



The Prevalence of Hepatitis B and C among HIV Positive Patients in Some Hospitals in Rivers State

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) are all blood borne pathogens that are still global health challenges and were known to be endemic in Nigeria. Little work had been done on Hepatitis-B and C co-infection among HIV positive patients in the three Senatorial Districts of Rivers State. A case- control, hospital- based study was conducted among subjects from Rivers state University Teaching Hospital (RSUTH), Zonal Hospital, Bori and Zonal Hospital, Ahoada to determine the prevalence of Hepatitis B and C co-infection in these areas. Three hundred and seventy-five subjects of (10-69 years) and both sexes were included in the study. A structured questionnaire was administered to obtain demographic parameters of the participants. The samples collected were screened and confirmed for hepatitis-B and C using standard techniques. The overall prevalence rates of HBV, HCV and HBV/HCV in this study are 4.5%, 2.1% and 0.8% respectively while the prevalence among HIV positive participants were; 4.6%, 2.8% and 1.1% respectively. Bori had the highest prevalence of HBV and HCV, (5.3% and 4.2%) while Ahoada had the highest prevalence of triple infection (2.1%). The prevalence of HIV/HBV, HIV/HCV and HIV/HBV/HCV infection was more among subjects within age range of 30-39 years (7.0%, 5.6% and 4.2%) and lowest within the age range of 20-29 years (2.3%, 0% and 0%). Conclusively, the research findings show that the prevalence of hepatitis B

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and C co-infection among HIV patients in these hospitals are high. Thus, every HIV positive patient should be screened and educated on the danger of co-infection for better management of the patient.

Keywords: Human immunodeficiency virus; hepatitis B; hepatitis C and Co-infection.

1. INTRODUCTION

Human immunodeficiency virus (HIV), Hepatitis B and C viral infections are all endemic in the sub-Saharan Africa (Nigeria inclusive) and are threats to the global health [1]. HIV, HBV and HCV are all blood borne pathogens that shared the similar route of transmission [2]. Although the introduction of antiretroviral therapy (ART) has reduced HIV/AIDS-related illness and death, a number of them are still dying from non-AIDS-related illnesses including; co-infections which could be bacterial, fungal, parasitic or viral [3]. Presently, there is increase in morbidity and mortality resulting from viral infections among people living with HIV (PLHIV) which according to researchers could either be due to co-infection with HBV and or HCV or other non-infectious agents [4].

Hepatitis is the inflammation of the liver and is now a major global health problem in developing countries especially Sub-Saharan Africa including Nigeria [5].

According to [4], HBV and HCV share a similar preference of replication in hepatocytes but their life cycles are entirely different. HBV is a DNA virus that replicates in the nucleus of hepatocytes, while HCV is an RNA virus that replicates mainly in the cytoplasm of hepatocytes. However, they both have RNA replicative intermediates and can interact in co-infected cells, leading to varying viral expression and serologic patterns.

Co-infection of HIV with HBV or HCV is more complex than mono-infection with HIV, HBV or HCV. Co-infection can be defined as the presence of two or more organisms replicating in the same host. Co-infection of HIV with viral hepatitis (HBV and/or HCV) usually occurs as a result of these viruses sharing a similar mode of transmission [2]. HBV and HCV both have an affinity for the liver cells and are responsible for approximately 96% of all hepatitis mortality. They cause severe morbidity including cirrhosis and hepatocellular carcinoma (HCC) due to intrahepatic apoptosis and mortality particularly among HIV-infected individuals [3,6,7]. Another

similarity among these viruses is the use of reverse transcriptase enzyme for replication and the possibility of developing chronic infections and the ability for mutation in their genomes. The tendency of mutation gives rise to some strains which are resistant to the commonly available antiviral agents, [1,8].

Studies have shown that the progression of HIV in those co-infected with either HBV or HCV is faster. It should be noted that most of the infected individuals (50% of HCV infected persons), 15-30% of HIV infected persons and about 75% of HBV infected persons are unaware of their infection status hence, the need for screening of every HIV positive patient.

