Seroprevalence of Hepatitis B and C Viruses Among HIV Patients Attending Faith Alive Hospital, Jos, Plateau State

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ABSTRACT

Co-infection with hepatitis B and C viruses in HIV infected patients accelerates hepatic disease progression and also has an effect on the management of the patients. The prevalence of HIV varies widely from that of hepatitis viruses. This study determined and evaluated the prevalence of hepatitis B and C among HIV patients accessing healthcare at Faith Alive Foundation health facility in Jos, Plateau State, Nigeria.

Blood samples (5 mls) were collected from 131 consenting patients at the hospital. The serum samples from the patients were screened for HIV using rapid immunoassay test kits. Further screening was done on HIV positive patients on the basis of presence of the HBsAg and HCV markers. Socio-demographic information was collected by the use of a questionnaire. The study population comprised of 55 (27.5%) males and 145 (72%) females, of which, 37 (18.5%) and 94 (47.0%) were positive for HIV in both sexes. 7.6% (10/131) were co-infected for HIV/HBV in males and 8.4% (11/200) for females. However, the females also had the highest prevalence of 2.3% (3/131) of all three viruses (HIV/HBV/HCV). The prevalence of hepatitis B and C co-infection among the HIV patients were not statistically significant at (P>0.05) for sex, ART status, educational status, marital status, age, occupation, and demographic factors. Considering the high risk of being infected with any of these viruses, it is important that regular screening for HBV and HCV viral infections be carried out on HIV infected persons.

(Keywords: *coinfection, HIV, HBV, HCV, patient management, virus infection*)

INTRODUCTION

Chronic viral hepatitis is a major health problem worldwide. Five hundred million people are estimated to be currently infected with hepatitis B virus (HBV) or hepatitis C virus (HCV) globally. These two viruses are the cause of one million deaths each year (UNAIDS, 2008).

Hepatitis B virus is a DNA virus which replicates in hepatocytes and damages the liver by immune response to the virus. The virus is transmitted vertically at birth, horizontally through unprotected sex, sharing of injecting equipment and close contact between infants and neonates. Transmission through unscreened blood products is another route of transmission since blood remains infectious for several weeks even when dried (Kouanfack, *et al*., 2012)

Human immunodeficiency virus (HIV) infected patients are commonly co-infected with HBV due to similar modes of transmission. Worldwide, about two to four million HIV patients are estimated to be co-infected with HBV (Spiegel *et al*., 2007). HIV-HBV co-infected patients are reported to be at higher risk for developing chronic hepatitis B, decreased hepatitis B antigen (HBeAg) clearance rate, increased HBV replication and higher HBV DNA viral loads (Tabi and Frimpong, 2003).

Recent studies have pointed out that individuals co-infected with HBV are at risk of faster progression of HIV infection and cirrhosis and more likely to lose previously developed protective anti-hepatitis B surface antibody (anti-HBsAb) (Ojo, *et al*., 2008). Hepatic immune reconstitution inflammatory syndrome may occur following initiation of antiretroviral therapy (ART), reactivation of HBV after discontinuation of ART regimen containing anti-HBV agents and

increased prevalence of antiviral resistance (Cropley and Main, 2000).

Hepatitis C virus is an RNA virus which is mostly transmitted by blood-to-blood contact. Sharing injecting equipment and blood transfusion are the most frequently observed routes of transmission (Geretti, *et al*., 2010). Approximately four to five million HIV patients are co-infected with HCV globally. In these patients, HIV virus weakens the immune response to HCV resulting in a lower probability of spontaneous viral clearance of HCV infection, higher levels of HCV RNA in the blood, more rapid progression to HCV-related end stage liver disease and increased risk of antiretroviral associated liver toxicity (Kaiser and Spiegel, 2002).

The problems listed above highlight the importance of preventing further spread of HBV and HCV infections in HIV-infected patients as well as diagnosing existing infections. Quality of treatment and life in HIV infected patients co-infected with HBV and/or HCV can be improved by appropriate management and monitoring (Stabinski *et al*., 2011). Hence, magnitude of HBV and HCV infections in patient populations in different areas as well as risk factors for the transmission in these areas should be investigated to take measures for reduction of such transmission with sound evidence in the populations (Kaiser, *et al.*, 2006).

