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Prevalence and socio-demographic association of Hepatitis B and C co-infection and dual infection among People Living with HIV: a seven year retrospective data review of Indigenous people attending HIV Clinic in Northwestern Nigeria

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Keywords

Indigenous population; People Living with HIV; Aboriginals; Hepatitis B (HBV), hepatitis C (HCV); Human immunodeficiency virus (HIV); co-infection

Abstract

Background: To date, no studies in Nigeria have specifically examined HIV-HBV and HCV co-infection and dual infection among the indigenous population.
Objectives: To examine the prevalence and associations of HBV and HCV co-infection and dual infections with HIV among indigenous population in Kebbi state, Nigeria
Methods: Retrospective review of hospital folders of 1728 HIV infected self-identified indigenous patients attending Federal Medical Center, Birnin Kebbi, Nigeria from 2009 to 2016. A total of 102 subjects with available viral hepatitis results formed the sample size.
Results: Of the 1728 HIV positive self-identified indigenous patients folders reviewed, 5.9% (102/1728) have available HBV and HCV results. 10.8% of indigenous PLHIV with available viral hepatitis results were HBV co-infected, 5(4.9%) were HCV co-infected and 3(2.9%) were dual infected with HBV and HCV. Majority (74/102; 66%) were <40 years. Young people <40 years were more likely to be co-infected with HIV and HBV compared with those with HIV only (39.3% vs 32%, p<0.001). In contrast, young people <40 years were more likely to be HIV mono-infected than HIV/HCV co-infected (32% vs 17.8%, p<0.001) or HIV/HBV/HCV dual infected (32% versus 10.7%; p<0.001).
Conclusion: The prevalence of HIV/HBV co-infection among indigenous population in Nigeria is higher than global estimate. Universal testing for HBV combined with harm reduction strategies is required for younger indigenous PLHIV.

Introduction

Hepatitis B and C are viruses of public health importance. According to the 2017 World hepatitis Report, 1.34 million people died from viral hepatitis in 2015(Global Hepatitis Report 2017). The figure is comparable to deaths from tuberculosis but higher than deaths from HIV. The report also stated that in 2015, estimated 257 million people were living with chronic Hepatitis B and 71 million people with chronic hepatitis C infection. Majority of those infected with HBV live in Africa and Western pacific regions while those infected with hepatitis C are mainly in the European and Mediterranean regions. To further depict the burden of HIV co-infection with hepatitis, the report stated that of the 36.7 million people living with HIV in 2015, 2.7 million were co-infected with HBV and 2.3 million with HCV giving HIV/HBV co-infection rate of 7.4% and HIV/HCV rate of 6.3% (Global Hepatitis Report 2017). Persons with HIV–HBV or HIV–HCV co-infection are at risk for accelerated disease progression, stigma and, in some instances, compromised access to health services.

In Nigeria, 20 million people are infected with hepatitis B and C with estimated 1.4 million annual infections (Global Hepatitis Report 2017). In the general population, prevalence of HBV in Nigeria range from 6-20% depending on subgroup and screening method (Emechebe etal 2009). A pooled HBV prevalence of 13.6% has been documented from a systematic review and anti-HCV sero-prevalence of 1.0% among children aged 10–18 years has also been reported (Eke etal 2016). Among PLHIV, a study from Northwestern Nigeria reported HIV/HBV prevalence of 12.3% and HIV/HCV co-infection rate of 1.6% and 0.6% HIV/HBV/HCV dual infection (Hamza etal 2013). Hepatitis B virus is 50—100 times more infectious than HIV (Hamza etal 2013).

Prevalence of viral hepatitis could be up to four times higher among Indigenous compared with non-Indigenous people depending on the region (Amazigo 1990). One study from eastern Nigeria found that with increasing age, significantly higher carriage of hepatitis B serum marker and exposure in the rural indigenous population when compared with the urban population (Amazigo 1990). Globally, hepatitis research have been conducted among indigenous populations such as the Australian Aboriginal and Torres Strait Islander, the Andamar and Nicobar Islanders in Indian Oceania, in the Americas, the Arctic, among the Maori people of New Zealand, European Roma, and the Alaskan Natives. Majority of these studies have reported higher but variable prevalence of viral hepatitis when compared with non-indigenous populations.

Several distinct factors and peculiarities account for greater risk of viral hepatitis and continued to reinforce the prevalence, morbidity and mortality disparities that are seen among the indigenous people. For instance, indigenous people have a disproportionately higher rates of poverty, lower levels of education and employment, imprisonment, seek some relief in non-conventional ways like intravenous drug use and more likely to engage in unsterile procedures like tattooing. They also suffer huge social and economic disparity in access to quality healthcare and prevention services which increase the risk of viral hepatitis (Center for Social Justice) Among the Canadian first nation Inuit and Metis for example, hepatitis B was five times higher and hepatitis C three times higher compared with general population. Similarly, for the Australian Torres and Aboriginal, Hep B was four times higher while hepatitis C was three times higher when compared with the non-indigenous people. Compared to HIV infected only, HIV/HCV co-infected are likely to be heterosexual, aboriginal, unemployed and of low income (Rourke etal 2012). A recent meta-analysis data report also shows that indigenous people are up to 10 times more likely to be infected with viral hepatitis than the general population in their respective countries (Taylor 2017). A study also reported that individuals with HCV were four times likely to have used tattoo (Gardner 2014).

Many studies in Nigeria have assessed prevalence of viral hepatitis B and C in various service delivery points (ANC, blood transfusion etc.).However, to the best of our knowledge, no study has been published on hepatitis prevalence with focus specifically on Indigenous people living with HIV in Nigeria.

