Sero-prevalence of HBV and HIV Co-infection in the Senatorial Districts of Ekiti State, Southwest, Nigeria

Abstract

Hepatitis is an inflammatory disease of the liver which can be acute or chronic. It can be caused by viruses (viral hepatitis), certain chemicals, drugs, prolonged or excessive consumption of alcohol (alcoholic hepatitis), some genetic abnormalities or a dysfunctional immune system (autoimmune hepatitis). And of the five types of viral hepatitis, HBV infection is the most virulent and infectious. According to a CDC (Centres for Disease Control and Prevention) estimate, nearly 300 million people are infected with hepatitis B virus (HBV), globally. It is a major public health challenge in most countries of the world, particularly in endemic areas. If HBV infection is bad for the general (healthy) populace, it is worse for the people living with HIV (PLWH). While HIV in PLWH helps to weaken or wreck the immune system, HBV attacks the liver- the most important organs in the body as far metabolism of drugs and related substances are concerned. This thus makes an already bad situation for the PLWH complicated and difficult to manage. It is critical and vital to screen all PLWH for HBV infection or assess their risks of contracting HBV infection. In the light of this, this study was designed to determine the sero-prevalence of HIV- HBV co-infection among PLWH/suspected PLWH in the three senatorial districts in Ekiti State (southwest, Nigeria).To do this, 209 PLWH/suspected PLWH were consecutively enrolled in the study population. The PLWH/suspected PLWH attending anti-retroviral (ARV) various clinics in the districts were re-screened with enzyme linked immunosorbent assay (ELISA) to establish that they were truly HIV positive. They were also screened for HBV using a rapid test kit and ELISA. Self-administered questionnaires were served on the subjects in order to collect their demographic data and investigate likely predisposing factors. Both descriptive and

inferential statistical analyses were carried out using different statistical techniques with the aid of SPSS. The results of the study indicated that 29 of the subjects had HIV- HBV co-infection, thus representing an overall co-infection prevalence of 13.9%. One hundred and sixty-two of the subjects were HIV positive, representing 78% of the study population. Twelve (5.4%) were negative to both HIV and HBV, while 6 (2.9%) were positive to HBV but negative to HIV. The study investigated the association between certain demographic variables and HBV, viz; age, gender, marital status, religion, tribe and occupation and some risk factors like smoking, use of sharp objects in initiation procedures. Subjects within the 26-35years age bracket had the highest HBV rate (6.3%), while 56-65 had the least (0.5%), female subjects had higher rate (11.7%) than the male subjects No significant association was established between HBV and any of the demographic variable or suspected risk factors. The findings of this study have shown that the prevalence of HIV-HBV co-infection among people living with HIV/AIDS in Ekiti State is relatively on the high side. It is therefore suggested that Ekiti State should vaccinate all children in the state against hepatitis, especially HBV, free of charge. And preferably, the government should heavily subsidise shepatitis vaccination for adults in the state.

Keywords: Hepatitis, HBV, HIV, co-infection, Ekiti, Senatorial districts

Introduction

The need for regular surveys about the prevalence of HBV in the general populace on one hand and HBV among people living with HIV (PLWH) on the other hand cannot be over-emphasised (Nasidi *et al*., 1986; Hall *et al*., 2008). This is especially true in sub-Saharan Africa and resource-limited settings where risky sexual practices and other behaviour are rife and rampant (Hilton *et al*., 2008). Though PLWH who are able to access quality anti-retroviral care now live and lead normal life like any other person and they also now live

longer, HBV infection is a serious challenge to the chemotherapeutic management of HIV. Hepatitis – which shares common transmission routes with HIV- significantly alters the pathogenesis and pathology of HIV infection and worsens its prognosis. While HIV attacks the PLWHs' immunity- by depleting the $CD4^+$ sub-population of T-lymphocytes- HBV infection complicates the clinical scenario by attacking the liver- a critical organ in the metabolism and body's utilisation of drugs. Though acute hepatitis may be challenging to clinically detect in adults, spontaneous resolution is not uncommon among most immune-competent adults whose antibodies against hepatitis B surface antigen (anti-HBs) can be detected (Thimme *et al.*, 2005). Roughly one out of ten immune-competent adults will progress to chronic infection (Fattovich *et al.*, 1991), whereas 20% of those with chronic infection may likely develop cirrhosis in 1–13 years (Fattovich *et al.*, 1995). Hepatocellular carcinoma and decompensated liver diseases are likely to occur respectively in 6 and 23% of patients with cirrhosis (McGovern, 2007). In fact, it's been estimated that PLWH who are co-infected with HBV have about 5-6 times higher risk of developing hepatocellular carcinoma (Shiels and Engels, 2017; Hleyhel *et al.*, 2014; Robbins *et al.*, 2014; Soriano *et al.*, 2009). HBV-HIV co-infection increases the progression of HBV infection by suppressing the immune response of the host (McGovern, 2007). This increases HBV replication significantly and triggers severe hepatocellular damage (Colin *et al.*, 1999; Gurtler, 2014). HBV-HIV co-infected PLWH show fibrosing cholestatic hepatitis (Revill *et al.*, 2007; Warner and Locarnini 2008) and changes in the hepatic cytokine environment (Thio, 2009; Sveghati-Baron and Minicis 2009; Bruno *et al.*, 2008). PLWH with HIV co-infection are at a high risk of contracting chronic HBV infection (Koblin *et al.*, 1992; Di Martino *et al.*, 2002; Thio *et al.*, 2004). This study aimed at determining the sero-prevalence of HBV-HIV co-infection among PLWH accessing anti-retroviral drugs in the three senatorial districts of Ekiti State, southwest, Nigeria. It investigated the

association between HBV and certain demographic variables as well as likely risk factors

Study Area

The study was carried out in Ekiti State (southwest, Nigeria).Ekiti State was created on 1st October 1996 from Ondo State, with Ado Ekiti is the capital. It has 16 Local Government Areas with a population of 2.4 million (2006 census).A referral centre was used in each of the three senatorial districts of the state as sample collection site.