HIV shares a common route of infection with HBV and HCV. HIV and HBV are known to be transmitted sexually. Sexual transmission of HCV appears to be certainly less efficient than is the case for HIV-1 (Matthews *et al*., 2011). However, sexual transmission of HCV has been documented. It is therefore not surprising to find that some patients with HIV are co-infected with HBV and/or HCV. HIV appears to have a marked influence on the natural history of HBV infection.

Despite the negative impact of HBV and HCV co-infections on mortality and morbidity rates among HIV-infected individuals, detailed information on the prevalence of HCV/HIV and HBV/HIV co-infection in most affected patients is lacking. For example, in Sub-Saharan Countries like Nigeria, hepatitis B infection have been under-resourced with poor public health and clinical awareness.

Another important issue is the interaction between HIV and HBV or HCV. HIV/HBV and HIV/HCV co-infection have a negative impact on liver disease caused by these viruses. For example, HCV accelerates the evolution and progression of liver disease in HIV-infected individuals. HIV/HBV co-infected patients are at an increased risk of developing cirrhosis, having higher levels of HBV replication, having lower rates of spontaneous resolution of the HBV infection, and having a higher risk of reactivation of previous infections (Lodenyo, *et al*., 2000). HCV and HBV infections also increase the toxicity to antiretroviral medications. HIV infected individuals have a high probability of getting co-infected with HBV/HCV.

HIV disease progression and enhanced immune suppression has a direct bearing on the natural history and pathogenesis of these infections (Polis, *et al*., 2007). Sexual transmission of both HBV and HCV also appears to be significant and is of epidemiological importance in the light of heterosexual transmission of HIV in India and some African countries.

Although screening for HBV and HCV infection in HIV infected patients is recommended in many HIV treatment guidelines, this screening has not been performed regularly in resource limited settings (Tamale and Mugyenyi, 2002). Some African studies have discovered independent transmission events, whereby hepatitis viruses (typically HBV) are acquired in childhood via horizontal or introgenic exposure, and HIV infection occurs later in life, primarily via heterosexual sex (Kapembwa, *et al.,* 2011).

In contrast, some series from West, East, and South Africa report that chronic HBV infection is over-represented in patients with HIV, suggesting shared risk factors or co-transmission events (Sherman *et al*., 2002). Both the virological expression of HBV and HIV-induced immunocompromised may influence HBsAg positivity rates in HBV endemic areas: HIV infection can promote HBV reactivation and also favour chronicity of newly acquired HBV infections (Sungkanuparph, *et al*., 2008). The aim of this study was to determine the seroprevalence of HBV and HCV coinfections and associated risk factors among HIV infected patients seeking medical attention at Faith Alive Foundation Hospital in Jos, Plateau State, Nigeria.

MATERIALS AND METHODS

Study Area

Faith Alive is a Christian faith-based hospital in Jos, Nigeria that provides free care for many patients. The great majority have HIV/AIDS but there are many that also have Tuberculosis (TB), Malaria and others that require surgery.

Study Design

Patients attending Faith Alive Hospital during the study period which lasted for about three weeks were sampled as newly or as existing HIV infected patients. Study participants were selected based on systematic random sampling technique.

Study Population

The target population are mostly sexually active patients of both sexes between the ages of 18 to 45 years attending Faith Alive Hospital during the study period. Faith Alive Hospital was chosen for this study because the health facility is a key research Centre in Jos metropolis that caters for patients with HIV virus infections and currently provides health services to more than a thousand people. The health Centre also provides outpatient screening services including hepatitis B, hepatitis C and for other related sexually transmitted diseases.

Sample Size Determination

The minimum sample size is calculated using the formula:

$$N = \frac{Z^2 P (1 - P)}{d^2}$$

Where; N = minimum sample size

Z = constant mean deviation (1.96)

P = reported prevalence = 5% (0.05) (Akyala, *et al*., 2013)

1 = constant

d^2 = allowable error = 5% (0.05)

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

$$= \frac{3.8416 \times 0.05(0.95)}{0.0025}$$

$$= \frac{0.19208 \times (0.95)}{0.0025}$$

$$= \frac{0.1825}{0.0025}$$

$$= 72.9 \approx 73 \text{ samples.}$$

Therefore, the minimum sample size for this study is 73 but for the purpose of this study a total of 131 samples were screened for HIV, HBV, and HCV.