In Nigeria, HIV/AIDS Indicator and Impact Survey report showed a prevalence of 8.1% and 1.1% for HIV/HBV and HIV/HCV for the country. Rivers state was also reported to have a prevalence of 4.7% for HIV/HBV [8]. Very little work has been done on Hepatitis-B and C co-infection among HIV patients in Rivers state. Proper management of patients will involve identifying possible cause of complications so as to effect the necessary actions and improve healthcare delivery.

The aim of this study was to determine the prevalence of Hepatitis B and C co-infection among HIV patients from the three senatorial zones of Rivers State.

2. MATERIALS AND METHODS

2.1 Study Area and Design

This study was carried out in Rivers State University Teaching Hospital (RSUTH) of Port-Harcourt, Zonal Hospital Bori and Zonal Hospital Ahoada. Some of the patients who visited the HIV clinic and out-patient department (OPD) during the study period formed the source population.

2.2 Inclusion and Exclusion Criteria

Both HIV positive and negative individuals of both sexes and within the age bracket of (10-69) years were included in this study.

2.3 Calculation of Sample Size

The minimum sample size required for this study was calculated using the formula by [9,10] at 95% confidence level and a report prevalence of 3.8% (0.038) [9].

Using the formula:

$$N = Z^2 pq / d^2$$

Where

N= sample size

Z= statistic corresponding to level of 95% confidence level 1.96

P= expected prevalence = 3.8% (0.038)

d= is the level of significance (allowable error) =5%, 0.05

q=1-p

$$N = ((1.96)^2 \times 0.038 \times (1-0.038)) / (0.05)^2$$

$$= (3.8416 \times 0.038 \times (1- 0.038)) / 0.0025$$

$$= (3.8416 \times 0.038 \times 0.962) / 0.0025$$

$$= 56.2 \text{ (minimum sample size).}$$

A total number of 375 patients were recruited in the study.

2.4 Blood Sample Collection

Total of 10mls of blood was collected from each subject using vein puncture technique [11]. Soft tubing tourniquet was tied around the upper arm of the subject to enable the index finger fill a suitable vein. The puncture site was then cleansed with methylated spirit and venipuncture made with the aid of a sized needle attached to a 10mls syringe. The tourniquet was released and the needle removed immediately after collecting sufficient blood. The sample was transferred into plain and EDTA bottles for screening and confirmation respectively after separation [12] and compared with control.

2.5 Screening for HBV, HCV and HIV

The screening was done using DiaSpot, a commercially available test kits for the detection of HBsAg or anti – HCV antibody from each patient's serum. The HBV or HCV Rapid Test strip is a qualitative, membrane based immunoassay for the detection of antibody to HBV or HCV in serum or plasma.

The test device was removed from the pouch and was dipped into fresh serum specimen for 3 seconds with the arrow end pointing down. The device was later laid on a clean, dry, nonabsorbent surface on the work-top bench. The result was read in ten minutes [13]. The National algorithm for HIV screening which involves the use of three test kits was employed. Two for parallel testing and one for a tie-breaker, was adopted. The three kits were Determine-HIV 1/2 (Abbott Japan Co. Ltd. Germany), Uni-Gold- HIV 1/2 (Trinity Biotec, France) and Stat-pak Dipstick (Chembio Diagnostic System Inc. The Manufactures' Standard Operating Procedures (SOP) were followed. HIV sero-positivity was defined as a reactive result on two of the test kits. Non-reactive subjects were considered sero-negative.

2.6 Confirmatory Test for HBV, HCV and HIV

The presence of the viruses was confirmed by running the patient's plasma sample on COBAS® AmpliPrep/ COBAS® TaqMan® 96 Analyser.

2.7 Principle and Procedure for Quantification of HIV in Human Plasma

This is an in-vitro test based on the amplification of nucleic acid for the quantitation of Human Immunodeficiency Virus in human plasma using an automated machine for both the preparation and detection. The three major processes include; the isolation of HIV-1 RNA, reverse transcription of the target RNA to generate complimentary DNA and finally, the simultaneous PCR amplification of the target complimentary DNA and detection of cleaved double-labeled oligonucleotide probe specific for the target. The machine was logged on and the daily maintenance performed. Reagents were removed from storage and loaded immediately. The samples which were stored were also removed from storage and allowed to thaw at room temperature before pipetting. Consumables were also loaded, order for viral load created, worksheets prepared and barcode clips attached to the sample racks. Sample tubes were placed in the sample racks and labeled. Control samples and test samples were pipetted into the respective tubes (1100 µl). The instrument status was checked and 'start run' button pressed. Prepared samples were removed from COBAS® AmpliPrep to the COBAS® TagMan® Analyzer

automatically because it is docked. Finally, results were reviewed and printed.