Sample Size

The sample size for the study was calculated to be 209 using the formula according to Araoye (2003)

Study Subjects

A total of 209patients aged 6 to 65 years attending outpatient department (OPD) and antiretroviral therapy (ART} clinics of the Ekiti State University Teaching Hospital, Ado Ekiti, Federal Teaching Hospital, Ido Ekiti, State Specialist Hospital, Ikere Ekiti constituted the subjects for this study.

Ethical Approval

Ethical clearance was obtained from the Research and Ethics Committee of the Ekiti State University Teaching Hospital Ado Ekitii and Federal Teaching Hospital, Ido Ekit

i

Inclusion and Exclusion Criteria

The participants in this study were aged 6 to 65 years regardless of gender, ethnicity or tribe. The participants who agreed to sign an informed consent form after being informed of the nature, the procedure of the study, the potential benefits and the foreseeable risks were recruited. Patients with history of jaundice were excluded from this study

Administration of Questionnaires

Self-administered questionnaires were served on the subjects in order to get their demographic data and investigate likely risk factors associated with HBV.

.

Sample Analysis

The subjects were re-screened for HIV with arapid screening test-kit, Determine® HIV 1/2 manufactured by Alere Medical (Japan) using parallel screening algorithm. Results of the rapid test kit were confirmed with enzyme linked immune-sorbent assay (ELISA) kits manufactured by Biorad Monolisa (France).

Subjects were also screened for HBV using rapid test kit Diaspot® manufactured in Belgium. Results of the rapid test kit were confirmed with enzyme linked immune-sorbent assay (ELISA) kits manufactured by Biorad Monolisa, (France).

Results

Two hundred and nine (209) subjects were enrolled into the study from the three senatorial districts of Ekiti State. Out of this, twenty-nine subjects were doubly positive to HIV and HBV, thus giving a co-infection prevalence of 13.9% in Ekiti State. One hundred and sixty-two (78%) of the subjects were HIV positive, 6 (2.9%) were positive to HBV, while 12 (5.74%) were negative to both HIV and HBV (see Table 1)

Table 1: Overall Prevalence of HIV-HBV Co-infection in Ekiti State

		HBV		
		Negative	Positive	Total
HIV	Negative	12	6	18
	Positive	162	29 (13.9%)	191
	Total	174	35	209

On senatorial basis, sixty-nine subjects (representing 33%) were enrolled from Ekiti North Senatorial District. Nine (representing 4.3% of the total population) were positive to HBV, while 60 (28.7%) were negative. In Ekiti South, there were 60 (representing 28.7%) subjects, out of which 10 (4.78%) were positive to HBV and 50 (23.9%) were negative. In Ekiti Central, 80 (representing38.3%) subjects were recruited into the study. Out of this, 16 (7.66%) were positive to HBV, while 64 (30.6%) were negative (see Table 2).

Table 2: Prevalence of HIV-HBV Co-infection in Ekiti State's Senatorial Districts

	HBV		
Senatorial Districts	Negative	Positive	Total
Ekiti North	60 (28.7)	9 (4.3)	69 (33)

EkitiCentral	64 (30.6)	16 (7.66)	80(38.3)
Ekiti South	50 (23.9)	10 (4.78)	60(28.7)
Total	174	35	209

Figures in parenthesis are percentages

Demographic Association

The study investigated the association between certain demographic variables and HBV, viz; age, gender, marital status, religion, tribe and occupation.

12(5.9%) of the subjects were in the 6-15 years age-bracket, while 20(9.7%), 53(25.7%), 71(34.5%), 37(18.0%) and 13(6.3%) respectively were in the 16-25, 26-35, 36-45, 46-55- and 56-65-years age-brackets. 2(1.0%) of the subjects were positive to HBV, while 5(2.5%), 3(6.3%), 10(4.9%), 3(1.5%) and 1(0.5%) respectively were positive in the 16-25, 26-35, 36-45, 46-55 and 56-65 years age-brackets. There was no statistically significant association between HBV and the age of the subjects ($p<0.05$) (see Table 3a)

Investigation of the association between the gender of the subjects and HBV revealed that: 68(33%) of the subjects were males, while 138(67%) were females. 10male (4.9%) subjects were positive to HBV, while 24 (11.7%) females were negative. There was no statistically significant association between HBV and the gender of the subjects at ($p>0.05$) (see Table 3a)

Analysis of the association between the marital status of the subjects and HBV revealed that: 49(23.8%) of the subjects were single, while 144(69.9%),9(4.4%) and 4(2.0%) respectively were married, divorced or of other marital status. 10of the single (4.9%%) subjects were positive to HBV, while 23 (11.2%), 0(0.0%) and 1 (0.5%) married, divorced and of other marital status respectively were positive to HBV. There was a statistically significant association between HBV and the marital status of the subjects at ($p<0.05$) (see Table 3a)

