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Prevalence of Hepatitis B and C among HIV Infected Pregnant Women Attending Care and Treatment at National Institute for Pharmaceutical Research and Development (NIPRD), Abuja, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author YY did the conceptualization, proposal writing, discussion/choice of method, supervised bench work and writing up manuscript for publication. Author SBM did the literature searches, proposal writing proof reading, discussion/choice of method. Author KTO carried out literature searches, socio-demographic data collection, bench work and data analysis. Author AA carried out socio-demographic data collection. Author MU did the laboratory/serological screening supervision and bench work. Author OCD carried out all statistical analysis. Author ARA carried out socio-demographic data collection, bench work and data entering. Author JFN did the discussion/choice of method, supervised socio-demographic data collection and proof reading of manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Viral Hepatitis and Human Immunodeficiency Virus (HIV) are most common top ranking leading causes of infectious diseases and deaths worldwide. If these infections, remain unidentified and untreated among HIV infected pregnant women, children born to these pregnant women are at high risk of these viral hepatitis infections.

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Aims: The aim of the study was to determine the sero-prevalence of HBV and HCV among HIV infected pregnant women in Abuja, Nigeria.
Methodology: A cross sectional study among 330 HIV infected pregnant women commencing antiretroviral therapy (ART) at National Institute for Pharmaceutical Research and Development (NIPRD), Abuja, Nigeria were studied. The women were screened for the presence of HBV and HCV antibodies. A pre-tested questionnaire was used to obtain socio-demographic data prior to recruitment/enrollment. Data were analyzed using statistical product and service solutions (SPSS) (version 20.0).
Results: Out of the 330 HIV infected pregnant women, 90 (27.3%) were HBV positive, while 5 (1.5%) were HCV positive (p = 0.42). The highest prevalence was observed among the age group of 20 – 29. However, none of the patients tested positive for both HBV and HCV.
Conclusion: The findings of this study indicated that infection with viral hepatitis is common and of public health concern. Therefore, concerted efforts should be put in place to mitigate the epidemics.

Keywords: Hepatitis B virus; hepatitis C virus; human immune deficiency virus; sero-prevalence; cross sectional; NIPRD.

1. INTRODUCTION

Viral Hepatitis and Human Immunodeficiency Virus (HIV) are among most common top ranking leading causes of infectious disease deaths worldwide [1,2]. Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections are regular causes of chronic hepatitis globally and they create highest burden to healthcare systems because of its high rate of morbidity and mortality, and also high costs of management and treatment [3,4,5,6].

Viral hepatitis can also be referred to as inflammation of the liver. The HBV and HCV infections primarily affect the liver and usually show no symptoms for a long time. Although, If the infections remain untreated, the virus can cause greater damage to the liver and death. HIV help in modifying the natural history of HBV and HCV infection among co-infected persons and therefore are more likely to develop chronic viral hepatitis; have an increased risk of liver-related mortality and morbidity and suffer from life-threatening complication beyond those caused by either infection alone [7,8,9,10]. World Health Organization (WHO) in 2018 reported an estimated 257million people are living with HBV infection (as defined by hepatitis B surface antigen reactive) [11]. It was also estimates by WHO that 3% of the world's populations are chronically infected with infection cause by HCV and most of these cases are found in Africa region [12,13].

The sero-prevalence of HBV infection is very high in the developing countries of sub-Saharan Africa and South East Asia where about 8 - 10% are chronic infectious carriers; and these same geographic regions have over two-thirds of the worldwide HIV burden [14,15]. In the developed countries, chronic HBV and HCV co-infection are found among estimated 30% and 10% of HIV-positive persons respectively, with only non or approximately 1% being triply infected with HIV, HBV and HCV [16].

Some studies carried out across Nigeria have shown difference prevalence frequencies of HIV/HBV co-infection from 9.2% to as high as 70.5% and that of HIV/HCV co-infection ranged from 0.5% to 14.7% [17,18,19,20]. HBV and HCV infections occur more frequently among HIV infected patients due to the shared modes of transmission and further worsens the outcome for the mother and the infant with a more rapid clinical and immunological progression [21,22]. Although, most perinatal and horizontal transmission of HBV occur in areas of greater endemicity as most infections are acquired in the first 5 years of life around Asia and Africa geographic regions and estimated 25% of infected children will die of HBV related chronic liver disease in adulthood [23,24].

