Co-Infection of Human Immuno-Deficiency Virus HIV and Viral Hepatitis (B And Or C) Among People Living With HIV in Taraba State

Danjuma Kamlen Adda[1], Obed Tiwah John[2*], Abdulhafiz Lamiya[3]

[1,2,3] *Center For Initiative and Development Taraba, Nigeria*

[2]*Department of Statistics and Operations Research, Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria*

**Corresponding author*

Abstract: **Co-infection is a phenomenon in which a person acquires multiple infections concurrently. Co-infections of HIV with hepatitis B and or hepatitis C (HCV) virus (es) among others are major public health problems. In Nigeria, there is a limited knowledge on viral hepatitis amongst at-risk populations (PLHIV). Taraba state is ranked as the state with the highest rate of both hepatitis B and C infections. Thus, this study sought to seek for causes and effects of relationship from the three groups of viruses namely; Hepatitis B virus, Hepatitis C virus and Human immunodeficiency virus as it affects human beings with specific objectives of determining the prevalence and co-infections of the viruses amongst people living with HIV (PLHIV) in federal medical center Jalingo (FMCJ). A cross sectional study was conducted among 237 PLHIV in FMCJ of which blood samples as well as demographic data were obtained after the mandatory pretest counselling with informed consent from the client. All samples were analyzed for hepatitis B surface antigen (HBsAg) and hepatitis C antibodies using rapid diagnostic test kits. Data were entered into Microsoft Excel and SPSS version 25 of which reliability and validity test were checked using Alpha Cronbach. Out of the subjects (PLHIV) sampled, 37 (15.6%) subjects had serum samples positive for HBsAg, whilst 38 (16%) subjects had samples positive for anti-HCV. Four subjects were positive for both HBV and HCV (1.7%). There was no statistical significant association between HBV and HCV Positive cases. The prevalence of the triple infection (HIV + HCV + HBV) was 4(1.7%) of which all occurred among female PLHIV. The prevalence of both HBV and HCV infection were high among female PLHIV than Male PLHIV that is 30(12.7%) against 7(3%) for HBV and 32(13.5%) against 6(2.5%) for HCV respectively. This study reported high prevalence of hepatotropic viruses (HBV and HCV) and coinfections among PLHIV in FMCJ. Findings from this study are of great public health concern due to the fatality rate associated with the triple infection. Thus, Screening for these viruses among HIV/AIDS patients is advocated and recommended as this will allow for early detection and proper management.**

Keywords: **Coinfection, Hepatitis B Virus, Hepatitis C Virus, Human Immuno-deficiency Virus**

I. INTRODUCTION

Co-infection is a phenomenon in which a person acquires multiple infections concurrently [1]. This is of utmost health importance because of the associated consequences that follows due to interaction between the parasites or their activities on the host. Human immunodeficiency virus (HIV) is retrovirus that targets and destroys human immune system which exposes the body to opportunistic infections. Unmanaged HIV infection allows the continues destruction and impairment of the functions of the immune cells in most infected individuals which allows them to gradually become immunodeficient a term known as acquired immunodeficiency syndrome AIDS [2]. Globally, it is estimated that about 37 million people are infected or living with HIV and approximately two thirds of the infected individuals live in Sub-Saharan Africa [3]. HBV and HCV are hepatotrophic viruses that account for 96% of all hepatitis mortality [4]. More than 250 million and 70 million people are also estimated to be chronically infected with HBV and HCV at the global scale, respectively [5]. Nigeria is one of the countries in sub-Saharan Africa with high burden of HBV infection [6] with HBV prevalence of 8.1% and HCV at 1.1% [7]. Co-infection of HIV with HBV or HCV are major public health problems worldwide [3,8]. Globally, it is estimated that approximately 7.4% of people living with HIV (PLHIV) are chronically HBV infected and 1.0 % HCV infected [9]. [10] Stated that the highest rate is found in Africa and Asia with the lowincome countries receiving the highest burden. The co-infection occurs due to the shared mode of transmission of the viruses (HIV, HBV and HCV) [11] compromised immunity that makes the body susceptible to infection and HIV management processes such as blood transfusion and tests that exposes the body to risk contracting the hepatic viruses. Individuals co-infected with both viruses have been shown to be 17 times more likely at risk for death from complications of liver disease than those mono-infected with HBV [12]. Studies have documented HBV protein X that enhances the replication of HIV [13] while HIV decreases the rate of HBsAg clearance in acute infection and enhances the progression of liver disease in those with chronic hepatitis B [14]. Co-infection with hepatic viruses has been a major reason for hospitalization and morbidity amongst HIV patients as retroviral drugs have drastically reduced the mortality rate of HIV [15,16]). However, death due to non- HIV/AIDS has been on the increase amongst PLWH [17] most especially due to HBV and or HCV co-infection [5].Co-infection rate of HIV