Table 3a: Association Between HBV and Demographic Variables

	Negative	Positive	Total	*Chi-*	P-value

					square	
Age	6-15	10 (4.9%)	2 (1.0%)	12 (5.9%)		
	16-25	15 (7.3%)	5 (2.5%)	20 (9.7%)		
	26-35	40 (19.4%)	13 (6.3%)	53 (25.7%)		
	36-45	61 (29.6%)	10 (4.9%)	71 (34.5%)		
	46-55	34 (16.5%)	3 (1.5%)	37 (18.0%)		
	56-65	12 (5.8%)	1 (0.5%)	13 (6.3%)		
	Total	172 (83.5)	34 (16.5%)	206 (100.0%)	6.451	.265
Gender	Male	58 ((28.2%)	10 (4.9%)	68 (33.0%)		
	Female	114 (55.3%)	24 (11.7%)	138 (67.0%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	.238	.625
Marital Status	Single	39 (18.9%)	10 (4.9%)	49 (23.8%)		
	Married	121 (58.7%)	23 (11.2%)	144 (69.9%)		
	Divorced	9 (4.4%)	0	9 (4.4%)		
	Others	3 (1.5%)	1 (0.5%)	4 (2.0%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0)	2.560	.465

Key: ** significant value at $p<0.05$ Figures in parenthesis are percentages

Analysis of the association between the religion, tribe and occupation of the subjects and HBV revealed that: 172(83.5%) of the subjects were Christians, while 33(16.0%), 1(0.5%), and 0 (0%) respectively were Muslims, traditional

practitioners and of other religions.27 (13.1%) of the Christian subjects were positive to HBV, 7(3.4%) of the Muslim subjects were positive, while the other faith types were negative to HBV. There was no statistically significant association between HBV and the religion of the subjects ($p>0.05$) (see Table 3b)

Tribe-wise 156 (75.7%), 22(10.7%), 16(7.8)% and 12 (5.8%) respectively of the subjects were Yoruba, Igbo, Hausa and of other tribes. 29(14.1%) of the Yoruba subjects were positive to HBV, while 2(1.0%), 2(1.0%) and 1(0.5%) Igbo, Hausa and other tribes respectively were positive to HBV. There was no statistically significant association between HBV and the tribe of the subjects ($p>0.05$) (see Table 3b)

Occupation-wise 42(20.4%), 19(9.3%), 64(31.1%), 17(8.3%), and 26 (12.6%) respectively of the subjects were civil servants, privately employed, medical personnel, petty traders, artisans and unemployed.5 (2.4%) of the civil servants were positive to HBV, while 10(4.9%), 2(1.0%), 10(4.9%), 2(1.0%) and 5(4.9%) of the privately employed, medical personnel, petty traders, artisans and unemployed subjects respectively were positive to HBV. There was no statistically significant association between HBV and the occupation of the subjects ($p>0.05$) (see Table 3b)

Table 3b: Association Between HBV and Demographic Variables (continued)

	Negative	Positive	Total	Chi-	p-value

					square	
Religion	Christianity	145 (70.4%)	27 (13.1%)	172 (83.5%)		
	Islam	26 (12.6%)	7 (3.4%)	33 (16.0%)		
	Traditional	1 (0.5%)	0	1 (0.5%)		
	Others	-	-	-		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	.810	.667
Tribe	Yoruba	127 (61.7%)	29 (14.1%)	156 (75.7%)		
	Igbo	20 (9.7%)	2 (1.0%)	22 (10.7%)		
	Hausa	14 (6.8%)	2 (1.0%)	16 (7.8%)		
	Others	11 (5.3%)	1 (0.5%)	12 (5.8%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	2.137	.544
Occupation	Civil servants	33 (16.0%)	5 (2.4%)	38 (18.4%)		
	Private Employment	32 (15.5%)	10 (4.9%)	42 (20.4%)		
	Medical personnel	17 (8.3%)	2 (1.0%)	19 (9.3%)		
	Petty traders	54 (26.2%)	10 (4.9%)	64 (31.1%)		
	Artisans	15 (7.3%)	2 (1.0%)	17 (8.3%)		
	Unemployed	21 (10.2%)	5 (2.4%)	26 (12.6%)		

Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	2.881	.718

Figures in parentheses are percentages

Analysis of the association between HBV and certain risk factors – smoking, use of sharp objects in initiations, patronage of commercial sex-workers, knowledge of own HBV status, tattoo and use of hard drugs- revealed that: 34(16.5%) of the subjects were cigarette-smokers and 172(83.5) out of this were positive to HBV. The study was able to establish a statistically significant association between smoking and HBV (p=0.03), thus indicating that smoking is an established risk factor for hepatitis B infection (see Table 4).

28(13.6%) of the subjects admitted that they had either used sharp objects in initiation procedures before or were currently practicing such as at the time of the study and 3(1.5%) of the sharp-objects users tested positive to HBV (see Table 4).26(12.6%) of the subjects were patrons/clients of commercial sex-workers and 4(1.9) of them were positive to HBV (see Table 4). Only 62(30.1%) of the subjects knew their HBV status and 12(5.8%) of those who knew their HBV status were positive to HBV, there was no association between knowledge of own HBV status and HBV (p=0.963)(see Table 4)

16(7.8%)of the subjects were tattooers and 4(2.0%) of them tested positive to HBV. A significant (p=0.046) association was established between tattooing and HBV (see Table 4).36(17.5)of the subjects were hard-drug users and 8(3.9%) of them were positive to HBV (see Table 4).