Ethical Clearance/Consideration

Ethical clearance was obtained from the medical and ethics committee at Plateau Specialist Teaching Hospital. The study participants were also informed about the purpose of the study and written informed consent was obtained from each participant before administration of questionnaire and sampling.

Inclusion Criteria

Willing Individuals of sexually active age (18 and 45) of both genders were included in the research.

Exclusion Criteria

Individuals outside the age limits of 18 and 45 were not allowed to participate as well as young children and pregnant women.

Sample Processing Method

An approximated five (5) milliliters of venous blood was collected using red top vacutainer tube and allowed to clot, serum was separated by centrifugation at 3 000 rpm for 10 minutes for HIV,

HBsAg and anti HCV screening. The sera were tested for HIV to determine the HIV status of the study population. Further screening was also carried out to determine HBsAg (One step HBsAg test, Ameritech-China, Ltd. Seattle, Washington, USA) and HCV antibody status using commercially available rapid test HCV lateral flow immunoassay strips (Agary Pharmaceutical Limited, Lagos, Nigeria). Rapid test kits used were according to the manufacturer's instruction.

Procedure for HIV, HBV and HCV Tests

The preserved samples were allowed to thaw at room temperature (20-30 minutes). An approximate 50µL of sample was applied on to the sample pads (HIV, HBV, and HCV) test strips using a clean Pasteur pipette and allowed to stay for about 15minutes before the results are read.

Interpretation of Results

The appearance of a purple/red band at the quality control lines is used as the internal control standard of the test paper strip. If in addition to a pink colored control, the appearance of a new distinct pink colored band at the test (T) region signifies Positivity of the test. The non-appearance of the test (T) band signifies negativity.

Data and Statistical Analysis

The data obtained was analyzed using statistical package for social sciences (SPSS) (version 16.0), descriptive statistics was presented in Chi-square (X^2) test and used to determine the level of association of the prevalence of HBV/HCV co-infection among HIV patients with respect to sex, age, marital status, occupation, alcohol consumption and use of ART. Values obtained were not considered statistically significant at 95% confidence level

RESULTS

Table 1 illustrates the seroprevalence of HIV, HBV and HCV infections among the HIV infected patients attending Faith Alive Hospital. HIV/HBV had the highest coinfection of 16.0% while the least coinfection was HIV/HBV/HCV (2.3%). However, there was no significant association between coinfections ($p>0.05$).

The seroprevalence of HBV and HCV co-infections in HIV positive patients attending faith Alive Hospital with respect to Age (Table 2) shows that the highest HBV infection among the HIV infected patients in terms of ages was between 26-30 years 8 (36.4%) while the least was 31-35 years 2 (10.0%). HCV coinfection with HIV was highest between ages 26-30 years 9 (40.9%) while the least was between ages 31-35 years 2 (10.0%). There was no significant association between coinfections among ages ($p>0.05$).

Table 3 shows the seroprevalence of HBV and HCV co-infections in HIV positive patients attending Faith Alive Hospital with respect to Sex. Females had the highest prevalence of HBV 18(19.1%), HCV 24(25.5%) and HBV/HCV 3(3.2%). There was no significant association between coinfections among sexes ($p>0.05$).

Table 1: The Seroprevalence of HIV, HBV, HCV and HIV/HBV/HCV Infections in HIV Patients Attending Faith Alive Hospital. (n=131)

Parameter	No. Positive	% Occurrence
HIV	131	65.5
HIV/HBV	21	16.0
HIV/HCV	19	14.5
HIV/HBV/HCV	3	2.3

$X^2 = 42.00$
p-value = 0.227

Table 2: The Seroprevalence of HBV and HCV Co-Infections in HIV Positive Patients Attending Faith Alive Hospital with Respect to Age. (n=131).

