Assessment of the Prevalence of Hepatitis B Virus Infection among people living with HIV visiting a Tertiary Health Institution in Edo State

Iyoha U.J.[1], Iyevhobu, K.O.[1,2], Ebode N.O.[1], Iredia Q.I.[1], Alao, B.M.[3], Okodua, M.A.[1], Ogbeide J.O.[1], Ugiagbe O.[1]

[1]Department of Medical Microbiology, Faculty of Medical Laboratory Science, Ambrose Alli University, Ekpoma, Edo State, Nigeria.
[2]CEPI/ISTH Lassa Fever Epidemiology Study, Institute of Viral Hemorrhagic Fever and Emergent Pathogens ISTH Irrua, Edo State, Nigeria.
[3]Department of Medical Laboratory Science, Faculty of Basic Medical Sciences, Ladoke Akintola University of Technology Ogbomoso, Oyo State, Nigeria
***Corresponding Author:**
Iyoha, Usunobuon Joseph
+2348106720696
Department of Medical Microbiology, Faculty of Medical Laboratory Science,
Ambrose Alli University, Ekpoma, Edo State, Nigeria.

DOI: 10.29322/IJSRP.14.01.2024.p14507
https://dx.doi.org/10.29322/IJSRP.14.01.2024.p14507

Paper Received Date: 15th November 2023
Paper Acceptance Date: 24th December 2023
Paper Publication Date: 6th January 2024

Abstract
Coinfection of Human Immunodeficiency Virus (HIV) and hepatitis B virus (HBV) is a global public health problem, with a more severe outcome than HBV or HIV mono-infections, includingan increased risk for liver-related morbidity and mortality. This study was conducted to investigatethe prevalence of HBV among people living with HIV attending Irrua Specialist TeachingHospital, Irrua, Edo State. A total of 250 samples each collected from different HIV subjects attending the antiretroviral clinic of the hospital were used for this study. Information regarding age, gender, occupation and marital status were obtained from the hospital register. The samples were analysed for HBV with standard laboratory techniques using serological test strips for preliminary diagnosis and HBV Diagnostic Test Strip (Colloidal Gold) for determination of the level of infectivity. The overall prevalence of HBV coinfection was 4%. The prevalence of the co-infection varied significantly ($p \leq 0.05$) with age, with the highest prevalence recorded among respondents 20-30years age range (26.7%), followed by >50years (6.7%) and 41-50 years (4%), while no prevalence was reported in those aged 0-19yrs. Females (7%) had a higher prevalence ofco-infection than Males (3.8%) but this was statistically not significant ($p>0.05$). Based on maritalstatus, the prevalence of co-infection was higher among the married (4.3%) than the singles (3.6%),but this difference was insignificant ($p>0.05$). There was also no significant variation ($p>0.05$) ofco-infection with occupation, but farmers (5%) had the highest prevalence compared to other occupations in the studied population. In conclusion, this study found that the prevalence of HBVco-infection among the subjects was low (4%), but varied significantly with age, while there was no significant variation with gender, marital status and occupation. It was in this study, that there was a there was a low level of infectivity of HBV/HIV co-infection among respondents with chronic cases (0.8%) and acute cases (3.2%). Despite this low prevalence there is still the need forall concerned actors such as individuals, governmental and nongovernmental organisations to engage in practices to further reduce this prevalence and public awareness should be enforced especially to those who have little to no educational background on HIV/HBV co-infection.

Keywords: HIV, hepatitis, hepatitis B virus, Coinfection, HBV, Immunodeficiency

Introduction

Human immunodeficiency virus type 1 (HIV-1) and hepatitis B virus (HBV) exact a high toll worldwide. Both can lead to chronic disease, cancer, and death, and neither can be eradicated with the use of current therapies. Antiviral drug resistance often develops after patients have received treatment for some time and is usually followed by the loss of clinical benefit. Coinfection with the two viruses exacerbates the negative effects (Ranjbar *et al.*, 2011). The human immunodeficiency virus (HIV) is grouped into the genus *Lentivirus* within the family of *Retroviridae*, subfamily *Orthoretrovirinae* (Ganapathy & Mozhi, 2021). It is an enveloped virus containing a 9.8 kilobyte (kb) positivesense RNA genome that codes for three polyproteins (Gag, Pol, and Env) and six accessory proteins (Tat, Rev,

Nef, Vpr, Vif, and Vpu) (German Advisory Committee [GAC], 2016). On the basis of genetic characteristics and differences in the viral antigens, HIV is classified into types 1 and 2 (HIV-1 and HIV-2) (Sharp *et al.*, 2005). This virus preferentially targets the CD4+ cells, and the stages in HIV replicative life cycle basically consist of cell entry, reverse transcription, integration, and formation of infectious virion by HIV protease (Pau & George, 2014; Iyevhobu & Obodo, 2020). HIV can be transmitted through sexual contact, occupational exposure, injection drug use (IDU), and/or vertical transmission (from mother to child) (Nambiar & Short, 2021). In the absence of antiretroviral treatment, the typical patient response to HIV infection has three main phases characterised by immunosuppression, which are, initial acute infection, long asymptomatic period, and the symptomatic stage leading to acquired immune deficiency syndrome (AIDS) (Hernandez-Vargas & Middleton, 2013; Iyevhobu & Obodo, 2020).