Table 4: Association Between HBV and Risk Factors

		Negative	Positive	Total	*Chi*-square	P-value
Smoking	Yes	28 (13.6%)	6 (2.9%)	34 (16.5%0		
	No	144 (69.9%)	28 (13.6%)	172 (83.5%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.5%)	0.039	0.844
Use of Sharp Objects	Yes	25 (12.1%)	3 (1.5%)	28 (13.6%)		
	No	147 (71.4%)	31 (15.0%)	178 (86.4%)		
	Total	172 (83.5%)	34 (16.5%)	206		0.375
Patronage of commercial sex-workers	Yes	22 (10.7%)	4 (1.9%)	26 (12.6%)		
	No	150 (72.8%)	30 (14.6%)	180 (87.4%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	0.027	0.869
Knowledge of own HIV Status	Yes	50 (24.3%)	12 (5.8%)	62 (30.1%)		
	No	122 (59.2%)	22 (10.7%)	144 (69.9%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	0.523	0.470
Tat too	Yes	12 (5.9%)	4 (2.0%)	16 (7.8%)		
	No	158 (77.5%)	30 (14.7%)	188 (92.2%)		
	Total	170 (83.3%)	34 (16.7%)	204 (100.0%)	0.868	0.351
Use of Ha rd	Yes	28 (13.6%)	8 (3.9%)	36 (17.5%)		
	No	144 (69.9%)	26 (12.6%)	170 (82.5%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	1.035	0.309

AssociationBetween HIV Demographic Variables

The study investigated the association between certain demographic variables and HIV, viz; age, gender, marital status, religion, tribe and occupation.

12(5.8%) of the subjects were in the 6-15 years age-bracket, while 20(9.7%), 53(25.7%), 71(34.5%), 37(18.0%) and 13(6.3%) respectively were in the 16-25, 26-35, 36-45, 46-55 and 56-65 years age-brackets. Also, 11(5.3%) of the subjects were positive to HIV, while 17(8.3%), 45(21.8%),66(32.0%), 36(17.5%) and 9(4.4%) respectively were positive in the 16-25, 26-35, 36-45, 46-55 and 56-65 years age-brackets. There was no statistically significant association between HIV and the age of the subjects ($p>0.05$) (see Table 5a).

Investigation of the association between the gender of the subjects and HIV revealed that: 68(33%) of the subjects were males, while 138(67%) were females. 61 male (29.6%) subjects were positive to HIV, while 123 (59.7%) females were negative. There was no statistically significant association between HIV and the gender of the subjects at ($p>0.05$) (see Table 5a)

Analysis of the association between the marital status of the subjects and HIV revealed that: 49(23.8%) of the subjects were single, while 144(69.9%), 9(4.4%) and 4(2.0%) respectively were married, divorced or of other marital status. 42 of the single (20.4%%) subjects were positive to HIV, while 130 (63.1%), 8(3.9%) and 4(1.9%) married, divorced and of other marital status respectively were positive to HIV. There was a statistically significant association between HIV and the marital status of the subjects at ($p<0.05$) (see Table 5a)

Table 5a: Association Between HIV and Demographic Variables

		Negative	Positive	Total	*Chi*-square	P-value
Age	6-15	1 (0.5%)	11 (5.3%)	12 (5.8%)		
	16-25	3 (1.5%)	17 (8.3%)	20 (9.7%)		
	26-35	8 (3.9%)	45 (21.8%)	53 (25.7%)		
	36-45	5 (2.4%)	66 (32.0%)	71 (34.5%)		
	46-55	1 (0.5%)	36 (17.5%)	37 (18.0%)		
	56-65	4 (1.9%)	9 (4.4%)	13 (6.3%)		
	Total	22 (10.7%)	184 (89.3%)	206 (100.0%)	10.497	0.062
Gender	Male	7 3.4%	61 29.6%	68 (33.0%)		
	Female	15 7.3%	123 59.7%	138 (67.0%)		
	Total	22 10.7%	184 89.3%	206 (100.0%)	.016	.900
Marital Status	Single	7 3.4%	42 20.4%	49 (23.8%)		
	Married	14 6.8%	130 63.1%	144 (69.9%)		
	Divorced	1 0.5%	8 3.9%	9 (4.4%)		
	Others	0 0.0%	4 1.9%	4 (2.0%)		
	Total	22 10.7%	184 89.3%	206 (100.0)	1.286	..732

Key: ** significant value at p<0.05 Figures in parenthesis are percentages

Analysis of the association between the religion, tribe and occupation of the subjects and HIV revealed that: 172(83.5%) of the subjects were Christians, while 33(16.0%), 1(0.5%), and 0 (0%) respectively were Muslims, traditional practitioners and of other religions.154 (74.8%) of the Christian subjects were positive to HIV, 29(14.1%) of the Muslim subjects were positive, 1(0.5%) of the traditional subjects were positive while the other faith types were negative to HBV. There was no statistically significant association between HBV and the religion of the subjects ($p>0.05$) (see Table 5b)