2.8 Statistical Analysis

Data generated from this study was analysed using the Statistical Package for Social Sciences (SPSS vs 22).

3. RESULTS

Among the 375 samples collected, 151 (40.3%) males and 224(59.7%) females were obtained as represented in Table 1. From the table, it was observed that about 103(27.5%) of the participants had only one sexual partner each while 272 (72.5%) had multiple sexual partners. Table 2 shows the prevalence of Hepatitis B and C among the recruited subjects with ART-naïve having the highest prevalence of HBV and

HBV/HCV (1.9% and 0.5%) respectively, followed by those on ART (1.6%). The highest prevalence of HCV is observed among subjects on ART (1.3%) while control has the least prevalence for both HBV and HCV (1.1% and 0.0%) respectively.

Table 3. Shows a total number of 285 HIV positive samples that were collected with a prevalence of HBV, HCV and HBV/HCV as; 4.6%, 2.8% and 1.1% respectively. Bori had the highest prevalence of HBV and HCV, 5.3% and 4.2% respectively.

Table 4 shows the highest prevalence of HIV/HBV, HIV/HCV and HIV/HBV/HCV infection among the age range of 30-39 years as; 7.0%, 5.6% and 4.2%, respectively while the lowest values were seen in 20-29years (2.3%) for HIV/HBV and 40-49years (1.8%) for HIV/HCV.

Table 1. Demographic characteristics of the participants

Location	Male	Female	One partner	Multiple partners
ART				
RSUTH	19	31	13	37
BORI	20	30	8	42
AHOADA	19	31	14	36
ART-NAIVE				
RSUTH	20	25	12	33
BORI	19	26	11	34
AHOADA	20	25	8	37
CONTROL	34	56	37	53
TOTAL	151(40.3%)	224 (59.7%)	103 (27.5%)	272(72.5%)

Human Immuno-deficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Rivers State University Teaching Hospital (RSUTH), Antiretroviral Therapy ART

Table 2. Prevalence of Co-infection among HIV Positive and negative control

Group	No Tested	HBV (%)	HCV (%)	HBV/HCV (%)
ART	150	6 (1.6)	5 (1.3)	1 (0.3)
ART-Naive	135	7 (1.9)	3 (0.8)	2 (0.5)
Control	90	4 (1.1)	0 (0.0)	0 (0.0)
Total	375	17 (4.5)	8 (2.1)	3 (0.8)
p-value		0.05	0.03	0.21
χ^2		1.009	1.006	1.91

Human Immuno-deficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Antiretroviral therapy (ART)

Table 3. Prevalence of Co-infections among the HIV positive participants according to location

Location	No. Examined	HIV/HBV (%)	HIV/HCV (%)	HIV/HBV/HCV (%)
RSUTH	95	4(4.2)	2(2.1)	1(1.1)
BORI	95	5(5.3)	4(4.2)	0(0)
AHOADA	95	4(4.2)	2(2.1)	2(2.1)
TOTAL	285	13(4.6)	8(2.8)	3(1.1)
p-value		0.08	0.12	0.22
χ^2		1.003	0.981	2.21

Human Immuno-deficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Rivers State University Teaching Hospital (RSUTH)

Table 4. Age - Related prevalence of Co-infection among the HIV positive participants

AGE	NO. TESTED	HIV/HBV (%)	HIV/HCV (%)	HIV/HBV/HCV (%)
10-19	19	1 (5.7)	1 (5.7)	0 (0.0)
20-29	87	2 (2.3)	0 (0.0)	0 (0.0)
30-39	71	5 (7.0)	4 (5.6)	3 (4.2)
40-49	56	3 (5.4)	1(1.8)	0 (0.0)
50-59	43	2 (4.7)	2 (4.7)	0 (0.0)
60-69	9	0 (0.0)	0 (0.0)	0 (0.0)
TOTAL	285	13 (4.6)	8 (2.8)	3 (1.1)

Human Immuno-deficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV)

The result of this work showed highest prevalence of HIV/HBV, HIV/HCV and HIV/HBV/HCV infection in age range of 30-39 years as; 7.0%, 5.6% and 4.2%, respectively while the lowest values were seen in 20-29years (2.3%) for HIV/HBV, 40-49years (1.8%) for HIV/HCV as shown on Table 4.