The World Health Organization's sustainable development goals for 2030 aim to end the epidemic of AIDS, combat hepatitis and other communicable and sexually transmitted diseases by 2030 (Ganesan *et al.,* 2019). Coinfection with Human Immunodeficiency Virus (HIV) and hepatitis B virus (HBV) is a global public health problem, with a more severe outcome than HBV or HIV mono-infections, including an increased risk for liver-related morbidity and mortality. The rates of significant clinical events, liver-related hospitalizations, as well as the incidence of hepatocellular carcinoma (HCC) are much higher in HIV-HBV coinfected patients than in HBV or HIV mono-infected ones, and liver mortality is still one of the leading causes of non-AIDS deaths in people living with HIV/AIDS (PLWH), including very young ones (Ganesan *et al.*, 2019).

Nigeria belongs to the group of countries highly endemic for viral hepatitis, unfortunately little is known about the burden of co-infection in HIV positive patients and the interaction between these two viruses as it affects the natural history of viral hepatitis, management and prevalence (Adnolfi *et al.*, 2001). Human immunodeficiency virus (HIV) continues to be a major public health threat with an additional risk of HBV coinfection. In 2021, 1.5 million people acquired HIV; 650,000 people died from HIV-related causes; and at the end of 2021, there were an estimated 38.4 million people living with HIV, two-third of whom were in the World Health Organisation (WHO) African Region (WHO, 2022). About 1.9 million people are living with HIV in Nigeria, and the country has the second-largest HIV epidemic in the world (Iyevhobu & Obodo, 2020). Human Immunodeficiency Virus (HIV) and hepatitis B virus (HBV) coinfection has been associated with higher morbidity and mortality and may impact significantly on healthcare resource utilization (Iyevhobu & Obodo, 2020).

HIV–HBV coinfection increases the morbidity and mortality beyond those caused by either infection alone. People coinfected with HIV have higher levels of hepatitis B viremia, have progression to chronic hepatitis B that is approximately five times as fast as that among people infected with only HBV, and have a higher risk of cirrhosis and hepatocellular carcinoma (Ranjbar *et al.,* 2011). HIV immunosuppression can even cause the loss of hepatitis B surface antibodies and reactivation to chronic hepatitis B (Thio, 2009). As compared with healthy, uninfected persons, those infected with HIV — particularly the most immunocompromised — mount poorer antibody responses to HBV vaccination. Managing hepatitis B in HIV-coinfected patients is further complicated by the dual activity of several nucleoside analogues, the emergence of resistant HIV or HBV strains, the limitations of and decreased response to interferons, and the more rapid development of lamivudine-resistant HBV (Platt *et al.,* 2020).

Globally, in 2017, 35 million people were living with HIV and 257 million had chronic HBV infection (HBsAg positive). The extent of HIV-HBsAg co-infection is unknown, although there is a high global burden of HIV-HBsAg co-infection, especially in sub-Saharan Africa (Platt *et al.,* 2020). In different parts of Nigeria, several studies have investigated the prevalence of HIV/HBV co-infection, Diwe *et al.*, (2013) Adewole *et al.,* (2009) and Nnakenyi *et al.,* (2020), noted a prevalence of HBV co-infection with HIV of 6.9%, 7%, and 7.9% respectively in different regions of Nigeria. However, information on the prevalence of HIV/HBV co-infection is still scare in some regions and due to the serious impact of HIV-HBV co-infection, it is important to provide evidence- based guidance and reports on the optimal management of HBV-HIV coinfection, and also inform policy on prevention strategies to reduce and eliminate HBV infection. In all of the preliminary reviewed published literature, none was found that specifically studied the prevalence of HBV co-infection with HIV in the whole of Edo Central Senatorial District, Edo State. Hence, this study was carried out to determine the presence of HBV infection in people living with HIV at ISTH, Edo state.