Tribe-wise 156 (75.7%), 22(10.7%), 16(7.8)% and 12 (5.8%) respectively of the subjects were Yoruba, Igbo, Hausa and of other tribes. 139 (67.5%) of the Yoruba subjects were positive to HIV, while 20(9.7%), 14(6.8%) and 11(5.3%) Igbo, Hausa and other tribes respectively were positive to HIV. There was no statistically significant association between HIV and the tribe of the subjects ($p>0.05$) (see Table 5b)

Occupation-wise 42(20.4%), 19(9.3%), 64(31.1%), 17(8.3%), and 26 (12.6%) respectively of the subjects were civil servants, privately employed, medical personnel, petty traders, artisans and unemployed. 34 (16.5%) of the civil servants were positive to HIV, while 36(17.5%), 18(8.7%), 62(30.1%), 12(5.8%) and 22(10.7%) of the privately employed, medical personnel, petty traders, artisans and unemployed subjects respectively were positive to HBV. There was no statistically significant association between HBV and the occupation of the subjects ($p>0.05$) (see Table 5b)

Table 5b: Association Between HIV and Demographic Variables (continued)

		Negative	Positive	Total	Chi-square	p-value
Religion	Christianity	18 8.7%	154 74.8%	172 (83.5%)		
	Islam	4 1.9%	29 14.1%	33 (16.0%)		
	Traditional	0 0.0%	1 0.5%	1 (0.5%)		
	Others	-	-	-		
	Total	22 10.7%	184 89.3%	206 (100.0%)	.200	.905
Tribe	Yoruba	17 8.3%	139 67.5%	156 (75.7%)		
	Igbo	2 1.0%	20 9.7%	22 (10.7%)		
	Hausa	2 1.0%	14 6.8%	16 (7.8%)		
	Others	1 0.5%	11 5.3%	12 (5.8%)		
	Total	22 10.7%	184 89.3%	206 (100.0%)	.191	.797
Employment	Civil servants	4 1.9%	34 16.5%	38 (18.4%)		
	Private	6 2.9%	36 17.5%	42 (20.4%)		
	Medical personnel	1 0.5%	18 8.7%	19 (9.3%)		
	Petty traders	2 1.0%	62 30.1%	64 (31.1%)		
	Artisans	5 2.4%	12 5.8%	17 (8.3%)		

Unemployed	4 1.9%	22 10.7%	26 (12.6%)		
Total	22 10.7%	184 89.3%	206 (100.0%)	2.881	.718

Figures in parentheses are percentages

Analysis of the association between HIV and certain risk factors – smoking, use of sharp objects in initiations, patronage of commercial sex-workers, knowledge of own HIV status, tattoo and use of hard drugs- revealed that: 34 (16.5%) of the subjects were cigarette-smokers and 29(14.1%) out of this were positive to HIV. The study was able to establish a statistically significant association between smoking and HIV (p=0.03), thus indicating that smoking is an established risk factor for hepatitis B infection (see Table 6).

28(13.6%) of the subjects admitted that they had either used sharp objects in initiation procedures before or were currently practicing such as at the time of the study and 3(1.5%) of the sharp-objects users tested positive to HIV (see Table 4). 26 (12.6%) of the subjects were patrons/clients of commercial sex-workers and 4(1.9%) of them were positive to HBV (see Table 4). Only 62 (30.1%) of the subjects knew their HIV status and 136(66.7%) of those who knew their HBV status were positive to HIV, there was no association between knowledge of own HIV status and HBV (p=0.963) (see Table 6)

16(7.8%) of the subjects hadtattoos and 13(6.4%) of them tested positive to HIV. A significant (p=0.046) association was established between tattooing and HIV (see Table 4). 31(15.0%) of the subjects were hard-drug users and 8(3.9%) of them were positive to HIV (see Table 6).

Table 6: Association Between HIV and Risk Factors

		Negative	Positive	Total	*Chi*-square	P-value
Smoking	Yes	5 2.4%	29 14.1%	34 (16.5%0		
	No	17 8.3%	155 75.2%	172 (83.5%)		
	Total	22 10.7%	184 89.3%	206 (100.5%)	0.039	0.844
Use of Sharp Objects	Yes	2 1.0%	26 12.6%	28 (13.6%)		
	No	20 9.7%	158 76.7%	178 (86.4%)		
	Total	22 10.7%	184 89.3%	206		0.375
Patronage of commercial sex-workers	Yes	22 (10.7%)	4 (1.9%)	26 (12.6%)		
	No	150 (72.8%)	30 (14.6%)	180 (87.4%)		
	Total	172 (83.5%)	34 (16.5%)	206 (100.0%)	0.027	0.869
Knowledge of own HIV Status	Yes	17 8.3%	136 66.7%	153 75.0%		
	No	3 1.5%	38 18.6%	41 20.1%		
	I've never care to know	2 1.0%	8 3.9%	10 4.9%		
	Total	22 10.8%	182 89.2%	204 100.0%	1.412	0.494
Tattoo	Yes	3 1.5%	13 6.4%	16 (7.8%)		
	No	19 9.3%	169 82.8%	188 (92.2%)		
	Total	22 10.8%	182 89.2%	204 (100.0%)	0.868	0.351
Use of Hard Drug	Yes	5 2.4%	31 15.0%	36 (17.5%)		
	No	17 8.3%	153 74.3%	170 (82.5%)		
	Total	22 10.7%	184 89.3%	206 (100.0%)	.471	0.493

Discussion

The co-infection of HIV and hepatitis B virus (HBV) has emerged as a major public health worry in the past years. As the HIV epidemic spreads, so does the risk of PLWH contracting HBV infection. HIV-HBV co-infection occurs when PLWH is infected with HBV, this can be either through a single exposure or subsequent exposures to both viruses. HIV-HBV co-infection is particularly unsettling becauseof the high morbidity and mortality associated with it, and the fact that it makes the management of HIV challenging. The risk of PLWH contracting HBV is high due to common transmission routes shared by HIV and HBV (Cheng, *et al*., 2021, Shun and Sherman, 2005; Utsun and Lusida, 2015; Kaspar and Sterling; Wyles, 2019).

