are traders and Civil Servants. The farmers produce food and cash crops such as yam, cassava, maize, groundnut, rice, guinea corn etc. The inhabitants are predominantly the Wurkun, Mummuye, Fulani, Kona, Jenjo, Jukun, Hausa and others (Taraba State Government Gazette, 1992). The Population projection of Jalingo Local Government Area is estimated at 187,500 (2006 National Census).

### *Sample Size*

Raosoft online sample size calculator (2018) was used to calculate the sample size. Two hundred and eighteen (218) was obtained and used as the sample size.

### *Study Design*

A cross sectional study was carried out among HIV positive persons between the months of January and February 2022. Data was obtained from the participants using an interviewer-administered questionnaire. Descriptive statistics such as frequencies, percentages and tables were used to represent data obtained. The serological analysis for Hepatitis B Surface Antigen (HBsAg) was carried out at the laboratory of Specialist Hospital, Jalingo.

### *Study Population*

The target population was all HIV positive individuals who presented at the ART Clinic during the study period and who were not known to have Hepatitis B Virus infection. Trained medical personnel at the hospital explained the objectives/benefits of the study to the patients. A Phlebotomist took four (4) milliliters of whole blood from consenting patients; (who also completed and endorsed the study questionnaires). Consenting attendees, male or female age fifteen (15) years and above were recruited into the study.

### *Ethical Considerations*

Ethical approval was obtained from the Ethics Review Committee of Federal Medical Center Jalingo, Taraba State.

### *Exclusion Criteria*

The following category of persons were excluded from the study:

- pregnant women
- patient that were unable or unwilling to return for follow up
- estimated life expectancy of less than one year based on clinical judgment of the Doctor
- patients with hepatocellular carcinoma (HCC) base on patient's history.
- patients with hepatic decompensation as defined by the presence of ascites or hepatic hydrothorax, variceal or portal hypertensive bleeding and hepatic encephalopathy.
- patients with the history of solid organ or bone marrow transplantation

### *Collection of Data*

Random sampling was done and necessary demographic parameters (age, sex, marital status, education and occupation) and epidemiological data for every participant was obtained using a structured questionnaire.

### *Collection of Samples*

About four (4) milliliters of blood sample were aseptically collected from each consenting confirmed HIV positive patient by vein-puncture into a well labeled, sterile vacutainer bottle. Serum sample were obtained by centrifuging each collected blood sample at 5000 revolution per minute (rpm) for 5minutes. The sera from the centrifuged blood samples were separated and stored at -20ºC in the refrigerator until needed

### *Assays for Hepatitis B Surface Antigen*

Hepatitis B surface antigen (HBsAg) was assayed from serum using HBsAg enzyme-linked immunosorbent assay (ELISA) kit developed by (CTK Biotech Incorporation, USA). The RecombLISA HBsAg is a solid-phase enzyme-linked immunosorbent assay based on the principle of antibody sandwich technique for the detection of HBsAg in human serum or plasma.

### *Statistical Analysis of Data*

The data from the findings was analyzed using Statistical Package for the Social Sciences (SPSS) version 20. Chi-square test for categorical variables was used to model the relationship between socio-demographic variables and HIV-Hepatitis B virus co-infection in the population. $P$ value $\leq 0.05$ was considered to be statistically significant.

## Results

A total of 218 HIV+ persons with age range of 15-65 years were tested for HBsAg. This number was made up of 60 males and 158 females; of these, 24 patients were positive for HBsAg, giving an overall prevalence of 11%. Table 1 shows that co-infection rate was highest in the 25-34 years age group (12.9%), while lowest case of co-infection (0%) was recorded in the >65 age groups. There was no

statistically significant association between the HIV/HBV co-infection with respect to age and sex ($P$>0.05).

The co-infection rates among different occupational groups was highest among the artisan and the retired (20%) followed by students (18.2%) while farmers had 6.3% infection rate (Table 2). There was also no statistically significant difference between the HIV/HBV co-infection with respect to occupation ($P$>0.05). Additionally, the co-infection rate among educational groups was highest among primary (22.2%) followed by tertiary (13.0%) and the secondary had (8.2%), Table 3. There was also no statistically significant difference between the HIV/HBV co-infection with respect to educational groups ($P$>0.05). In relation to marital status, married people had the highest rate of co-infection (11.1%), while those who were unmarried had 10.8% (Table 3). There was similarly no statistically significant difference between the HIV/HBV co-infection with respect to marital status ($P$>0.05).