Materials and Methods

Study Area

The study was carried out at Irrua Specialist Teaching Hospital (ISTH), Edo state in department of IHVN, Irrua South-South Nigeria. Irrua is a town situated at latitude 6º45'01'' North and longitude 6º15'48'' East, the vegetation is mixed rainforest and transition guinea savannah (Asogun *et al.*, 2015). The natives are mainly farmers and is literally surrounded by towns with tertiary educational institutions. Irrua Specialist Teaching Hospital is located in Irrua, Esan Central Local Government Area. It is a tertiary health institution that occupies an area of about 436sq km. The host town –Irrua, is the administrative headquarters of Esan Central Local Government Area of Edo State, Nigeria. It shares boundaries with Ugbegun, Ekpoma, Uromi, Ewu and Opoji towns. The Hospital has 8 clinical wards, 270 beds, 7 operating theatres, a casualty unit and an out-patient department, and with a staff strength of about 750 workers comprising various health professionals, including doctors, nurses, laboratory scientists, radiographers and pharmacists among others. These professional cadre of staff are supported by administrative and security personnel (Enahoro *et al.*, 2015).

Research Design

Institutional-based cross-sectional study design was used to examine the prevalence and factors associated with hepatitis B infection in people living with HIV at Irrua specialist Teaching Hospital (ISTH). Quality control was applied to ensure good practicing in collection of the samples and serological testing using diagnostic test strips.

Study Population
The study population includes 250 HIV positive patient samples.

The sample size was calculated based on a single population proportion formula: N $= Z^2pq/d^2$
Where: N= sample size (Subjects); Z = standard deviation (1.96), P = prevalence = 8.3% i.e. 0.083, q =1-P (1- 0.083) and D = degrees of freedom 5% i.e. 0.05.
According to (Babatope *et al.*, 2015) the prevalence of HBV in Ekpoma, Edo state is currently 8.3%.

$$N = \frac{(1.96)^2 \times 0.083 \times (1 - 0.083)}{(0.05)^2}$$

$$N = \frac{3.8416 \times 0.083 \times 0.92}{0.0025}$$

$$N = 117.33$$

In order to minimize sampling error, 250 subjects were therefore recruited for the study.

Sample Collection/Analysis
About 3ml of venous blood samples was collected from the study participants at the Irrua Specialist Teaching Hospital (ISTH), Irrua, Edo State after thoroughly explaining the benefits and stating the reasons for carrying out the study and obtaining informed consent from them. The sample was analyzed with standard laboratory techniques using serological test strips for diagnosis and other confirmatory test for HBV profile.

Serological test strips: The samples were analyzed using a rapid chromatographic immunoassay for qualitative detection of the HBV infection. The test strip contains antiHBsAG particles and HBsAg coated on the membrane. Using HBV Combo Test Kit, the level of infectivity was determined through the serological markers (HBsAg, HBsAb, HBeAg, HBeAb, and HBcAb) present in the Test Kit. For each participant, the blood sample were labeled and stood on the bench for at least one hour to allow clot retraction to take place before it was centrifuged. After centrifugation, the sera were harvested for analyses. They were screened for both HIV, HBsAg and HBV profiles (HBsAg, HBsAb, HBeAg, HBeAb, HBcAb), using HIV Determinant test strips, hepatitis B surface antigen test strips and HBV Diagnostic Test (Colloidal Gold) respectively. These are qualitative, lateral flow immunoassay test kit devices for the detection of both HBsAg and HIV in plasma with a relative sensitivity of 99.0% and relative specificity of 98.6%. The tests were done and interpreted according to the manufacturer's instructions. Positive and negative controls were included in each batch of tests to confirm test procedure and also to verify proper test performance. The prevalence of each viral infection (HBV and HIV) was determined from proportion of seropositive individuals in the total population under consideration.

HBsAg
HBsAg Test: The whole blood sample was centrifuged and the plasma (supernatant) obtained. The plasma was transferred to a labelled cryovat tube and then stored in the refrigerator at -4^{o}C.The refrigerated or frozen specimen and test components was allowed to cool at room temperature. The specimen was mixed well prior to assay once thawed. When ready to test, the pouch was opened at the notch and device removed. HBsAg test device was placed on a clean, flat surface. The device was labelled with appropriate specimens ID number. The HBsAg strip was immersed into the sample with arrow end pointing towards the sample and not allowed to past the MAX (maximum) line. The strip was taken out after 8-10 seconds and the strip laid flat on a clean, dry, flat surface. A timer was set up and results read in 15 minutes (Diasino Laboratories, 2022).