There are several reported consequences of an acute viral hepatitis in pregnancy, this may include premature labor with the resultant sequelae of prematurity [25,26]. An increase in the incidence of prematurity over that are seen in the general population has being demonstrated in some studies [25,26,27]. Other later effect of HBV infection may include a higher risk of intraventricular hemorrhage.

Accordingly, except if HBV infected pregnant women are identified and sufficient management, care and treatment are given, their babies would be at high risk of HBV infection and its challenges later in life. For HIV patients co-

infected with both/or HBV and HCV are usually associated with accelerated prognosis into cirrhosis and other liver diseases, hence, causing higher mortality rates; despite the impacts of HCV on HIV disease prognosis still remains unclear [28,29]. Additionally, it is reported that individuals co-infected with HBV and HCV are risk of hepatoxicity associated with the use of antiretroviral drugs (ARDs) [21,22,23,24,28,29].

The clinical presentation of non-specificity and the chronic course that makes the early diagnosis of HBV and HCV difficult [21,22]. Thus, there may be a latent or silent epidemic of HBV and HCV among pregnant women living with HIV/AIDS which remain unreported and thereby no intervention plan to scrub such menace. It is of significant to investigate the proportion and frequency of HBV and HCV co-infection among HIV infected HIV infected pregnant women attending care and treatment at National Institute for Pharmaceutical Research and Development (NIPRD) Abuja in order to understand and profound interventions aimed at management, prevention, care and treatment in view of its growing public health importance. Thereby, providing a window of opportunity for patient education and behavioral modification by counselling and improved management of our HCV and or HBV co-infection in HIV infected pregnant women to achieve better pregnancy outcome. Therefore, this present study is aim to investigate the sero-prevalence of HBV and HCV among HIV infected pregnant women in NIPRD, Abuja seeking healthcare and management.

2. MATERIALS AND METHODS

2.1 Study Area and Design

The study was a cross-sectional survey carried out between 5th January, 2015 to 23rd December 2018 among HIV infected pregnant women on their commencement for ART at NIPRD for HIV care and treatment. Abuja is the developing Federal Capital City of Nigeria lying between latitude 8.25°N and 9.20°E of the equator and longitude 6.45°N and 7.39°E of Greenwich Meridian. It is located at the centre of the country with a landmass of approximately 7,315 km², of which the actual city occupies 275.3 km2. It is situated within the Savannah region with moderate climatic conditions. The territory is located just north of the confluence of the River Niger and Benue River [30].

NIPRD is the apex medical research and referral institution in Nigeria charged with the responsibility to conduct research into disease of public health significant in the country. Although, with the Federal Government of Nigeria programme in 2002 on antiretroviral drug (ARDs) treatment, it was selected among the 25 treatment centres. It was selected principally to provide the research backup and referral centre serving a large population in the heart of Abuja and its environs for the National HIV programme. Presently, the facility provides free comprehensive care, treatment and support for over 6,646 HIV patients. Patients are enrolled into the HIV treatment programme following HIV confirmations or a referral from the HIV Counseling and Testing Centre (HCT), Virology laboratory of NIPRD, Abuja or transfer from other government recognized HIV treatment facility in the country.

2.2 Study Populations

As a tradition and requirement, all HIV infected pregnant women to commence ART are screened for pregnancy. A total of 330 HIV infected pregnant women were confirmed for pregnancy in our laboratory (Human Virology unit of Microbiology and Biotechnology Department, NIPRD, Abuja) were recruited for this study.

2.3 Research Questionnaire

A well-structured self-administered questionnaire was designed to achieved the desired objective of the study and was used to collect baseline information about the patients. The questionnaire before the study was pretested on 20 HIV infected pregnant woman in our health facility with the necessary modification and corrections made after the pre-test. The baseline information (socio-demographic variants) include age, present place of abode, viral hepatitis status, educational status, occupational status, history of previous blood transfusion, alcoholism and phone numbers.

2.4 Samples Collection

Five millilitres (5mL) of venous blood were carefully drawn from the veins of each patient into a well labeled Ethylene Diethyl Tetracetic Acid (K2 EDTA) tube for CD4+ count and haematological assay as required for ART initiations/commencement baseline parameters. After the assay, the samples were centrifuged at 4,000 revolutions per minutes (rpm) for 10 minutes. The plasma was aliquoted into cryovials

and stored in the -40°C freezer until ready for serological screenings for HBV and HCV.