with hepatitis B and or C virus have been found to vary with places depending on certain factors that include predominant transmission modes, vaccination rate and prevalence of hepatitis B and C viruses in the general population [18,19]. Studies have shown that the sero-prevalence of HBV/HIV co-infection vary from 5 to 10% in the USA to 20-30% in parts of sub-Saharan Africa and Asia [20].

In Nigeria, HIV/HBV co-infection rate is estimated to be between 10% and 70% [21]. There is a limited knowledge about the hepatitis virus amongst the general public, policy makers, at-risk populations and even health-workers which poses the entire population at a risk of community transmission and infection in Nigeria [22]. In addition, Pappoe, et al. 2019 asserted that hepatitis infection is not monitored alongside HIV despite both diseases being public health concern and shared mode of transmission which increases the complications and mortality of the co-infection and can have negative effect on the efficacy of the regimens used to manage them. Also, studies on these diseases are limited and usually done on single sites. Taraba state has been ranked as the state with the highest rate of both hepatitis B and C infection [16] hence; there is a tendency of high incidence of co-infection with HIV in the state which compounds HIV infection. This research work investigated a randomly selected HIV clients attending federal medical center Jalingo in 2019 to determine the incidence of co-infection of HIV and hepatitis B and or C. The outcome of this result can help healthcare workers and relevant authorities to revisit the present policies of public health management most especially in the management of coinfections.

II. METHODOLOGY

Study Design

This was a cross-sectional study conducted among PLHIV attending Federal Medical Center, Jalingo (FMCJ) located in Taraba State-Nigeria. FMC, Jalingo is the biggest hospital that renders health services to PLHIV in Taraba state, the center is the oldest and accommodates mostPLHIV.

Population of the Study

The population of the study included PLHIV and are accessing health services at Federal Medical Center, Jalingo.

Sample size

The sample size was calculated using Cohcran'sformular for determining sample.The formular is given by

$$n = \frac{z^2 pq}{e^2}$$

Where n = is the sample size

P = is the estimated population proportion (83%)

q = 1-p (0.17)

E = is the desired level of precision (0.05)

Therefore,

$$n = \frac{(1.96)^2 \times 0.83 \times 0.17}{(0.05)^2} = 217$$

However, 20 was added to the calculated sample size for error allowance (20+217) = 237.

Sampling Technique

A simple random sampling technique was used to collect data from PLHIV that met the set inclusion/exclusion criteria and were therefore recruited for the study.

Data collection

Data collection was carried out between *December 2018- May 2019at* Federal Medical Center, Jalingo-Taraba State. The patients who attended the study center for routine ARV drugs collection and fulfilled the inclusion criteria to participate in the study at their own will were recruited, until the target sample size was reached. Demographic (age, sex)were obtained from the participants through oral interview.

Laboratory methods

With the consent of the participants, blood samples were obtained, using the latest WHO testing guidelines and standard algorithmperformed after the mandatory pretest counselling with informed consent of the client. Serum was separated, aliquoted, and kept at -20°C prior to testing. All samples were analyzed for hepatitis B surface antigen (HBsAg)and hepatitis C antibodies. Using Rapid diagnostic test kits (Elecsys®, Roche Diagnostics).All the laboratory tests were performed within the laboratory routines of Federal Medical Center, Jalingo by well-trained medical laboratory Scientists and technicians.