**Table 1: HBsAg Seropositivity By Age and Sex in HIV+ Persons**

| Age (Years) | Sex (Total positive) | | | |
|---|---|---|---|---|
| | No. Tested | M No. (+) | F No. (+) | No. (%) |
| 15-24 | 24 | 6 (0) | 18 (3) | 3 (12.5) |
| 25-34 | 62 | 14 (1) | 48 (7) | 8 (12.9) |
| 35-44 | 90 | 25 (2) | 65 (6) | 8 (8.90) |
| 45-54 | 32 | 10 (2) | 23 (2) | 4 (12.5) |
| 55-64 | 10 | 5 (0) | 5 (1) | 1 (10.0) |
| >65 | 0 | 0 (0) | 0 (0) | 0 (0) |
| Total | 218 | 60 (5) | 158 (19) | 24 (56.8) |

Key: M = Male, F = Female, + = Positive, $\varkappa^2$= .777[a]

P value= 0.05

**Table 2: Distribution of HBsAg in HIV+ Persons by Occupation**

| Occupation | No. Tested | No. Positive | Percent Positive |
|---|---|---|---|
| Civil Servants | 36 | 5 | 13.9 |
| Business | 84 | 9 | 10.7 |
| Farming | 32 | 2 | 6.3 |
| Artisans | 10 | 2 | 20.0 |
| Retired | 5 | 1 | 20.0 |
| Students | 11 | 2 | 18.2 |
| Unemployed | 40 | 3 | 7.5 |
| Total | 218 | 24 | 96.6 |

$\varkappa^2$ =3.370[a], P-Value = 0.05

**Table 3: Distribution of HBsAg in HIV+ Persons by Education and Marriage**

| Variable | No. Examined | No. Positive | Percent Positive |
|---|---|---|---|
| Education Status: | | | |
| No education | 58 | 5 | 8.6 |
| Primary | 18 | 4 | 22.2 |
| Secondary | 73 | 6 | 8.20 |
| Tertiary | 69 | 9 | 13.0 |
| Marital | | | |
| Status: | 83 | 9 | 10.8 |
| Single | 135 | 15 | 11.1 |
| Married | | | |

**+ = Positive, $x^2$ = 0.51[a], P-Value = 0.05**

Out of six questions, three were used to assess the patient's knowledge of HBV Of the 218 participants 59 (27%) were aware of the route of transmission of HBV, while 157 (72%) don't know its routes of transmission. Out of this number, 93 (42.7%) were aware that HBV leads to liver cirrhosis, 55 (25.5%) knew that HBV leads to cancer, while 161 (73.9%) were not aware. There was statically difference in prevalence of HIV/HBV co-infection with respect to knowledge p<0.05. Equally, among the 218 participants, 203 (93%) had good attitude towards HBV prevention, while 15 (6.9%) had a poor attitude towards HBV prevention (Table 5). There was statically difference in prevalence of HIV/HBV co-infection with respect to attitudes (P<0.05). In relation to practice, out of the 218 participants, 20 (9.2%)

received vaccine against HBV, while 198 (90.8%) were not vaccinated against HBV, (Table 5). There was statistically difference in prevalence of HIV/HBV co-infection with respect to practice (P<0.05).

**Table 4: Seroprevalence of Hepatitis B Virus Infection among HIV+ Persons with respect to knowledge**

| Question | Response | Number | Correct response |
|---|---|---|---|
| Have HBV | Yes | 23 | 23 |
| | No | 38 | |
| | I don't know | 157 | |
| Sexually Transmitted | Yes | 59 | 59 |
| | No | 2 | |
| | I don't know | 157 | |
| HBV leads to cirrhosis | Yes | 93 | 93 |
| | No | 0 | |
| | I don't know | 125 | |
| HBV leads to cancer | Yes | 54 | 54 |
| | No | 3 | |
| | I don't know | 161 | |

**Table 5: Attitudes and Practices towards HBV Prevention**

| Variable | Number | P Value | Total |
|---|---|---|---|
| Positive Attitude | 203 | | |
| Negative Attitude | 15 | 0.05 | 218 |
| Vaccinated | 20 | | |
| Unvaccinated | 198 | 0.05 | 218 |