2.5 Serological Screening

Serological diagnosis was carried out using Rapid diagnostic tests (RDTs), for HBV infection the SD BIOLINE (Standard Diagnostic (SD) Inc., Korea) one step HBV test kit was used for detection of HBV infection and HCV antibodies was carried out using the SD BIOLINE HCV test kit. This is an immunochromatographic rapid test for the qualitative detection of antibodies specific to HCV in blood with a sensitivity of 100% and specificity of 99.4% according to manufacturer's instructions found on the standard operation procedure insert.

The seropositive samples to HBsAg and anti-HCV detected by RDTs screening were further confirmed by Western blot (Trinity Biotech, Bray, Ireland) according to manufacturer's specifications.

2.6 Data Analysis

The data obtained from the study was analyzed using statistical product and service solutions (SPSS) (version 20.0), descriptive statistics were presented in Tabular form. The student t-test (t^2) test was used to determine the level of association of the prevalence of HBV and HCV among HIV infected pregnant women with respect to age distribution. Values obtained were considered statistically significant at $p \leq 0.05$.

3. RESULTS

A total number of 330 HIV infected pregnant women were included in this study. The mean age of the patients was 29.5 years with range 10 - 49 years. Of the 330 HIV infected pregnant women studied, 90 (27.3%) tested positive for HBV, 5 (1.5%) tested positive for HCV. However, none of the patients tested positive for both HBV and HCV in this present study. The age distribution and results of screened viral hepatitis (HBV, HCV and HBV/HCV) of the study patients (n = 330) are shown in Table 1.

It was observed that age group 20 – 29 had the highest prevalence 65 (19.7%) of HBV and closely followed by 30–39 age group with prevalence of 25 (7.6%) HBV sero-positivity. No HBV sero-positivity observed among other age groups. The HCV sero-positivity observed among HIV infected pregnant women during this study was 5 (1.5%) at age group 20–29 years (Table 1).

3.1 Socio-demographic Characteristics of the HIV Infected Pregnant Women Studied (n = 90)

The socio-demographic characteristics of the studied HIV infected pregnant women: educational attainment, marital status, occupation status and others are presented on Table 2. In this present study, majority of the pregnant women were within the age group 20 - 29 (42.4%) and least at age group 10 – 19 (14.8%). Most of the women are married (77.3%), follow by those that are not married (10.6%), closely followed was widowers (9.1%) and least women are divorces (3.0%). The educational status, half of women had at least a secondary education (48.5%) and followed by primary pupil (22.7%). About 22.7% are gainfully self-employed. It was observed that 25.8% ever had blood transfusion and 19.7% consumed alcohol. It was observed that 19.7% had ever tested for viral hepatitis. The screening of viral hepatitis B and C was found to be 90 (27.3%) and 5 (1.5%) seropositive respectively among the pregnant HIV infected women.

4. DISCUSSION

Viral hepatitis B and C virus poses as an endemic in countries worldwide. The 27.3% prevalence of HBV observed among the HIV infected pregnant women (n = 330) shows it has high endemicity of HBV infection according to WHO criteria [31] This finding is also in agreement with the WHO (1990) report for Nigeria as highly endemic area for HBV with prevalence greater than 8%. Although, the prevalence (27.3%) of HBV found in HIV infected pregnant women (n = 330) attending ART care and treatment in NIPRD did not falls within the range of reports given in other studies carried out in other parts of Nigeria, Africa and the rest of the world. Our findings, thus, show that NIPRD Abuja, like other areas in Nigeria, is highly endemic for HBV infection.

The overall prevalence of HBV among HIV infected pregnant women reported in this study was 27.3%, implying that HBV is prevalent among HIV infected pregnant women. This relatively high prevalence could be attributed to the similar modes of transmission of these viruses (HIV, hepatitis B and C); thus infection with any one of the three viruses is predictive of a likely exposure to the remaining two viruses. People living with HIV/AIDS (PLWHA) are disproportionately affected by viral hepatitis infections and this is quite evident in different

prevalence reported in different studies. The prevalence reported here in this study is relatively higher than 10.8% prevalence reported by [32] among HIV infected persons in Abuja, Nigeria.