Age	No. Examined	NO. REACTIVE		
		HBV (%)	HCV (%)	HBV/HCV (%)
≤20	13	3 (23.1)	2 (15.4)	0 (0.0)
21-25	15	3 (20)	3 (20.0)	1 (6.7)
26-30	22	8 (36.4)	9 (40.9)	1(6.7)
31-35	20	2 (10)	2 (10.0)	0 (0.0)
36-40	20	3 (15)	6 (30.0)	0 (0.0)
41-45	41	11 (26.8)	6 (14.6)	1 (6.7)

X^2= 10.32
p-value = 25.00

Table 3: The Seroprevalence of HBV and HCV Co-Infections in HIV Positive Patients Attending Faith Alive Hospital with Respect to Sex. (n=131)

Sex	No. Examined	NO. REACTIVE		
		HBV (%)	HCV (%)	HBV/HCV (%)
Male	37	12 (32.4)	4 (10.8)	0 (0.0)
Female	94	18 (19.1)	24 (25.5)	3 (3.2)

X^2 = 6.05
P-value = 5.99

The seroprevalence of HBV and HCV co-infections in HIV positive patients attending Faith Alive Hospital with respect to marital status (Table 4) shows that both the divorced and widows had the highest prevalence of HBV 1 (25.0%) and HCV 1 (25.0%) respectively while the married had the highest prevalence of HBV/HCV 2 (2.7%) coinfection. Also, there was no significant association between coinfections with respect to marital status (p>0.05).

The seroprevalence of HBV and HCV co-infections in HIV positive patients attending Faith Alive Hospital with respect to occupation is illustrated in Table 5. Farmers had the highest prevalence of HBV 3 (30.0%), those who do business had the highest prevalence of HCV 18 (25.7%) and HBV/HCV coinfection 3 (4.3%). No significant relationship was found for occupations (p>0.05).

Table 6 illustrates the seroprevalence of HBV and HCV co-infections in HIV positive patients attending Faith Alive Hospital with respect to common risk factors. There was no significant association between risk factors and coinfections.

DISCUSSION

This study examines the seroprevalence of HIV, HBV and HCV infection among patients and the observed positivity of HBV and HCV among the HIV infected patients were 16.0%, and 14.5% respectively. These rates gotten for HIV and HBV coinfection in this study is lower than earlier reported rates for some parts of Nigeria; Keffi (20.6%) (Forbi, *et al*., 2007), Jos (28.7%) (Irisena, *et al*., 2002). This could be as a result of more awareness on the severity of viral hepatitis and possibly due to increase in vaccination coverage for HBV across the country (Ott, *et al*., 2012).

The prevalence rates of coinfection with HIV, HBV and HCV gotten among these group of patients (1.5%) despite low is worrisome considering the low rate of vaccination and awareness observed in the study group. Analysis of the sex-related sero-prevalence of HBV/HCV co-infection amongst the HIV infected patients showed that of the 55 total number of males screened, 37 (18.5%) which was higher compared to the 145 females screened of which 94(47%) were HIV positive, although more of the

female patients reported to hospital for medical attention than the males. The reason for higher frequency of HBV/HCV co-infection among the female patients could probably be because of higher frequency of exposure to risk factors associated with the viruses such as, unprotected sex, multiple sexual partners, use of sharp objects from hair braiders as well as alcohol consumption and unscreened blood transfusion (Halim, *et al*., 1992). However, no statistical significance association was observed among the patients in respect to sex ($p \leq 0.05$) which is comparable to results reported by (Akyala, *et al.,* 2013). The present study has reported a higher prevalence of Hepatitis B and C co-infection among patients of ages between 23-27, 28-32 and 43-50 years with a reported prevalence of 0.8% and a higher prevalence of hepatitis B alone among patients within the age bracket of 43-50 years (6.1%) and HCV alone among patients of age 28-32 years (4.6%).

Although there was no statistically significant difference between the prevalence of the hepatitis viruses in respect to age ($p>0.05$). Analysis of marital status-related sero-prevalence of HBV/HCV co-infection amongst the HIV infected patients showed that there was a higher prevalence of the viruses among patients that are married (1.5%) compared to those that are single (0.8%) and divorced (0%) which could probably be due to high tendency of promiscuous behavior among those who are married than those that are single or divorced. However, the difference was not statistically significant ($p>0.05$) which is comparable to study conducted by (Mohsen *et al.,* 2002). The higher prevalence rate of HBV in HIV (16.0%) patients in comparison to the rate for HCV in HIV patients (9.5%) could be considered as noticeable and it could be attributed to diverse factors particularly due to reckless lifestyles and lack of vaccination awareness for HBV.

Table 4: The Seroprevalence of HBV and HCV Co-Infections in HIV Positive Patients Attending Faith Alive Hospital with Respect to Marital Status.