HBV Diagnostic Test (Colloidal Gold): The test board was reverted and the testing samples to room temperature (20 – 30 C). The right side of the test board was kept horizontal from the original package, from left to right, respectively corresponding to HBsAg, HBsAb, HBeAg, HBeAb, and HBcAb. With a small straw to take subjects' plasma, and added into 5 sample wells of the test board by drop (25Ul per well or one drop), It was observed and the experimental result recorded within 15 minutes. Weakly positive samples appear test line in 15-20 minutes. Determination after 30 minutes is recorded invalid (Diasino Laboratories, 2022).

Interpretation of Results for HBsAg Test: Results were interpreted according to the manufacturers guide.
Positive (+): In addition to a pink colored control (C) band, a distinct pink colored band will also appear in the test (T) region.
Negative (-): Only one colored band appears on the control (c) region. No apparent band on the test (T) region
Invalid: If a color band is not visible in the control region or a color band is only visible in the test region, the test is invalid. Another test is run to re-evaluate the specimen. Note: there was no meaning attributed to line color intensity or width.

Interpretation of Results For the HBV Diagnostic Test (Colloidal Gold)

HBsAg, HBsAb, HBeAg (Sandwich method)
Negative: only one purple bar (control line) is seen in the control C zone.
Positive: In detecting T zone there are two purple bars in the control C zone
Invalid: In detecting T zone there is no purple bar in the control C zone

HBcAb, HBcAb (Competition method)
Negative: In detecting T zone there are two purple bars in the control C zone
Positive: only one purple bar (control line) is seen in the control C zone (Weakly positive sample may appear a very thin response line at the test line).
Invalid: In detecting T zone there is no purple bar in the control C zone

Table on Hepatitis B test results and its interpretation

HBsAg	HBsAb	HBeAg	HBeAb	HBcAb	Interpretation
+Ve	-Ve	-Ve	+Ve	+Ve	Acute infection
+Ve	-Ve	+Ve	-Ve	+Ve	Chronic infection

HBsAg – The presence of HBsAg indicates that the person is infectious.
HBsAb – The presence of HBsAb is generally interpreted as indicating recovery and immunity from hepatitis B virus infection.
HBeAg – The presence of HBeAg is associated with higher HBV DNA levels, thus, increasing infectiousness.
HBeAb – It marks a transition from active disease to an inactive 'carrier state' and indicates immunity from a previous infection only.
HBcAb – The presence of total HBcAb indicates previous or ongoing infection with hepatitis B virus in an undefined time frame.

Data Analysis
Data generated were analyzed using Microsoft Excel Software and using the chi square test performed by Microsoft Excel (Microsoft Corporation) version 22. The seroprevalence was calculated as the number of serologically positive samples divided by the total number of samples tested. P-values ≤ 0.05 were considered statistically significant, while those with p-values >0.05 were considered statistically insignificant

Results

Table 1 shows the socio-demographic characteristics of the population in relation to prevalence of HBV/HIV co-infection A total of 250 serum samples from HIV infected patient were analyzed for the prevalence of HBV infection. Most of the respondents were within 3140 years (44%) of age, followed by 41-50 yrs (40%), 20-30 yrs (6%), >50 yrs (6%). and 0-19 yrs (4%). Most of the respondents were females (68%), while the others were males (32%). Most of the respondents were married (56%) while others were single (44%). Most of the respondents were farmers (32%), followed by traders (28.8%), civil servants (14.8%), health workers (12.4%), students (8%), and unemployed (4%).

Table 2 shows the highest percentage of prevalence rate of HBV/HIV coinfection was observed among respondents within age group of 20-30 years (26.7%), followed by >50 (6.7%) and 41- 50 (4%). There was no prevalence of HBV/HIV co-infection among respondents within age group of 0- 19 years. The result shows that there was a significant association between HBV/HIV co-infection and age range. The overall prevalence of HBV/HIV co-infection irrespective of age range was low (4%).

The percentage of prevalence rate of HBV/HIV co-infection was higher in Females (7%) in comparison to the Males (3.8%). There was no significant association between HBV/HIV co-infection in relation to the gender of the subjects. The overall prevalence of HBV/HIV co-infection irrespective of gender was low (4%) (table 3).

On the percentage of prevalence rate of HBV/HIV co-infection was higher in Married subjects (4.3%) in comparison to the Singles (3.6%). There was no significant association between HBV/HIV co-infection in relation to the marital status of the respondents. The overall prevalence of HBV/HIV co-infection irrespective of marital status was low (4%) (table 4).

Table 5 shows that the highest percentage of prevalence rate of HBV/HIV coinfection was observed among respondents that are farmers (5%), followed by health workers (3.2%), Trader (2.8%) and Civil Servant (2.7%). There was no prevalence of HBV/HIV coinfection among respondents that were students and unemployed. The result shows that there was no significant association between HBV/HIV co-infection and occupation of the respondents. The overall prevalence of HBV/HIV co- infection irrespective of occupation was low (4%).