Statistical analysis

Data fromserological results with their descriptions were entered into a spreadsheet (MS Excel 2016) and transferred to statistical package for social science (SPSS) version 25. The seroprevalence of hepatitis B and/or hepatitis C coinfections were expressed as the percentage of PLHIV screened. Logistic regression was conducted on dichotomized categorical variables dependent variables and some demographic variables to test whether significance difference exist. A confidence interval (95%) for proportions was used and a p-value less than 0.05 were considered statistically significant.

III. RESULTS

Table 1. Percentages of Respondents Tested For HBsAg and HCV

Hepatitis B and C Status of PLHIV	Male	Female	Total
No of PLHIV screened negative for HBsAg	46(19.4%)	154(65%)	200(84.4%)
No of PLHIV screened Positive for HBsAg	7(3%)	30(12.7%)	37(15.6%)

total No of PLHIV screened for HBsAg	53(22.4%)	184(77.6%)	237(100%)
No of PLHIV screened negative for hepatitis C	47(19.8%)	152(64.1%)	199(84%)
No of PLHIV screened Positive for hepatitis C	6(2.5%)	32(13.5%)	38(16%)
total No of PLHIV screened for Hepatitis C	53(22.4%)	184(77.6%)	237(100%)

Table 2. Crosstabulation of HBsAg and Anti-HIV

			Anti_HCV		Total
			Positive	Negative	
HBsAg	Negative	Count	34	166	200
		% of Total	14.3%	70.0%	84.4%
	Positive	Count	4	33	37
		% of Total	1.7%	13.9%	15.6%
Total		Count	199	38	237
		% of Total	84.0%	16.0%	100.0%

Table 3. Prevalence of HBsAg and Anti-HCV among PLHIV

Number of PLHIV Tested	HBsAg	Anti-HCV	Both HBsAg and Anti-HCV
Male	7(3%)	6(2.5%)	0(0%)
Female	30(12.7%)	32(13.5%)	4(1.7)
Total	37(15.7%)	38(16%)	4(1.7%)

Table 4. Classification Table[a]				
Observed		Predicted		
		HBsAg and HCV		Percentage Correct
		Negative	Positive	
HBsAg	Negative	200	0	100.0
	Positive	37	0	.0
Overall Percentage				84.4
a. The cut value is .500				

Table 5. Variables in the Equation (HBV)

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	SEX(1)	-.197	.456	.187	1	.665	.821
	AGE (Binned)(1)	.358	.370	.936	1	.333	1.430
	Constant	-1.852	.308	36.109	1	.000	.157
a. Variable(s) entered on step 1: SEX, AGE (Binned).							

Table 6. Variables in the Equation (HCV)

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	SEX(1)	-.501	.478	1.099	1	.295	.606
	AGE (Binned)(1)	-.005	.359	.000	1	.989	.995
	Constant	-1.555	.284	30.067	1	.000	.211
a. Variable(s) entered on step 1: SEX, AGE (Binned).							