Marital Status	No. Examined	NO. REACTIVE		
		HBV (%)	HCV (%)	HBV/HCV (%)
Single	41	10 (24.4)	9 (21.9)	1 (2.4)
Married	73	16 (21.9)	15 (20.5)	2 (2.7)
Divorced	4	1 (25.0)	1 (25.0)	0 (0.0)
Widow	12	3 (25.0)	3 (25.0)	0 (0.0)
Widower	1	0 (0.0)	0 (0.0)	0 (0.0)

$X^2 = 0.578$
p-value = 5.51

Table 5: The Seroprevalence of HBV and HCV Co-Infections in HIV Positive Patients Attending Faith Alive Hospital with Respect to Occupation.

Occupation	No. Examined	NO. REACTIVE		
		HBV (%)	HCV (%)	HBV/HCV (%)
Civil Servant	26	3 (11.5)	5 (19.2)	0 (0.0)
Student	15	3 (20.0)	2 (13.3)	0 (0.0)
Farmer	10	3 (30.0)	1 (10.0)	0 (0.0)
Business	70	20 (28.6)	18 (25.7)	3 (4.3)
Others	10	1 (10.0)	2 (20.0)	0 (0.0)

$X^2 = 3.905$
p-value = 15.51

Table 6: The Seroprevalence of HBV and HCV Co-Infections in HIV Positive Patients Attending Faith Alive Hospital with Respect to Common Risk Factors.

	No. Examined	NO. REACTIVE		
		HBV(%)	HCV(%)	HBV/HCV(%)
ALCOHOL				
Yes	27	7 (25.9)	4 (14.8)	1 (3.7)
No	104	23 (22.1)	24 (23.1)	2 (1.9)
X^2= 1.109				
p-value = 5.99				
SHARP OBJECTS				
Yes	46	9 (19.6)	9 (19.6)	0 (0.0)
No	85	21 (24.7)	19 (22.4)	3 (3.5)
X^2= 1.37				
p-value = 5.99				
HISTORY OF BLOOD TRANSFUSION				
Yes	30	6 (20.0)	8 (26.7)	1 (3.3)
No	101	24 (23.8)	20 (19.8)	2 (1.98)
X^2= 0.70				
p-value = 5.99				
MULTIPLE SEXUAL PARTNERS				
Yes	11	2 (18.2)	1 (9.1)	0 (0.0)
No	120	28 (23.3)	27 (22.5)	3 (2.5)
X^2= 0.463				
p-value = 5.99				
HISTORY OF HBV VACCINATION				
	No. Examined	**NO. REACTIVE**		
		HCV (%)	**HBV/HCV (%)**	
Yes	30	6 (20.0)	1 (3.3)	
No	101	22 (21.8)	2 (2.0)	
X^2= 0.269				
p-value = 3.84				

In this research, 13.5% of the respondents are said to be alcohol consumers of which 3.0% and 2.3% are positive for HBV and HCV respectively. Although several studies have established the strong link between alcohol consumption and HIV status (p=0.033), being over 30 years of age (p=0.023) (Hargreaves, *et al.,* 2002). A total prevalence rate for alcohol consumption for the HBV and HCV patients was obtained as 3.0% and 2.3% wand a high prevalence of 13.5% among HIV positive patients and considered not statistically significant.

Also in this study, risk factors of Hepatitis like multiple sex partners, blood transfusion, alcohol consumption, sharing of sharp objects, tattoos, etc. were not statistically significant, that is (p>0.05). This could be due to public awareness by various health institutions as well as availability of affordable drugs to most affected patients

CONCLUSIONS

With the 2.3% prevalence of HBV/HCV co-infection in this study population, it is an indication that HBV and HCV infections is maintained but can also be reduced to the barest minimum if proper awareness and prompt medical diagnosis are made available to the ailing patients. Co-infected patients with the three viruses have increased risk of developing cirrhosis, liver deficiency, and mortalities in comparison to when a person is infected with only one of these viruses. Therefore, diagnosing HBV/HCBV in HIV patients is vital to take care of them and allot resources in health plans so that all HIV patients must be tested for both HBV and HCV (Salmon, *et al.*, 2003; Bruno, *et al.,* 2007).

However, the low rate of vaccination and awareness among this group of HIV infected patients calls for more frequent monitoring of HIV patients especially those on retroviral drugs as HBV and HCV are both viruses that affects the hepatocellular cells causing liver damage.

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