

# Prevalence of Human Immuno-deficiency Virus (HIV) and Hepatitis B Virus (HBV) Co-Infection among People Living with HIV in Dutse Metropolis, Jigawa Nigeria.

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## Abstract

Hepatitis B virus (HBV) is a known major global public health problem. HBV–HIV co-infection is not uncommon due to shared risk of transmission particularly in areas of endemic HBV infection. The purpose of this study is to assess the prevalence of co-Infection of human immunodeficiency virus (HIV) and hepatitis B virus (HBV) infection among people living with HIV in Dutse metropolis, Jigawa Nigeria. A hospital-based cross-sectional study included 100 confirmed People Living With HIV/AIDS (PLWHA) attending General Hospital Duste, Jigawa. Demographic information, risk factors, and serological analyses for HBV were obtained using a structured questionnaire and the vein puncture technique. Statistical analysis utilized SPSS version 25, employing the Chi-square test for categorical variables. The study revealed a statistically significant association between age groups and HIV/HBV co-infection ( $p = 0.006$ ), with the highest prevalence in the 29–39 age range. Primary education ( $p = 0.009$ ) also exhibited significant associations. Employed individuals (8.51%) exhibited a higher HIV/HBV co-infection rate than the unemployed (7.01%), with a non-significant association ( $p = 0.54$ ). Males showed a marginal elevation in co-infection rates (8%) compared to females (7.55%), but the gender difference was not statistically significant. Divorced individuals had a significantly higher prevalence (22.22%) than married (6.67%) and single (6.25%) individuals. Risky behaviors and residence did not show significant associations with co-infection. The overall prevalence of HBV/HIV co-infection in this study was 8%. Our study showed a high prevalence of HBV/HIV co-infection

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*among people living with HIV/AIDS attending the care and treatment center in Dutse General Hospital Jigawa. These findings highlighted the complex interplay of behavioral and demographic factors that contribute to the prevalence of HIV/HBV co-infection among people living with HIV/AIDS.*

**Keywords:** Co-infection, Duste, Hepatitis B, Human immuno-deficiency Virus, Nigeria, Prevalence.

## INTRODUCTION

Hepatitis B virus (HBV) is the most prevalent etiology of viral inflammation of the human liver (Omatola *et al.*, 2019). The Hepatitis B virus is a major global public health problem. HBV-HIV co-infection is not uncommon due to shared risk of transmission particularly in areas of endemic HBV infection. The risk of acquiring HBV infection in HIV-infected patients is increased by 40% compared to HIV-negative individuals. HBV co-infection is an increased cause of morbidity and mortality among people living with HIV. Moreover, many people living with HIV are unaware that they are infected with HBV and they are at high risk of developing liver-related disease (Auckl, 2021). Co-infection is another major challenge as it affects the rate at which the disease progresses to AIDS (Okonko *et al.*, 2020). The spread of HIV has now reached epidemic proportions in the world, especially in developing countries such as Nigeria. HBV infection represents a significant health burden worldwide (Im *et al.*, 2022). In 2019, an estimated 296 million people suffered from chronic HBV infection and more than 820,000 died from HBV (WHO, 2021a). Chronic viral hepatitis is one of the most burdensome diseases in Nigeria (Cookey *et al.*, 2022). Hepatitis B is responsible for approximately 96.0% of viral hepatitis deaths worldwide (Cooke *et al.*, 2019).

Approximately 70 million people with chronic HBV infection are Africans, commonly known as Africa's silent killer (Muanya, 2022). 75.0% of them live in Asia, and 25.0% of them die from infection-related liver disease (Sato *et al.*, 2014). Liver disease is reportedly the leading cause of death in several countries and viral hepatitis infections are both associated with more rapid progression of liver fibrosis and fibrosis in HIV co-infection (Weber *et al.*, 2006). According to other estimates, approximately 30% of HIV-positive patients worldwide also suffer from HCV or HBV infection (Lacombe & Rockstroh, 2012). The global prevalence of HBV/HIV co-infection varies between 1.13% and 59.0% (Askari *et al.*, 2014). Reports from Africa indicate that the prevalence of HBV/HIV co-infection ranges from 10.0% to 20.0%, with many countries in sub-Saharan Africa typically classified as endemic, high-level, or intermediate-level HBV infection. (Thio *et al.*, 2009). The global prevalence of HIV/HBV and HIV/HCV co-infection in sub-Saharan countries was 15.0% and 7.0%, respectively (Barth *et al.*, 2010). In Nigeria, HIV/HBV co-infection rates are estimated to range from 10.0% to 70.0% (Owolabi *et al.*, 2014).