With about 250million suffering from chronic hepatitis worldwide (Potthoff *et al*., 2010; Mavilia and Wu, 2018; Venook *et al*., 2010; El-Serg and Rudoph, 2007), hepatitis is a serious public health challenge in many parts of the world.

The rate of HBV-HIV co-infection could be as high as 28% in some regions of the world (Kourtis *et al*., 2012; Dunford *et al*., 2012; Templeton *et al*., 2015; Bell *et al*., 2012). Prevalence as high as 28% has been in Vietnam, where (Dunford *et al*., 2012) perinatal transmission, close household contact during childhood, and unsafe cultural practices speed up the spread of infection. (Kourtis *et al*., 2012; Modi and Feld, 2007). Among same-sex couples rates could vary from 9 to 17% (Sun *et al*., 2014). The overall HIV-HBV co-infection

sero-prevalence in this study is 13.9%. The national sero-prevalence of HIV in Nigeria is 1.4%, while that of HBV and HCV respectively is 12.2 -14% and 2.8-24.2% (Pennap *et al*., 2016; Ahinge *et al*., 2013; Omote *et al*., 2018; Olayinka *et al*., 2016). This compares favourably with a similar study conducted in Nasarawa State, where the prevalence was found to be 11% (Okwori *et al*., 2013). This however is slightly lower than the global estimate of 7.6% prevalence obtained by Platt *et al.*, (2022) in their meta-analysis. Also, the co-infection prevalence obtained by Adesegun *et al* (2020) is roughly half of that obtained by this present study and that of Okwori *et al* (2013). Kye-Duodu *et al* (2016) in their own study in eastern Ghana got a co-infection prevalence of 8.8%. Zenebe and his colleagues (Zenebe et al, 2014) however in their own study got prevalence as high as 19% in the city of Bahir Dar, northwest Ethiopia.

In this present study, subjects in the 25-35 years age-bracket had the highest positivity rate (4.53%) to HBV. Not surprisingly, subjects within 56-65 years age-bracket had the least positivity rate to HBV (0.5 %). A very likelyreason for this could be the sexuality and risk-taking behaviour of the subjects. Being sexually active and risky sexual behaviours tend to increase the likelihood that somebody will contract sexually transmitted infection. And since both HIV and HBV can be transmitted sexually, the risk of the subjects in the fringe age-brackets seemed to be lower compared to subjects in other age-brackets. Oluremi *et al*., (2014) in their study among HIV positive patients receiving

treatment at State Specialist Hospital, Ikole-Ekiti, reported a similar outcome. The patients in the fringe age-brackets had 0% and 1 % positivity rate to HBV. In their own study, more than 80% of those who were positive to HBV were in the 30-49 age-brackets. In this present study, the female subjects had a higher HBV prevalence than the males. The females had 11.7% prevalence. This is contrary to the findings of Balogun *et al*., (2012) who got the opposite result.Also, in this present study of all the demographic factors analysed- age, gender, marital status, religion, tribe and occupation of the subjects, had no significant association with HBV infection and HIV-HBV co-infection.

Conclusion and Suggestion

The findings of this study have shown that the prevalence of HIV-HBV co-infection among people living with HIV/AIDS in Ekiti State is relatively on the high side. It is therefore suggested that, since hepatitis is fortunately a vaccine-preventable disease (unlike HIV), Ekiti State should vaccinate all children in the state against hepatitis, especially HBV, free of charge. And preferably, vaccination against hepatitis should be heavily subsidised by the government for all willing adults

References

1 Nasidi, A., Harry, T.O. and Ajose-coker, O.O (1986). Evidence of LAV/HTLV III infection and AIDS relation complex in Lagos, Nigeria. II International conference on *AIDS* (Abstract FRS6-3), Paris France.

2 Hall, H.I., Ruiguang, S. and Rhodes, P. (2008). Estimation of HIV incidence in the United States. *J. Amer. Med. Assoc.* 300:520-529.

3 Hilton, B.A, Thompson, R, Moore-Dempsey, L and Janzen, R.G. (2008). Harm reduction theories and strategies for control of HIV: a review of the Literature, *J. Adv. Nurs* 33(3):357-370

4 Thio CL. Hepatitis B and human immunodeficiency virus coinfection. *Hepatology*. (2009) 49(5 Suppl):S138–45. doi: 10.1002/hep.22883

5 Thimme R, Spangenberg HC, Blum HE. Hepatitis B or hepatitis C and human immunodeficiency virus infection. *J Hepatol*. (2005): 42(Suppl.1):S37–44. doi: 10.1016/j.jhep.2005.01.002

6 Fattovich G, Brollo L, Giustina G, Noventa F, Pontisso P, Alberti A Natural history and prognostic factors for chronic hepatitis type B. *Gut*. (1991) 32:294–8. doi: 10.1136/gut.32.3.294

7 Fattovich G, Giustina G, Schalm SW, Hadziyannis S, Sanchez-Tapias J, Almasio P. Occurrence of hepatocellular carcinoma and decompensation in western European patients with cirrhosis type B. The EUROHEP Study Group on Hepatitis B Virus and Cirrhosis. *Hepatology*. (1995) 21:77–82. doi: 10.1002/hep.1840210114

8 McGovern BH. The epidemiology, natural history and prevention of hepatitis B: implications of HIV coinfection. *Antiviral Ther*. (2007) 12(Suppl. 3):H3–13.