Table 1. Socio-Demographic Characteristics of HBV/HIV Co-infection Study Population

Variable		Frequency (N=250)	Percentage (%)
Age Range (years)	0-19	10	4

	20-30	15	6
	31-40	110	44
	41-50	100	40
	>50	15	6
Gender	Male	80	32
	Female	170	68
Marital Status	Married	140	56
	Single	110	44
Occupation	Student	20	8
	Health Worker	31	12.4
	Trader	72	28.8
	Civil Servant	37	14.8
	Farmer	80	32
	Unemployed	10	4

Table 2: Prevalence of HBV/HIV Co-infection in relation to the Age Range of the Subjects

Age Range (years)	Number Tested (%)	No. Positive (%)	X^2	P-value
0-10	10	0(0)		
20-30	15	4(26.7)		
31-40	110	1(0.9)	0.0274	0.868541
41-50	100	4(4)		
>50	15	1(6.7)		
Total	**250**	**10(4)**		

Table 3: Prevalence of HBV/HIV Co-infection in relation to Gender

Gender	Number Tested (%)	No. Positive (%)	X^2	P-value
Male	80	3(3.8)		
Female	170	7(4.1)	18.464	0.00100
Total	**250**	**10(4)**		

Table 4: Prevalence of HBV/HIV Co-infection in relation to Marital Status

Marital Status	Number Tested (%)	No. Positive (%)	X^2	P-value
Married	140	6(4.3)		
Single	110	4(3.6)	0.0435	0.834841
Total	**250**	**10(4)**		

Table 5: Prevalence of HBV/HIV Co-infection in relation to Occupation

Occupation	Number Tested (%)	No. Positive (%)	X^2	P-value
Student	20	0(0)		
Health worker	32	1(3.2)		
Trader	72	3(2.8)		
Civil Servant	37	1(2.7)	2.793	0.731862
Farmer	80	5(5)		
Unemployed	10	0(0)		
Total	**250**	**10(4)**		

Discussion

The World Health Organization's sustainable development goals for 2030 aim to end the epidemic of AIDS, combat hepatitis and other communicable and sexually transmitted diseases by 2030 (Ganesan *et al.,* 2019). Coinfection with Human Immunodeficiency Virus (HIV) and hepatitis B virus (HBV) is a global public health problem, with a more severe outcome than HBV or HIV mono-infections, including an increased risk for liver-related morbidity and mortality. The rates of significant clinical events, liver-related

hospitalizations, as well as the incidence of hepatocellular carcinoma (HCC) are much higher in HIV-HBV coinfected patients than in HBV or HIV mono-infected ones, and liver mortality is still one of the leading causes of non-AIDS deaths in people living with HIV/AIDS (PLWH), including very young ones. Nigeria has one of the highest rates of HBV-attributable cancer in West Africa, with an agestandardized incidence estimate of 2.6 to <5.1 cases per 100,000 person-years (Hutin *et al.,* 2018). Due to the serious impact of HBV infection and HIV-HBV co-infection, it is important to provide evidence-based guidance and reports on the optimal management of HBV-HIV coinfection, and also inform policy on prevention strategies to reduce and eliminate HBV infection. Hence, this study was carried out to determine the presence of HBV infection in people living with HIV at ISTH.

In assessing the socio-demographic characteristics of HIV patients in the study population, the present study has revealed that most HIV patients attending ISTH are adults within the age range of 31-40yrs (44%), females (68%), traders (28.8%), and married (56%). The sociodemographic characteristics of the respondents in this study is in tandem with the studies of Adebayo *et al*, (2013), Okerentugba *et al*, (2015) and Awofala & Ogundele, (2018) which similarly revealed a higher prevalence of HIV among females, married couples, and traders respectively.

The prevalence of HBV/HIV co-infection obtained in this present study is 4.0% among people living with HIV at ISTH. This finding is comparable with some earlier reports for instance, the prevalence rates of 3.2% by Odusanya *et al*, (2007), 4.98% by Ejele & Ojule, (2004) and 6.5% which have been reported among 401 pregnant women with HIV in Enugu, Nigeria by Okeke *et al*, (2012). However, the HBV/HIV coinfection rate was higher than the findings of studies conducted in Mali, by evaluation of a large sample size of 11,592 blood donors, with a prevalence of 1.13% by Tounkara *et al*, (2009). The presence of shared modes of transmission of both viruses in the study patients as well as limited access of health information about the transmission and prevention of HBV infection in the study area might be possible reasons for the discrepancies seen in this study.