As far as we are aware, studies are scarce on the prevalence of HIV/HBV co-infections among HIV-positive individuals and related risk factors in Duste, Jigawa state, Nigeria. HBV/HIV co-infection is a complex and challenging condition that can worsen the outcomes of both infections and increase the risk of death. Therefore, it is crucial to prevent, diagnose, and treat HBV and HIV effectively, and to improve the health care services and awareness for people living with these infections. This research examined a random sample of HIV patients at General hospital Duste to estimate the co-infection rate of HIV and hepatitis B and to explore the socio-demographic determinants of the co-infections. This result can assist health

professionals and relevant agencies to review the current strategies of public health care, especially in the handling of co-infections.

## **MATERIALS AND METHODS**

### **Study area**

The study was conducted at General Hospital Dutse, Jigawa state, Nigeria. This hospital is one of the main hospitals that render health services to People Living with HIV/AIDS (PLHIV) in Jigawa state. Jigawa state is located in the Northwest part of the country. Dutse is the capital of Jigawa state (11°42'05"N and 9°20'31"E) with a total area of 738 km<sup>2</sup>.

### **Study Design**

A hospital-based cross-sectional study design was employed in the study, aimed at determining the rates of HIV/HBV co-infection among PLWHA attending General Hospital Dutse, Jigawa state, Nigeria. The methods of this study consist of obtaining informed consent and withdrawing blood to screen for HIV/HBV co-infections. Additionally, demographic information and risk factors were assessed using a well-structured closed-ended questionnaire.

### **Collection of Samples**

The study population comprises one hundred (100) confirmed PLWHA, positively confirmed patients attending the HIV outpatient clinic at General Hospital Dutse, Jigawa State, Nigeria. These individuals voluntarily consented to participate, enrolled between October 2023 and November 2023, who were on Anti-retroviral therapy (ART) and came to access treatment. Socio-demographic data were also collected. Necessary demographics (age, sex, marital status, educational background, and occupation). Risk factors and epidemiological data of each patient were obtained using a well-structured questionnaire. Interviews were conducted and the data were entered using the pre-structured questionnaire.

The method of sample collection employed was the vein puncture technique. Five milliliters of venous blood were collected from each participant using sterile syringe and transferred into plain specimen bottles. The blood was allowed to clot for 30 minutes, and then centrifuged at 2500 rpm for five minutes. The serum obtained was used for the analyses.

### **Serological Analysis**

Serum samples were tested for the presence of HBV infection using HbsAg rapid agglutination test kits (Cal-Tech Diagnostic, inc. USA). The test and interpretation were carried out based on the manufacturer's specifications and guidelines. All laboratory tests were done utilizing quality controls following standard operating procedures and were completed following the manufacturer's instructions.

### **Data Analysis**

All data were entered into a Microsoft Excel spreadsheet. Analysis was done using Statistical Package for Social Sciences (SPSS) version 25 for Windows. The Chi-square test was employed to compare categorical variables. A confidence interval (95%) for proportions was used and a p-value less than 0.05 were considered statistically significant.

### **Ethical Approval**

This research was approved by the ethical committee of Jigawa state Ministry of Health. Before samples were taken and processed everyone who participated gave informed consent.

**Results**

In this study, socio-demographic information regarding the participants was collected. The study involved 100 participants diagnosed with HIV, consisting of 47 (47%) male and 53 (53%) female participants, with ages ranging from 18 to 65 years, as detailed in (Tables 1), HIV/HBV co-infection prevalence varied across age groups, with the highest observed in the 29-39 age range (12.5%), followed by 51-61 (10%), 40-50 (6.90%), and 18-28 (3.57%). The p-value of 0.006 indicates that there is a statistically significant association between age groups and HIV/HB co-infection. Regarding age, HBsAg seroprevalence decreased with increasing age, from 12.5% (29-39 years) to 10% (51-61 years), and inversely with decreasing age from 6.90% (40-50 years) to 3.57% (18-28 years).

The aggregate prevalence of HIV/HBV co-infection exhibited a marginal elevation among males (8%) in contrast to females (7.55%). However, the p-value of 0.23 suggested that this difference is not statistically significant. In terms of Educational Achievement, those with primary education (10%) were noted to have a higher prevalence of HIV/HBV co-infection than those with tertiary (9.09%), secondary (0.70%), or no education (0.0%). Despite these observed differences, the p-value of 0.009 suggests that there is a statistically significant association between educational background and HIV/HBV co-infection. Occupationally, employed individuals (8.51%) were observed to have a higher HIV/HBV co-infection rate than the unemployed (7.01%), with a non-significant association (p = 0.54). Marital status revealed a higher prevalence of HIV/HBV co-infection among divorced individuals (22.22%) compared to married (6.67%) and single (6.25%). A non-significant association was present between HIV/HBV co-infection and marital status (p = 0.19). Urban residents (13.89%) exhibited a higher HIV/HBV co-infection rate than rural residents (4.70%), with a non-significant association between HIV/HBV co-infection and residence (p = 0.19).