9 Koblin BA, Taylor PE, Rubinstein P, Stevens CE. Effect of duration of hepatitis B virus infection on the association between human immunodeficiency virus type-1 and hepatitis B viral replication. *Hepatology*. (1992) 15:590–2. doi: 10.1002/hep.1840150406

10 Di Martino V, Thevenot T, Colin JF, Boyer N, Martinot M, Degos F. Influence of HIV infection on the response to interferon therapy and the long-term outcome of chronic hepatitis B. *Gastroenterology*. (2002) 123:1812–22. doi: 10.1053/gast.2002.37061

11Thio CL, Netski DM, Myung J, Seaberg EC, Thomas DL. Changes in hepatitis B virus DNA levels with acute HIV infection. *Clin Infect Dis* (2004) 38:1024–9. doi: 10.1086/382534

12 Colin JF, Cazals-Hatem D, Loriot MA, Martinot-Peignoux M, Pham BN, Auperin A. Influence of human immunodeficiency virus infection on chronic hepatitis B in homosexual men. *Hepatology*. (1999) 29:1306– 10. doi: 10.1002/hep.510290447

13 Gürtler LG. Effect of antiretroviral HIV therapy on hepatitis B virus replication and pathogenicity. *Intervirology*. (2014) 57:212–7. doi: 10.1159/000360942

14 Revill PA, Littlejohn M, Ayres A, Yuen L, Colledge D, Bartholomeusz A, et al. Identification of a novel hepatitis B virus precore/core deletion mutant in

HIV/hepatitis B virus co-infected individuals. *AIDS*. (2007) 21:1701–10. doi: 10.1097/QAD.0b013e32826fb305

15 Warner N, Locarnini S. The antiviral drug selected hepatitis B virus rtA181T/sW172∗ mutant has a dominant negative secretion defect and alters the typical profile of viral rebound. *Hepatology*. (2008) 48:88–98. doi: 10.1002/hep.22295

16 Svegliati-Baroni G, De Minicis S. HIV protein gp120 and chemokines receptor for liver fibrosis. *Gut* (2010): 59:428–9. doi: 10.1136/gut.2009.195024

17 Bruno R, Galastri S, Sacchi P, Cima S, Caligiuri A, DeFranco R. gp120 modulates the biology of human hepatic stellate cells: a link between HIV infection and liver fibrogenesis. *Gut* (2010) 59:513 20.doi:10.1136/gut.2008.163287

18 Shiels MS, Engels EA. Evolving epidemiology of HIV-associated malignancies. Curr Opin HIV *AIDS* (2017) 12:6– 11 doi:10.1097/COH.0000000000000327

19 Hleyhel M, Hleyhel M, Bouvier AM, Belot A, Tattevin P, Pacanowski J. Risk of non-AIDS-defining cancers among HIV-1-infected individuals in France between 1997 and 2009: results from a French cohort. *AIDS* (2014) 28:2109–18. doi: 10.1097/QAD.0000000000000382

20 Robbins HA, ShielsMS, Pfeiffer RM, Engels EA. Epidemiologic contributions to recent cancer trends among HIV-infected people in the United States. *AIDS* (2014) 28:881–90. doi: 10.1097/QAD.0000000000000163

21 Soriano V, Vispo E, Labarga P, Medrano J, Barreiro P. Viral hepatitis and HIV co-infection. *Antiviral Res.* (2010) 85:303– 15. doi: 10.1016/j.antiviral.2009.10.021

22 Platt Lucy , Clare E French, Catherine R McGowan, Keith Sabin, Erin Gower, Adam Trickey, Bethan McDonald , Jason Ong, Jack Stone, Philippa Easterbrook, Peter Vickerman (2020): Prevalence and burden of HBV co-infection among people living with HIV: A global systematic review and meta-analysis. *J Viral Hepat* 27(3):294-315 doi: 10.1111/jvh.13217

23Kye-Duodu Gideon, Priscillia Nortey, Keziah Malm, Kofi Mensah Nyarko, Samuel Oko Sackey, Sampson Ofori, Edwin Andrews Afari (2016): Prevalence of hepatitis B virus co-infection among HIV-seropositive persons attending antiretroviral clinics in the Eastern Region of Ghana. *Pan Afr Med J* 1;25 (Suppl 1):7. doi: 10.11604/pamj.supp.2016.25.1.6172. eCollection 2016.