$\varkappa^2$=169.689[c] ,145.339[b], P-value=0.05

**Discussion**

An overall 11% HBsAg seropositivity was observed in this study, suggesting a high prevalence of HBV infection among HIV patients undergoing anti-retroviral therapy in Specialist Hospital Jalingo, Taraba State. Findings in this study are comparable to the co-infection prevalence of 11.9% reported by Otegbayo *et al.* (2008) in Ibadan. Similarly, this finding is comparable with the results of a recent study from Zambia, which reported an HBsAg prevalence of 11.3% (Wandeler *et al.*, 2016) and Eastern Ethiopia 11.7% (Ayana *et al.*, 2019). Comparable figures were also reported in Cambodia between 2003 to 2014, where the estimated prevalence of HBV co-infection was 11.0% (van Griensven *et al.*, 2014). The HBV co-infection rate in this study is higher than the 9.7% reported by Sirisena *et al*. (2002) from an urban population in Northern Nigeria. In Uyo, Innocent-Adiele *et al.* (2021), observed HBsAg positivity rate of 6.3% among HIV infected individuals, while in Enugu, Nnakenyi *et al.* (2020) recorded HIV/HBV prevalence of 7.8% among HIV positive patients enrolled at the HIV outpatient clinic of the University of Nigeria Teaching Hospital, Enugu. Also, HBsAg prevalence among HIV patients was observed to be 6.4% in Abuja, (Anyanwu *et al.*, 2020). A prevalence of 7.6% was observed by Odita *et al.* (2023). 8.0% in Lokoja by Omatola *et al.* (2020), 8.5% in Kakuri, Kaduna State by Omatola *et al. (*2017), 9.2% in Jos (Akindigh *et al.*, 2019) and 9.5% in Zambia by Katamba *et al.* (2020).

The co-infection rate observed in this study is lower than other reports from Southwestern Nigeria with a HBsAg prevalence of 28.4% Balogun *et al.,* (2012), while 25.9% was reported by Uneke *et al*. (2005), 26.5% reported by Mustapha and jubril., (2004). Outside the shores of Nigeria, 21.7% prevalence of hepatitis B surface antigen (HBsAg) was obtained in Sierra Leone by Yendewa *et al.* (2019) and 13.1% seroprevalence of hepatitis B virus among HIV infected patients was reported in Southern Taiwan by Tsai *et al.* (2015). The observed differences in the rates observed in this study and other works might be due to varied socio-economic status, screening protocols, study subjects and the size of the population.

Co-infection rates as observed in age groups of this study were also found by Okonko *et al.* (2020), in Rivers State and Abuja, Ogundeji, (2018), and in North-West Ethiopia Hou *et al.,* (2005), may be associated with higher sexual activities within this age group, especially those within adolescent age. Ogundeji (2018) reported that age group of 21-40 years had the predominant HIV, HBV, and HCV prevalence in his study. This finding is in agreement to the finding of Olokoba *et al.,* (2011) who reported that women between the ages 25-29 years have a greater prevalence Hepatitis B virus rate. Katamba *et al.* (2020) also reported that one of the correlates of HIV and Hepatitis B co-infections was age (between 20 and 39 years). Furthermore, age was not found to be significantly associated with HBV co-infection ($p>0.05$). The age group (25-34) have huge economic implications as they constitute the bulk of the nation's workforce, which could slow or reverse growth in the labour supply and worsen dependency ratio, as well as increase health expenditures for HIV-and liver-related illnesses reducing household incomes (Katamba *et al.*, 2020). On the contrary, Avwioro *et al.* (2014) found that individuals within the ages of 31- 50 years had the highest prevalence, i.e. HBV infection prevalence increased with the age of the subjects. However, Mustapha and Jibrin (2004) reported higher prevalence in age group 41-49 years of age with no cases in ≤ 19 years in Gombe.

For sex, the rate of co-infection was higher in females than male's counterpart. This observation agrees with studies of Okonko *et al.* (2022), there was a greater prevalence of HBV among females in Port Harcourt. Similarly, females in Anyigba, showed higher HBsAg seropositivity than males, in a study by Omatola *et al.,* (2019). Cookey *et al.* (2021) also reported that females were more likely than males to have HBV infection in Port Harcourt. In Warri, Okonko *et al.* (2023) reported HBV only among females. Also, this study's findings align with Adewole *et al.* (2009), who also reported a higher prevalence in females who were co-infected in FCT Abuja. The higher rate of HIV/HBV co-infection among females may be because women of all ages are more likely than men to become infected with HIV and HBV during unprotected vaginal intercourse (Nnakenyi *et al.,* 2020). In contrast, Ekanem *et al.* (2015) reported higher male prevalence in Uyo, Akwa Ibom State. Similarly, Forbi *et al.* (2008), also reported higher prevalence in males than females in Nassarawa State. Okonko *et al.* (2020) also reported that males were more probable than females to have HBV infection in Port Harcourt. Also, Isa *et al.* (2014) found that males had a higher prevalence than females. According to Zafrin *et al.,* (2019), males are more likely than females to have HBV. The Omatola *et al.* (2020) study found that males were likelier than females to have HBV. The Odita *et al.* (2023) study found males to be more prone to have HBV. While the reason(s) for this disparity is not clear. However, it is known that males are less likely to have a higher risk of progression to cirrhosis (Mustapha *et al.,* 2020).