In contrast, higher prevalence rates of 11.0% in Makurdi by Agwale *et al*, (2007), 12.6% in Lagos by Fasola *et al*, (2008), 12.8% in Minna by Egah *et al*, (2007), 13.2% in a rural settlement in Northern Nigeria by Jombo *et al*, (2005), have been reported in Nigeria. Factors like differences in sample size, the sensitivity and reliability of viral assay reagents, the category of people studied, geographical location of the study population might have contributed to the differences reported for HBV viral infection prevalence in these areas.

The prevalence rate of HBV in this study was significantly higher among participants aged 20-30years, which is same with a previous study on high prevalence of HBV infection in the age range 20-30years old individuals in Lome by Malewe *et al*, (2016). Previous authors have also found significant association with this age group (Bwogi *et al.,* 2009). Adewole *et al*, (2019) also reported that individuals within 20-30 years of age have the highest rate of getting infected with HBV and the age group encompasses individuals with high sexual activities. The current study recorded higher prevalence among females (2.8%) than males (1.2%). Contributory factors may be attributed to socio-economical, cultural, hormonal or immunological factors which increases the female gender's vulnerability to HBV infection. Sexual activities can also influence the prevalence rate of HIV/HBV coinfection in females, as Royce *et al,* (2007) reported that during unprotected vaginal intercourse, a woman's risk of becoming infected with HBV is 4 times higher than the risk of man. The current study showed that HBV prevalence was highest in married individuals. This observation is in concordance with the report of (Baanik *et al.,* 2022) who documented a higher prevalence among married and divorced/widowed people than single. This high prevalence may imply that transmission of HBV via sex is important (Omolumen *et al.,* 2023). In order to break the cycle of HBV transmission, it is highly recommended that, screening among sexually active individuals be performed. The present study shows that there was no significant variation in the prevalence of HIV/HBV co-infection depending on the marital status of the subject.

With respect to occupation, positivity of HBV/HIV occurs more in farmers (1.6%) and traders (1.2%). It can be assumed that these individuals are residing in rural areas where there is lack of public awareness/enlighten about HIV/HBV co-infection. Logical reasoning could also be that, although uncommon, these individuals can become infected when health-care professionals do not follow the proper steps needed to prevent the spread of blood borne infections, sharing of personal items and having sex with an infected person. It can be assumed that most of these aforementioned individuals might be traditional practitioners who have little or low educational attainment resulting to ignorance.

At the end of this research, it has been established that: The prevalence of HIV/HBV co-infection in Edo Central Senatorial District is 4%. There is a low level of infectivity of HBV/HIV co-infection among respondents with chronic cases (0.8%) and acute cases (3.2%) in Edo Central Senatorial District. HIV/HBV co-infection in Edo Central Senatorial District is more common among young adults (20 -30yrs). HIV/HBV co-infection in Edo Central Senatorial District does not vary significantly with gender, occupation and marital status.

Conclusion

The current study showed that there is low prevalence of HBV co-infection (4%) among HIV patients attending Irrua Specialist Teaching Hospital (ISTH), Edo State. The risk of dual infection increases with increase in age and females which seems to be more prone to this infection. There was a significant variation in HBV co-infection according to age with the respondents within 20-30yrs having the highest prevalence. No significant association between HBV co-infection with gender, occupation, and marital status was observed in this study.

Human immunodeficiency virus (HIV) and hepatitis B (HBV) are viral disease both of which have witnessed high concern among researchers, public health enthusiasts and governments, due to the degree of damage either or both diseases can induce on human health. Human immunodeficiency virus type 1 (HIV-1) and hepatitis B virus (HBV) exact a high toll worldwide.
Based on the outcome of this study, the following recommendations are suggested:

- Increased efforts are needed globally to address the barriers to comprehensive care and treatment for key populations with HIV/HBV co-infection.
- Governments, non-governmental organisations and private individuals are encouraged to provide research grants to researchers seeking to explore other issues surrounding HBV co-infection with HIV.
- Further research on the prevalence of HIV/HBV co-infection in other regions using larger sample sizes should be conducted.

Conflict of interest

The authors declare no conflicts of interest. The authors alone are responsible for the content and the writing of the paper.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or not-for- profit sectors.

Acknowledgements

The authors would like to thank all the Laboratory staff of the Department of Medical Microbiology, Faculty of Medical Laboratory Science, Ambrose Alli University, Ekpoma and the research and technical staff of St Kenny Research Consult, Ekpoma, Edo State for their excellent assistance and for providing medical writing support/editorial support in accordance with Good Publication Practice (GPP3) guidelines.