The findings of this study reveal that the prevalence of HBV and HCV infection among this group of patients is 27.3% and 1.5% respectively, this may imply that these patients are at risk of developing life threatening

Table 1. Age distribution of HIV infected pregnant women with HBV and HCV (n = 330)

Age group	HBV positive women	Percentage (%) HBV positive	HCV positive women	Percentage (%) HCV positive
10 – 19	0	0	0	0
20 – 29	65	19.7	25	1.5
30 – 39	25	7.6	0	0
40 – 49	0	0	0	0
Total	90	27.3	25	1.5

Table 2. Socio-demographic characteristics, HBV and HCV seropositivity of HIV infected pregnant women (n = 330)

Variables	Frequency	Percentage(%)
Age group		
10 – 19	49	14.8
20 – 29	140	42.4
30 – 39	85	25.8
40 – 49	35	17.0
Educational status		
No formal	50	15.2
Primary	75	22.7
Secondary	160	48.5
Tertiary	45	13.6
Marital status		
Single	35	10.6
Married	255	77.3
Widowed	30	9.1
Divorced	10	3.0
Occupational status		
Civil servant	45	13.6
Self employed	75	22.7
Un employed	110	33.4
Trading	65	19.7
Student	35	10.6
Ever tested for Viral hepatitis		
Yes	65	19.7
No	265	80.3
Blood transfusion		
Yes	85	25.8
No	245	74.2
Alcohol consumption		
Yes	85	19.7
No	365	80.3
HBV screened		
Reactive	90	27.3
Non-reactive	240	72.7
HCV screened		
Reactive	5	1.5
Non-reactive	325	98.5

challenges, since viral hepatitis are reported to prognosis faster among HIV patients than non HIV patients, thereby causing liver related health challenges.

Interestingly, few studies across Sub-Sharan Africa have shown a variation in the prevalence of HIV/HBV co-infection in pregnancy. The prevalence of HIV/HBV co-infection in pregnant women of 27.3% in this our present study was not in agreement with 4. 2% and 4.1% by [33] and colleagues in Nnewi, South East Nigeria and [34] and colleagues from Rwanda, South Africa respectively [33,34]. A likely explanation for this is that they found that HBV positivity was associated with black African origin of whom accounted for one fifth of their study population [35]. Higher prevalence of 8.9% and 9.0% were reported by [36] from Ibadan Nigeria and [37] from Abidjan, Cote d'Ivoire respectively. The variations in social and cultural practices as well as varying sample size, testing kits specificity and sensitivity may have been accounted and responsible for the variation in prevalence rates in the Nigerian studies [38].

In this study, one of socio-demographic characteristic considered were age group of the patients. The age group of 20 – 29 years had the highest HBV sero-prevalence rate of 19.7% and followed by 30 – 39 years 7.6%. This is in agreement with the highest viral hepatitis sero-prevalence rate observed in the 25 – 29 years' age group in a similar study in Ibadan, Nigeria [39]. This may be so because this age range falls within the sexually active age group and hence are more at high risk of having a sexual contact with an infected person [40].

The age group (20 – 29) years had the highest prevalence of 5 (1.5%) of HCV antibody sero-positivity. The reason for this was not immediately apparent, but this was suggestive of the probability of transmission routes other than sexual as mode of acquisition of HCV among the seropositive patients. The HCV co-infection among HIV-infected patients have been reported infrequently from location to location which is in agreement with variations observed in other studies carried out in Nigeria. This co-infection prevalence is non-negligible, and patients co-infected with these two viruses should receive special care, as it is known that HCV infection causes increased morbidity and mortality in HIV-positive patients [41,42]. However, there was no statistically significant ($p \leq 0.05$) between age of the patients and prevalence of HBV and HCV infections.

5. CONCLUSION

The findings of this study indicated that infections with HBV and HCV are common and of public health concern. Therefore, concerted effort should be put in place to mitigate the epidemics. This finding stress the urgent need for more provident HBV immunization programs and screening of the HIV infected pregnant women for HBV and HCV before and even during antiretroviral therapy to prevent children born to these pregnant women the risk of HBV or HCV. Therefore public enlightenment campaigns against these silent killers diseases and symptomless infections should be mounted.

CONSENT

The patients were recruited after they were sufficiently counseled on the objectives, risk and importance of the study. Written consents were obtained and all relevant confidentiality was kept throughout and after the study period.

Only the principal investigator held the results of blood samples tested. The patients were informed of their HBV and HCV test results as desired and the test results were delivered to individuals in a sealed form. The patients found reactive or positive were further counseled and linked to care in addition to the HIV treatments at the institute research clinic (NIPRD).

ETHICAL APPROVAL

Ethical approval for the study was sought and obtained from the Institutional Review Board (IRB) of National Institute for Pharmaceutical Research and Development (NIPRD), Abuja in accordance with the code of ethics for biomedical research involving human subjects.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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