**Table 1:** Social demographic variable of the co-infected subjects (n = 100)

Variables	Screened Subjects (n)	HBsAg Positive Subjects (n)	Prevalence (%)	P-Value
<b>Age</b>				
18-28	28	1	3.57	0.006
29-39	32	4	12.50	
40-50	29	2	6.90	
51-61	10	1	10.00	
62-72	1	0	0.00	
<b>Sex</b>				
Male	47	4	8.51	0.23
Female	53	4	7.55	
<b>Education</b>				
Primary	10	1	10	0.009
Secondary	57	4	0.70	
Tertiary	33	3	9.09	
None	0	0	0.00	
<b>Occupation</b>				
Employed	47	4	8.51	0.54
Unemployed	53	4	7.01	

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<b>Marital Status</b>				
Single	16	1	6.25	0.19
Married	75	5	6.67	
Divorced	9	2	22.22	
<b>Residence</b>				
Rural	64	3	4.70	0.19
Urban	36	5	13.89	

A comprehensive illustration of the association between hepatitis B co-infection and various risk factors was provided in (Table 2). These factors, collectively demonstrating non-significant associations, serve as predisposing elements among the study subjects. In terms of risky behaviors, individuals engaging in unprotected sex (9.52%) showed a higher HIV/HBV co-infection rate than those practicing protected sex (7.59%) ( $p = 0.37$ ). Furthermore, individuals with a history of blood transfusion (10%) exhibited a higher HIV/HBV co-infection rate than those without history of blood transfusion (7.78%) ( $p = 0.14$ ). Surgical procedures were associated with a higher prevalence of HIV/HBV co-infection (22.22%) compared to those without surgery (6.59%) ( $p = 0.15$ ). Additionally, sharing sharp objects was associated with a higher HIV/HBV co-infection rate (8.82%) compared to those who did not share (7.58%) ( $p = 0.15$ ).

**Table 2:** Predisposing factors among the subjects (n = 100)

Variables	Screened Subjects (n)	HBsAg Positive Subjects (n)	Prevalence (%)	P-Value
<b>Unprotected Sex</b>				
Yes	21	2	9.52	0.37
No	79	6	7.59	
<b>Blood Transfusion</b>				
Yes	10	1	10.0	0.14
No	90	7	7.78	
<b>Surgical Procedure</b>				
Yes	9	2	22.22	0.15
No	91	6	6.59	
<b>Sharing Of Sharp object</b>				
Yes	34	3	8.82	0.15
No	66	5	7.58	

**Discussion**

People living with HIV have a greater risk of being co-infected with HBV compared to the general population because these infections share a common mode of acquisition. The prevalence of hepatitis B and HIV co-infection in our study was 8%, which is comparable to

or lower than reported percentages in different studies: 9.20% discovered by (Bittaye *et al.*, 2019), 10.68% in Sokoto (Uchenna Iyioku Ugah *et al.*, 2020), and 10.87% discovered by Demarchi *et al.* (2022). However, our study's prevalence was higher than percentages reported in other regions, such as 3.6% reported by (Ihongbe *et al.*, 2022) in Ogun State, 3.5% in Anyigba, Kogi State (Cornelius *et al.*, 2019), Nigeria, and various other percentages ranging from 4.0% to 7.6% in different studies (Banik *et al.*, 2022; Emeka *et al.*, 2013;; Lawal *et al.*, 2020; Nwankwo *et al.*, 2012 and Odita *et al.*, 2023).

With age, the highest prevalence of HBV/HIV co-infection (12.50%) was recorded among those with age of 29-39 years while the lowest prevalence of HBV/HIV co-infection (0.00%) was observed among those with age of 62-72 years. This results dispute with the reported findings of Ekanem *et al.* (2013), who recorded the highest prevalence of 19% within 40-49 years patients in Uyo. It also disagreed with the study of Forbi and another researcher who had more prevalence of 44.0% within the age of 51-60 in Jos. (Forbi *et al.*, 2008). The observed age-related disparities may be attributed to factors such as sustained sexual activity within the age group of 29-39 years, potentially increasing the risk of co-infection. For sex, the HIV/HBV co-infection rate was higher among males (8.5%) than females (7.01%). This observation aligned with findings from previous studies, such as those conducted by Ekanem *et al.* (2015) in Uyo, Akwa Ibom State, Nigeria, and Forbi *et al.* (2008) in Nassarawa State, Nigeria, both of which reported a higher prevalence of co-infection among males. Similarly, the study agreed with consistent findings in Port Harcourt, Nigeria, as reported by Okonko *et al.* (2020b), where males were more probable than females to have HBV infection. Similar outcomes were documented by Isa *et al.* (2014), Zafrin *et al.* (2019), Omatola *et al.* (2020), and Odita *et al.* (2023), all indicating a higher prevalence of HBV in males. However, the current findings are not consistent with earlier research. Okonko *et al.* (2022) documented a higher prevalence of HBV among females in Port Harcourt, Nigeria. Similarly, studies conducted in Anyigba, Nigeria, by Omatola *et al.* (2019), and by Cookey *et al.* (2021 & 2022) in Port Harcourt, revealed elevated HBsAg seropositivity among females. Our findings also disagreed with Adewole *et al.* (2009), who reported a higher prevalence in females co-infected in FCT Abuja. These variations emphasize the complex interplay of factors influencing sex-based inequities in HBV/HIV co-infection.