References

Adebayo, S. B., Olukolade, R. I., Idogho, O., Anyanti, J., & Ankomah, A. (2013). Marital status and HIV prevalence in Nigeria: implications for effective prevention programmes for women. *Advances in Infectious Diseases*, ***3***(03), 210-218.

Adewole, O.O., Andeyi, E., Ajuwon, Z., & Wada, I. (2019). Seroprevalence of hepatitis B and C viruses' co-infection in Nigerian patients with HIV infection. *Journal of Infection in Developing Countries, 6*(5), 369-375.

Adewole, O.O., Anteyi, E., Ajuwon, Z., Wada, I, Elegba, F., & Ahmed, P. (2009). Hepatitis B and C virus co-infection in Nigerian patients with HIV infection. *Journal of Infection in Developing Countries, 3*(5), 369–375.

Adnolfi, L.E, Gambardella, M., Andreans, A., Tripidi, M.F., Utili, R. & Guggiero, G. (2001). Steatosis accelerates the progression of liver damage of chronic hepatitis C patients and correlates with specific HCV genotype and visceral obesity. *Hepatology*, *33*, 13581364.

Agwale, S.M., Temina, L. & Womack, O. (2004). Prevalence of HCV co-infection in HIVInfected individuals in Nigeria and characterization of HCV genotypes. *Journal of Clinical Virology*, *31*, 3-6.

Asogun, D., Tobin, E., Esezobar, T. & Ishaq, R. (2015). Child adoption amongst women attending Infertility Clinic in a Tertiary Hospital in South-South Nigeria. *International Journal of Basic and Applied Research, 4*(4), 13001307.

Awofala, A. A., & Ogundele, O. E. (2018). HIV epidemiology in Nigeria. *Saudi Journal of Biological Sciences, 25*(4), 697–703.

Baanik, S., Datta, A., Ghosh, A., Ghosh, K.Y., & Debi, H. (2022). The Prevalence of hepatitis B virus infection in Bangladesh: a systematic review and meta-analysis. *Epidemiology and Infection*, *150*(47), 1-8.

Babatope, I.O., Inyang, N.J., Imhanrenezor K., & Aghahowa A., (2015). Seroprevalence of Hepatitis B and C viruses among apparently healthy adults in Ekpoma, Edo State, Nigeria. *Special Viral Pathogens Journal (SVPJ)*; *1*(1), 0015-0020.

Bwogi, J.B., Makumbi, F., Mishra, I., Bakamutumatio, V., Nanyunja, B., Opio, M., Downing, A., Biryahwaho, R. & Lewis, B.R.F. (2009). Hepatitis B infection is highly endemic in Uganda: findings from a National serosurvey. *African Health Sciences, 9*, 98-108.

Diwe, C.K., Okwara, E.C., Enwere, O.O., Azike, J.E., & Nwaimo, N.C. (2013). Seroprevalence of hepatitis B virus and hepatitis C virus among HIV patients in a suburban university teaching hospital in south-east Nigeria. *Pan Africa Medical Journal*, *16*, 7.

Egah, D.Z., Banwat, E.B., Audu, E.S., Iya, D., Mandong, B.M., & Anele, A.A. (2007). Hepatitis B surface antigen, Hepatitis C and HIV antibodies in a low-risk blood donor group in Nigeria. *East Mediterranean Health Journal*, *13*(4), 961-966.

Ejele, Q.A. & Ojule, A.C. (2004). The prevalence of Hepatitis B surface antigen (HBsAg) among prospective blood donors and patients in Port-Harcourt, Nigeria. *Nigeria Journal of Medicine, 13*, 336-338.

Enahoro, F.O., Daudu, J.I., Nwaopara, A.O., & Orjiakor, I.C. (2015). The Incidence of Hepatitis B virus Infection among patients at the Specialist Teaching Hospital, Irrua, Edo State, Nigeria. *International Journal of Basic and Applied Research, 4*(2), 44 -53.

Fasola, F.A., Kotila, T.R., & Akinyemi, J.O. (2008). Trends in transfusion transmitted viral infections from 2001 to 2006 in Ibadan, Nigeria. *Intervirology, 51*, 427-431.

Ganapathy, D., & Mozhi, K. (2021). Awareness of management of children with HIV among dental students. *International Journal of Dentistry and Oral Sciences*, *8*(03), 20992103.

Ganesan, M., Poluektova, L.Y., Kharbanda, K.K., & Osna, N.A. (2019). Human immunodeficiency virus and hepatotropic viruses comorbidities as the inducers of liver injury progression. *World Journal of Gastroenterology*. ***25***, 398–410.

German Advisory Committee. (2016). Human immunodeficiency virus (HIV). *Transfusion Medicine and Haemotherapy*, *43*(3), 203-222.