24 Zenebe Yohannes, Wondemagegn Mulu, Mulat Yimer, Bayeh Abera (2014); Sero-prevalence and risk factors of hepatitis B virus and human immunodeficiency virus infection among pregnant women in Bahir Dar city,

northwest Ethiopia: a cross sectional study. *BMC Infect Dis* 1;14:118 doi: 10.1186/1471-2334-14-118

25 Potthoff A, Manns MP, Wedemeyer H. Treatment of HBV/HCV coinfection. *Expert Opin Pharmacother*. (2010): 11:919–28. doi:10.1517/14656561003637659

26 Mavilia MG, Wu GY. HBV-HCV coinfection: viral interactions, management, and viral reactivation. *J Clin Transl Hepato*. (2018): 6:296–305. doi: 10.14218/JCTH.2018.00016

27 Venook AP, Papandreou C, Furuse J, de Guevara LL. The incidence and epidemiology of hepatocellular carcinoma: a global and regional perspective. *Oncologist* (2010): 15(Suppl. 4):5–13. doi: 10.1634/theoncologist.2010-S4-05

28 El-Serag HB, Rudolph KL. Hepatocellular carcinoma: epidemiology and molecular carcinogenesis. *Gastroenterology* (2007): 132:2557–76. doi: 10.1053/j.gastro.2007.04.061

29 Kourtis AP, BulterysM, Hu DJ, Jamieson DJ. HIV-HBV coinfection–a global challenge. *N Engl J Med* (2012): 366:1749–52. doi: 10.1056/NEJMp1201796

30 Dunford L, Carr MJ, Dean J, Nguyen LT, Ta Thi TH, Nguyen BT, et al. A multicentre molecular analysis of hepatitis B and blood-borne virus coinfections in Viet Nam. *PLoS ONE* (2012): 7:e39027. doi: 10.1371/journal.pone.0039027

31 Templeton DJ,Wright ST,McManus H, Lawrence C, Russell DB, LawMG, et al. Antiretroviral treatment use, co-morbidities and clinical outcomes among Aboriginal participants in the Australian HIV Observational Database (AHOD). *BMC Infect Dis* (2015): 15:326. doi: 10.1186/s12879-015-1051-4

32 Bell TG, Makondo E, Martinson NA, Kramvis A. Hepatitis B virus infection in human immunodeficiency virus infected southern African adults: occult or overt–that is the question. *PLoS ONE* (2012): 7:e45750. doi: 10.1371/journal.pone.0045750

33 Sun HY, ShengWH, TsaiMS, Lee KY, Chang SY, Hung CC. Hepatitis B virus coinfection in human immunodeficiency virus-infected patients: a review. *World J Gastroenterol* (2014): 20:14598–614. doi: 10.3748/wjg.v20.i40.14598

34 Modi AA, Feld JJ. Viral hepatitis and HIV in Africa. *AIDS Rev* (2007): 9:25–39

35 Pennap G, Nuhu I, Oti V. Prevalence of hepatitis C virus infection among people attending a voluntary screening centre in Masaka, Nasarawa State, Nigeria. *Asia J Appl Microbiol.* (2016): 3(3):31–37

36 Ahinge Godwin I, Malu Abraham O, Mbaave Peter T, Bitto Terkaa T, Shaahu Vivian N, Mohammed Hameed. Prevalence of hepatitis C in Makurdi, North Central Nigeria. *IOSR J Dent Med Sci*. (2013): 7(5):6–10

37 Omote Victor, Emmanuel Kashibu, Isreal Ojumah, Danjuma Adda, Johnson Etaghene, Henry Ukwamedua. Serological screening of hepatitis B virus and hepatitis C virus among patients attending a tertiary hospital in Jalingo, Taraba state, Nigeria. *Saudi J Heal Sci*. (2018): 7(3):167

38 Olayinka Adebola T, Akin Oyemakinde, Muhammad Balogun S, Anthonia Ajudua, Patrick Nguku, Moses Aderinola, et al. Seroprevalence of Hepatitis B infection in Nigeria: a national survey. *Am J Trop Med Hyg* (2016): 95(4):902–907

39 Okwori, A.E.J, Alabi, S.S, Ngwai, Y.B, Makut, M.D, Obiekezie, S.O, Ishaleku, D, Gabo, S, Akogwu, N. G, Anejo Okopi, J, Ameh, J. The Seroprevalence of Hepatitis B and C Virus Co-Infection among HIV-1-infected

Patients in Keffi, North Central Nigeria (2013): *IOSR J. Den Med Sci* 9 (5) 70-75

40 Adesegun Oluwaseyitan Andrew, Olabiyi Hezekiah Olaniran, Emmanuel Bamidele, Joseph Nicholas Inyang, Michael Adegbe, Tolulope Oyinloluwa Binuyo, Osaze Ehioghae, Oluwafunmilola Adeyemi, Oyekunle Oyebisi, Akolade Olukorede Idowu, and Oluwafemi Ajose. HIV-hepatitis co-infection in a rural community in Northern Nigeria (2020): *Pan Afr Med J.* 2020; 36: 352 doi: 10.11604/pamj.2020.36.352.23978

41 Balogun TM, Emmanuel S and Ojerinde EF. HIV, Hepatitis B and C viruses' coinfection among patients in a Nigerian tertiary hospital (2012): *Pan Afr Med J* 12 (1) eISSN: 1937-8688

42 Oluremi Adeolu Sunday , Oluyinka Oladele Opaleye, Bosede Abimbola Babalola, Mujeeb Shittu and Oladipo Abayomi. Coinfection of Hepatitis B and C virus among HIV Patients Visiting Specialist Hospital in Ikole Ekiti, Nigeria (2014): *J Med Sci and Cli Res* 2 (11) 2933-2939