Higher HIV/HBV co-infection had been observed among those with primary education (10%) than those with tertiary education (9.09%), secondary education (0.70%) or none (0.00%). This result was consistent with the finding of other studies (Katamba *et al.*, 2020; ). It contradicted with the previous research in Warri and Port Harcourt, Nigeria, where HBV infection had been exclusively found in people with tertiary education (Okonko *et al.*, 2023a, b). Moreover, it disagreed with findings from (Ihongbe *et al.*, 2022), who had discovered a higher prevalence of HBV among tertiary education. The observed higher HIV/HBV co-infection rate among individuals with primary education compared to those with secondary and tertiary education may be attributed to disparities in health literacy, healthcare access and socio-economic factors associated with lower education levels. In terms of occupation, the highest prevalence of HBV/HIV co-infection was recorded in employed individuals (8.51%) than in unemployed individuals (7.01%). This result disagreed with the findings of other studies in Warri, Nigeria (Okonko *et al.*, 2023a), and Port Harcourt (Okonko *et al.*, 2022). Higher HIV/HBV coinfection was observed among divorced (22.22%) than the married (6.67%) and single (6.25%). This result disagreed with the findings of other studies (Buiet *et al.*, 2014; Okonko *et al.*, 2023a), who reported the higher prevalence among the married. Also it contradicts with the work of Olayinka *et al.* (2016), who reported a higher prevalence in

singles. Significant emotional distress and lifestyle changes, which may increase risky behaviors such as unprotected sex or substance abuse may be the reason for the observed higher HIV/HBV co-infection among divorced individuals compared to the married and single individuals. The overall prevalence of HBV/HIV co-infection was recorded in urban areas (13.89%) than in rural areas (4.70%). This result disagreed with the previous research reported by (Okonko et al., 2023a, b) who reported the high prevalence in urban areas, possibly due to factors such as higher population density and increased risky behaviors such as unprotected sex, multiple sexual partners and injection drug use, all of which are known risk factors for both HIV and HBV transmission.

In terms of predisposing factors among the subjects, the study explored various risk factors associated with HIV/HBV co-infection, including engaging in unprotected sex, a history of blood transfusion, surgical procedures, and sharing sharp objects were examined. No statistically significant association was observed. However, certain behaviors exhibited higher co-infection rates. The overall prevalence of HBV/HIV co-infection was recorded higher in individuals with a history of surgical procedures (22.22%) than in those with blood transfusion (10%), unprotected sex (9.52%), and sharing of sharp objects (8.82%). This result agreed with the reported findings by Uwaezuoke et al (2020) who reported the significantly higher prevalence for those with history of surgical procedure. Generally, the prevalence of HBV/HIV co-infection in the present study was observed to be lower than the documented 19% in Northern Nigeria, aligning with the findings of various other studies. The reason for this is not obvious, but may be due to the epidemiological differences in the different study populations and variations in methodology.

### **Conclusion**

The overall prevalence of HBV/HIV co-infection in this study was 8%. Our study showed a high prevalence of HBV/HIV co-infection among people living with HIV/AIDS who attended the care and treatment center at Dutse General Hospital Jigawa. These findings highlighted the complex interplay of behavioral and demographic factors that contribute to the prevalence of HIV/HBV co-infection among people living with HIV/AIDS. Additionally, a statistically significant association between age and educational background was revealed. Hepatitis B requires increased attention compared to what it has received in the past. It is now recommended that all recently diagnosed HIV cases be screened for HBV at point of entry and treatment instituted as appropriate, to enhance the management of HBV/HIV co-infection. The high prevalence of HBV infection in patients with no knowledge of HBV infection showcases the need for continuous public enlightenment by creating awareness campaigns on the routes of transmission of these infections and educating people living in Dutse Jigawa State on the potential for transmission. .

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