Hernandez-Vargas, E. A., & Middleton, R. H. (2013). Modelling the three stages in HIV infection. *Journal of Theoretical Biology*, *320*, 33-40.

Hutin, Y., Nasrullah, M., Easterbrook, P., Nguimfack, B.D., Burrone, E., Averhoff, F… Bulterys, M. (2018). Access to Treatment for Hepatitis B Virus Infection—Worldwide. *MMWR. Morbidity and Mortality Weekly Report., 67*, 773–777.

Iyevhobu KO & Obodo BN (2020). Prevalence of Parasitic Infections in Relation to CD4+ and Antiretroviral (ART) Usage of HIV Sero-Positive Patients Attending Irrua Specialist Teaching Hospital (ISTH) Irrua, Edo State, Nigeria. *Research and Reviews Journal of Microbiology and Biotechnology, 1*(2), 34 – 41.

Jombo, G.I., Egah, D.Z., & Banwat, E.B. (2005). Hepatitis B virus infection in a rural settlement of Northern Nigeria. *Nigerian Journal of Medicine, 14*, 425-428.

Malewe, K., Gnatoulma, K., & Mounerou, S. (2016). High prevalence of Hepatitis B Virus Infection in the Age Range of 20-39 Years Old Individuals in Lome. *The Open Virology Journal, 10*, 2174.

Nambiar, P., & Short, W. R. (2021). Mechanisms of HIV Transmission. In W. D. Hardy (Ed.), *Fundamentals of HIV Medicine* (pp. 26-29). Oxford University Press, Oxford.

Nnakenyi, I.D., Uchechukwu, C., & Nto-Ezimah, U. (2020). Prevalence of hepatitis B and C virus co-infection in HIV positive patients attending a health institution in southeast Nigeria. *African Health Science*, *20*(2), 579-586.

Odusanya, O.O., Meurice, F.P., & Hoet, B. (2007). Nigerian Medical students are at risk for hepatitis B infection. *Transactions of the Royal Society of Tropical Medicine & Hygiene, 101*, 465-468.

Okeke, T.C., Obi, S.N., Okezie, O.A., Ugwu, E.O., Akogu, S.P., & Ocheni S. (2012). Coinfection with hepatitis B and C viruses among HIV positive pregnant women in Enugu south east, Nigeria. *Nigeria Journal of Medicine, 21*(1), 57-60.

Okerentugba, P. O., Uchendu, S. C., & Okonko, I. O. (2015). Prevalence of HIV among pregnant women in Rumubiakani, Port Harcourt, Nigeria. *Public Health Research, 5*(2), 58-65.

Omolumen LE, Iyevhobu KO, Babatope IO, Aliu II, Ediale SE, Imoren RA (2023). Evaluation of Some Micronutrients of Hepatitis (HBV and HCV Positive) Subjects. *SunText Review of Medical & Clinical Research, 4*(1), 170.

Pau, A. K., & George, J. M. (2014). Antiretroviral therapy: Current drugs. *Infectious Disease Clinics of North America*, *28*(3), 371–402.

Platt, L., French, C.E., McGowan, C.R., Sabin, K., Gower, E., Trickey, A., McDonald, B., Ong, J., Stone, J., Easterbrook, P… Vickerman, P. (2020). Prevalence and burden of HBV co-infection among people living with HIV: A global systematic review and metaanalysis. *Journal of Viral Hepatitis; 27*(3), 294-315.

Ranjbar, R., Davari, A., Izadi, M., Jonaidi, N., & Alavian, S.M. (2011). HIV/HBV coinfections: epidemiology, natural history, and treatment: a review article. *Iranian Red Crescent Medical Journal*, *13* (12), 855–862.

Royce, R.A, Sena, A., Cates, W. Jr. & Cohen, M.S. (2007). Sexual transmission of HIV. *New England Journal of Medicine, 336*(15), 1072-1078.

Sharp, P. M., Shaw, G. M., & Hahn, B. H. (2005). Simian immunodeficiency virus infection of chimpanzees. *Journal of Virology*, *79*(7), 3891-3902.

Thio, C.L. (2009). Hepatitis B and human immunodeficiency virus coinfection. *Hepatology*, *49*, S138-S145.

Tounkara, A., Sarro, Y.S., Kristensen, S., Dao, S., Diallo, H., & Diarra, B. (2009). Seroprevalence of HIV/HBV co-infection in Malian blood donors. *Journal International Association of Pysicians AIDS Care (Chic*), *8*(1), 47-51.

World Health Organization (2022). *HIV*. Retrieved from https://www.who.int/data/gho/data/themes/hiv-aids.