Analysis by marital status showed that co-infection rate was higher (11.1%) in those who were married than among the singles (10.8%), this may probably be related to sexual infidelity among couples or multiple sexual partnerships, though this was not statistically significant. This result agrees with other findings; in Port Harcourt, married people had a higher risk of HBV infection (Okonko *et al.* (2020a, 2022). Okonko *et al.* (2023) also found that married people had a higher risk of HBV in Warri. Positive rates for HBsAg among the infected married in this study could be an indication that the infection might be through unprotected heterosexual intercourse or close contact with infected partners, as the virus can be spread through body fluids (Okonko *et al.,* 2022). Nevertheless, this observation disagrees with the work of Olayinka *et al.* (2016), who reported a higher prevalence in singles. At Uyo, Innocent-Adiele (2021) likewise noted a higher frequency among single people. In another study in Port Harcourt, Cookey *et al.* (2021) found higher HBV infection rates among widowed people. Omatola *et al.* (2019) also found that widowed patients had a significantly higher prevalence of HBsAg. According to Demarchi *et al.* (2022) unmarried Brazilians are more likely to have HBsAg.

The education-specific prevalence of HIV-HBV co-infections in this study revealed a higher (22.2%) prevalence among those with limited primary education status compared to other educational status; tertiary (13.0%) and secondary (8.2%) and there was no significant difference between educational status and HBsAg seropositivity ($p>0.05$), the higher prevalence among those with limited primary education shows that educated individuals are likely more enlightened on the dangers posed by hepatitis B when seropositive to HIV and as such could implement strategies in preventing HBV infection, and those with limited knowledge have inadequate knowledge about the risk factors associated with contracting HBV (Omatola *et al* 2020). This observation agrees with Katamba *et al.* (2020) who found higher prevalence among those with elementary (primary) school qualification. Omatola *et al. (*2020) also found higher prevalence among individuals with less formal education in Anyigba. It however, contradicts research in Warri and Port Harcourt, where HBV infection was exclusively found in people with Tertiary education (Okonko *et al.,* 2023). Also, the result obtained disagrees with findings of Ihongbe et *al.,* (2022), who discovered a higher prevalence of HBV among Tertiary education holders.

Occupation wise prevalence showed that Artisans and the retired had the highest (22.2%) prevalence and closely followed by the students (18.2%) compared to other occupations, civil servants (13.9%), business (10.7%), unemployed (7.5%) and farming had the least prevalence

(6.3%). Ezegbudo *et al.* (2004) reported in their study that the occupation of the subjects influenced the infection of antenatal women because they are expose to risk factors for contracting HBV infection. The low socioeconomic factor initiates multiple sexual partnerships, unprotected sex, and predisposes to sexually transmitted infections (Kebede and Chamiso 2000). This study is also compatible with the findings of Ikeako *et al.* (2014) who reported higher prevalence in unemployed subjects and artisans. Ogundeji *et al.* (2018) also reported higher prevalence of HBV in unemployed subjects and artisans.

In relation to knowledge, the results showed that there was a general lack of knowledge about HBV, as out of the 218 participants 59 (27%) were aware of the route of transmission, 93 (42.7%) were aware that HBV leads to cirrhosis, while 55 (25.8%) knew that HBV leads to cancer. The findings of the study posited that the level of knowledge was not significantly associated with age, occupation, marital status, educational level, or working experience. However, 203 (93%) held positive attitude towards HBV could prevent HBV. Having a good attitude means that respondents are willing to take preventive measures such as screening, condom use, and follow-up vaccination to help combat HBV infection. Nevertheless, in relation to preventive practice, 90.8% were not vaccinated against HBV, while 9.2% received vaccines against HBV. This result has shown that the respondents had a poor practice towards HBV. The poor practice means how many respondents were screen for hepatitis B and how many received booster immunizations against HBV. The findings were much lower than the findings reported by Gebrecherkos *et al*., 2020 which showed that 20.3% of study participants had good practice and 85.9% had not screened for HBV. Another study conducted in Honiara, Solomon Islands, in 2015 showed that 26.3% of study participants had good practice (UNAIDS, 2011). This poor practice and low number of respondents who were vaccinated in the current study could be as results of lack of knowledge of respondents on HBV vaccination, laxity of health institutions towards HBV vaccination and the notion respondents have that, vaccines are not safe or may lead to death (Killard, 2021).

## Conclusion

From the study conducted it can be concluded that, there have been missed opportunities around HBV screening, HBV immunization and improper knowledge of HBV complications. The HBV co-infection rate in this study was high and, as per World Health Organization's (WHO) standard which corresponds to a hyper-endemic level. The findings of this study equally revealed unsatisfactory knowledge and poor practice scores toward HBV infection. However, the level of attitude is satisfactory among the study population.

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