Fig. 1. No. of PLHIV Screened Negative or Positive for HBsAg and Anti-HCV

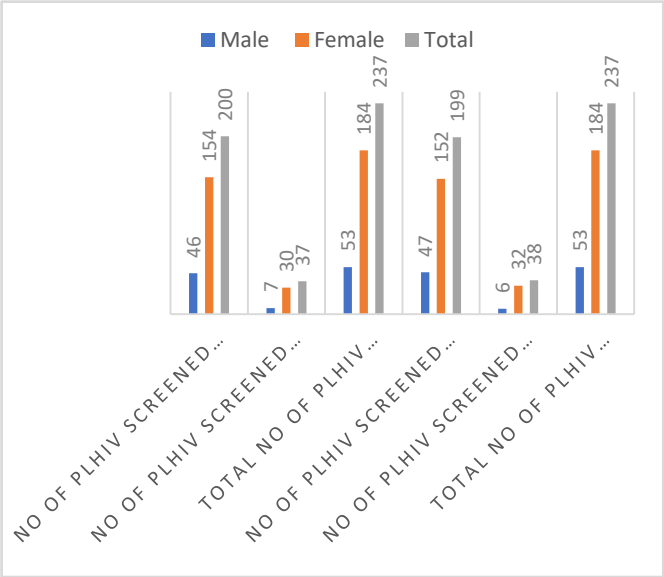
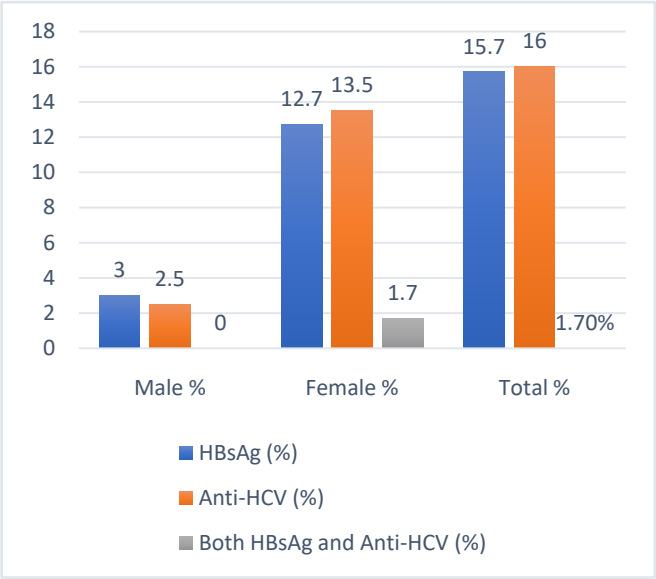


Fig. 2. Percentage of Coinfection of HBsAg and HCV among PLHIV



IV. RESULT DESCRIPTION

A total of 237 PLHIV were tested for HBV and or HCV. The ages of the participants were from 9 to 68 years. Fifty three 53 (22.4%) of them were male and 184 (77.6%) were female (Table 1, Fig.1). 37 (15.6%) subjects had serum samples positive for HBsAg, whilst 38 (16%) subjects had samples positive for anti-HCV. Four subjects were positive for both HBV and HCV (1.7%) (Table 2, table 3) There is said to be no statistical significant association between HBsAg/Anti-

HCV and the demographic variables (Age and sex) (Table 5&6). The classification table (Table 4) shows that the model makes a correct overall prediction of 84%. Therefore, we can deduce that the prevalence of HBV co-infection in the study population (PLHIV) was 37(15.6%) while that of HCV co-infection was 38(16%). Triple infection (HIV + HCV + HBV) prevalence was 4(1.7%)of which all occurred among female PLHIV. The prevalence of both HBV and HCV infection was highest among female PLHIV than Male PLHIVthat is 30(12.7%) against7 (3%) for HBV and 32(13.5%) against 6(2.5%) for HCV respectively.

V. DISCUSSION

Several literatures have reportedHIV, HBV and HCV co-infection as a leading cause of morbidity and mortality due to liver disease throughout the world in the last two decades [23]. This co-infection complicates the clinical course of HIV in infected patients, and may also adversely affecttreatment of HIV infection [24]. Different studies have reported varying prevalence of this co-infection among different HIV population and have been mostly associated with geographical differences [25] This study reports an overall viral hepatitis seroprevalence of 75(31.7%) in the targeted population.coinfection with HBV was found to be 37(15.6%)of the entire population, while 38(16%) of the population where found to be HCV positive. Of the 237 population, 4(1.7%) were found to be both HBV and HCV coinfected. In HBV endemic countries, the severity of HBV infection has been classified into low (<2%), moderate (2-8%) and high (>8%) prevalence by [26]. An overall 15.6% HBsAg seropositivity was observed in this study, thus suggesting a high prevalence of HBV infection amongst the participating population. Finding in this study 15.6% was found to be high compared to the 3.6% reported by [27] in Biu, Borno State and 3.5% by [28]in Anyigba, Kogi State, 2.5% HBV/HIV coinfection among apparently healthy blood donors in Ibadan[29] all in Nigeria. In comparison with studies still carried out in Nigeria, this figure (15.6%) reported in this study is higher than 11.9% reported in Ibadan, 6.6% in Nasarawa and 2.7% in Ado Ekiti, but lower than 20.6% documented in North Central Nigeria, 25.9% in Jos, and 28.4% in Lagos. Higher figures of 51.9% and 70.5% have equally been documented in Lagos and Kano, respectively, both being the most populated and highly commercially active cities in Nigeria [30]. It is also far higher than figures earlier reported by [31]3.6% , 3.2% by [32], 3% by[33] and 3.7% by [34]previously reported among HIV patients in Netherlands, Japan, Johannesburg and Brazil respectively. HBsAg seropositivity rate of 15.6% in the population of HIV patients in this region under consideration calls for great concern as HBV/HIV co-morbidity have been linked with high risk of high prevalence of HBV, accelerated progression of HIV infection and even mortality [35]. The study also revealed that there were 7 (3%) of male coinfected with HBV and 30(12.7%) females coinfected with the HBV. The results were said to differ significantly (P<0.05) from each other. This finding supports the report of [28,36]. The higher ratio of female to male in this study may be attributed to the fact that more female than male visits hospitals for medical attention in Nigeria [28,37]