4. DISCUSSION

This study investigated the sero-prevalence of HBV and HCV among HIV positive using HIV negative subjects as control. An overall prevalence of 4.5%, 2.1% and 0% for HBV, HCV and HBV/HCV was observed among the HIV positive and negative subjects and is in agreement with the findings from other parts of Nigeria [5,11]. A prevalence of 1.1%, for HBV and 0% for HCV was observed among the negative control. For the HIV positive subjects, a prevalence of 4.6%, 2.8% and 1.1% for HIV/ HBV and HIV/HCV and HIV/ HBV/HCV respectively was observed among the participants.

The prevalence of 4.6% in this study for HIV-HBV co-infection rate is comparable with prevalence of HBsAg of 4.1%, 4.8%, 5.6%, 6.67%, 9.7%, 6.7% reported by [5,13-17] in Port Harcourt and other parts of Nigeria.

Higher prevalence of 56.7% by [18], 51.9% by [19] and 70.5% by [20] were also observed.

Generally, as several studies reported and anticipated in different parts of the world, such co-infection differences could be due to differences in geographic regions, types of risk groups and the means of exposures involved [21,22]. The sero-prevalence rates of HIV-HCV co-infection in this study was 2.8% which is similar to other studies from different parts of the country with prevalence ranging from 2- 6% [23-26]. Co-infection rates of HIV-HCV ranging from 3.6-13.3% were also reported from different studies in Ethiopia [7]. Lower prevalence of HIV/HCV had also been reported in other

countries like Chile, (1.1%), Colombia (0.8%), Venezuela (0.7%) and Nigeria 0.8% [7,27].

Higher prevalence of HIV/HCV had been reported with prevalence rates ranging from 5.0% to 13.86% in Nigeria and Ethiopia [18,28]. The sero-prevalence of HIV-HBV-HCV triple infection in this study was 1.1%, which is similar to studies from Ethiopia (1.1%) other parts of Nigeria (0.7%, 0.9%) and is more or less comparable to reports from Senegal (0.5%), Kenya (0.26%) and Egypt (0.44%) [26,27,28]. However, higher prevalence of HCV-HBV-HIV triple co-infection was reported in Argentina (9.5%) and Iran (9.2%) [28]. The prevalence of 1.1% for the triple infection in this study reflects what has been reported earlier in Nigeria and in other West African countries [23,27,29]. For such variations, risk factors which accounts for HBV and HIV prevalence difference might also work for the triple infection. A higher prevalence of co-infection was observed at Bori (5.3% and 4.2) for HBV and HCV respectively while, Ahoada had the highest prevalence for triple infection (2.1%). This is not surprising since Khana local government is topping the list of HIV prevalence in the Rivers State [30].

The result from this work also showed highest prevalence of HIV/ HBV, HIV/HCV and HIV/ HBV/HCV infection in age range of 30-39 years as; 7.0%, 5.6% and 4.2%, respectively while the lowest values were seen in 20-29years (2.3%) for HIV/ HBV, 40-49years (1.8%) for HIV/HCV. The findings of this work were similar to the findings from other parts of the country who had higher prevalence of HBV and HCV among this same age brackets suggestive of the higher sexual activity among this age bracket [3,5,9,11].

5. CONCLUSION

The overall prevalence of HIV/ HBV (4.6%), HIV/HCV (2.8%) and HIV/ HBV/HCV (1.1%) had been established in this study. It was also

observed that Bori apart from having the highest HIV burden in the state, has the highest prevalence of co-infection of HBV and HCV among HIV patients. Having known the complication that accompany co-infection in the management of HIV infection, every HIV positive patient should undergo screening for HBV and HCV.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

An ethical approval for this work was obtained from the office of the Permanent Secretary, Rivers State Ministry of Health, Port Harcourt. Each participant filled a consent form and questionnaires were issued to obtain their demographic data.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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