Similar to HBV, geographical differences in the endemicity of HCV infection can be described based on regional prevalences; high (prevalence ≥3%) moderate (prevalence 2–2.9%), low (prevalence 1.0–1.9%), and very low (prevalence < 1.0%) [38]. Out of the entire population of this study, 38(16%) of the study population were found to be HCV positive.This figure is however higher than Previous report by [39] in Benin state as well as [40]in Lagos state all in NigeriaWho reported no HCV/HIV coinfection.Also, it was found to be lower than the the 33% reported by [41] in Jos plateu state Nigeria. This percentage was very high when compared with the results 2(0.5%) of [4] in central region of Ghana. When the distribution of the infection amongst the study population was observed gender wise, it was revealed that 6(2.5%) were found to be male while 32(13.5%) were female. No statistically significant association (P>0.05) was observed between HBV/HCV and the demographic variables (gender and age categories).

Comparing the HBV and HCV results of this current study, there was no statistically significant difference (P>0.05) observed between coinfection with both hepatitis viruses. Contrary to the findings in other geographical locations such as central region of Ghana who reported a statistically significant difference between these coinfections with 24(6.1%) and 2(0.5%) for HBV and HCV coinfection respectively [4]

A relatively lower incidence of triple coinfection with HBV, HCV and HIV was found in this research with only 4(1.7%) of the study population being positive of this coinfection when compared with the proportions of the other coinfections. All the positive subjects were female participants with no incidence from the male participants which may be attributed to the proportion of the female population that visit hospitals [28]. This proportion though very low is far higher than the proportions (0%) reported by [4]. In another study in Nigeria, the prevalence was found to be 7.2% in Keffi, North central Nigeria [42] and 1% in Ibadan [43]. Relatively higher prevalence of HIV/HBV/HCV co-infections has been documented in Lagos (3.9%) [44] And also a Tanzanian study reported similar percentage 3.9% prevalence of HIV/HBV/HCV co-infections [45]. As stated in many literatures, the geographical variations of these coinfections are attributed to the prevalence of all the viral infections (HIV, HBV, HCV) and other risk factors. This is however of great public health concern due to the fatality rate associated with the triple infection.

Generally, there are conflicting reports regarding male or female predominance for co-infection with either of these viruses. The reason for this is not obvious, but may be due to the epidemiological differences in the different study populations and variations in methodology [46].

VI. CONCLUSION

Coinfection of HIV and or HBV, HCV is a big public health challenge threatening the health sector of the region under consideration as well as the country at large due to the relatively high figure {37 (15.6%), 38 (16%) and 4(1.7%)} of HIV-HBV, HIV-HCV and HIV-HBV-HCV coinfections recorded respectively. Screening for these viruses among HIV/AIDS patients is, therefore, advocated and recommended as it is in the developed nations as this will allow for early detection and proper management.Thence, cutting down the co-morbidity and mortality associated with the coinfection in this part of the world.

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DECLARATIONS

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Conflict of interest: None declared

Ethical approval: Ethical clearance was obtained from the Ethical Committee of Federal

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CONFLICT OF INTEREST: None declared

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