Aims and objectives

- To determine prevalence of hepatitis B and C among indigenous people living with HIV attending Federal Medical Center, Birnin Kebbi Kebbi State, Nigeria
- To document the demographic characteristics and association with HIV/Hepatitis co-infection
- To provide recommendations based on gaps for policymakers, implementers and healthcare workers providing health services for indigenous people in Nigeria

Materials and Methods

Study Site

The study was conducted at Federal Medical Center, Birnin Kebbi.. The state was created in 1991 and has a population of 3,137,989 (projected from 1991 census) total area of 36,800 km^2 and comprises of 21 LGAs, 225 political wards, 3000 settlements, 1036 hard to reach settlements (Bawa 2004). Federal Medical Center Birinin Kebbi is an urban tertiary health facility providing health services for people within and outside including indigenous people of the state. It is a referral center for primary and secondary facilities in the state. It provides accident and emergency service, laboratory, pathology, pharmacy, general medical, surgical, Obstetric and gynecological as well as comprehensive HIV and other chronic infectious diseases services like viral hepatitis. Provision of comprehensive HIV services started in 2008. The hospital has enrolled above 3,000 PLHIV on ART since inception and has over 900 patients active on ART.

Study Population

Zuru people are aboriginals and indigenously referred to as Lelna in north-western Nigeria and are presently located in the south of Kebbi and Niger State. Zuru is the town of indigenous Lelna people (divided into five Chiefdoms), the people referred to as Proto-Lelna and Lelna and the origin of the Language is Proto C'lela (Bawa 2004). The Maguzawas, the aboriginal Hausa speaking people found in Northern Nigeria and the Lelna most share the same cultural affinities in common with these indigenous tribes and have been claimed to be genetically related to Lelna citing some overlapping borrowed consonants as reasons. Our study population comprises individuals who have self-identified as indigenous person of Zuruland in Kebbi State and the indigenous status and residence were available in ART clinic folder during initial registration. Further validation of indigenous status was done by comparing status in ART folders with that in ART care card. There are no benefits attached to being indigenous in terms of access to care. The participants resided within rural, remote and very remote hard to reach indigenous communities that maintain traditional connections to their land and culture. The addresses were also verifiable locations harboring indigenous communities and within a sparsely populated area with poor communication, transport and infrastructures.

Study Design

A retrospective cohort study of 1728 indigenous people living with HIV and enrolled into HIV care between 2009 and 2016 at Federal Medical Center, Birnin Kebbi, Northwestern Nigeria. A chart abstraction tool was then developed to capture socio-demographic and other clinical details of 102 self-identified PLHIV with documented screening and hepatitis test results in their clinic folders.

Screening Methods

All the blood samples were screened for HBV using the HBsAg rapid test kit (ACON, USA) following the manufacturer's instructions. Similarly, all the blood samples were screened for anti- HCV using rapid test kits (ACON, USA). The diagnosis of HIV was made in patients using WHO approved Determine1/2 very rapid kits with 100% sensitivity and 99.6% specificity.

Data Analysis

Data was analyzed using SPSS version 21. Group comparison was done between HIV infection only versus co-infection or dual infection with viral hepatitis B and C. The level of significance was set at $p < 0.05$. Percentage was used to calculate proportion while cross tabulation statistics was used to compare associations among various HIV un-infected, co-infected and triple infected categories.

Ethical approval

Data for this study were retrieved from secondary data routinely collected at Federal Medical Center, Birnin Kebbi, Kebbi State. Permission for data collection was obtained from the management of Federal Medical Center, Kebbi. Ethics committee approval was waived because no patients were directly involved.

Results

Table I: Socio-demographic characteristics of subjects

Characteristics	HIV infected only n=83	HIV/¦Hepatitis B co-infected, n= 11(%)	HIV/HepC co-infected, n=5(%)	HIV/Hepatitis B&C Total co-infected n=3(%)	Total
Age Group					
0-14yrs	1(1.2)	0(0)	0(0)	0(0)	1
15-29yrs	6(7.2)	7(64)	3(60)	2(67)	18
30-34yrs	1(1.2)	3(27)	2(40)	1(33)	7
35-44yrs	1(1.2)	1(9)	0(0)	0(0)	2
45-54yrs	63(75.9)	0(0)	0(0)	0(0)	63
55>yrs	11(13.2)	0(0)	0(0)	0(0)	11
Sex					
Male	46(55.6)	7(64)	4(80%)	1(33)	58
Female	37(44.4)	4(36)	1(20%)	2(67)	44
Marital Status					
Single	17(20.4)	1(9)	0(0)	0(0)	18
Married(polygamous)	52(63)	7(63.6)	3(60)	3(100)	65
Married (monogamous)	2 (2.4)	2(18.1)	1(20)	0(0)	5
Divorcee	3(3.7)	1(9.3)	1(20)	0(0)	5
Widow/Widower	9(10.5)	0(0)	0(0)	0(0)	9
Blood Transfusion					
Yes	12(14.5)	3(37.5)	2(22.2)	1(9.1)	18
No	71(85.5)	8(72.7)	9(77.8)	10(90.9)	89

Table I shows the socio-demographic characteristics of the subject by HIV, hepatitis B and C co-infection and dual infection status. A total of 1728 folders of self-identified indigenous people living with HIV attending HIV clinic at Federal Medical Center Birnin Kebbi was extracted. 5.9% (102/1728) were tested for viral hepatitis B and C and have results available. 85% (83/102) of the subjects have HIV infection only, 10.8 %(6.4-17.1, CI-95%) co-infected with HBV only, 4.9 % (0.9-9.5, CI-95%)) with HCV only while 2.9 % (0.4-6.3, CI -95%) dually infected with HBV and HCV. Our study found HIV/HBV prevalence of 10.8%, HIV/HCV of 4.9% and HIV/HBV/HCV dual infection of 2.9%. Majority (75.9%) of those who self-identified as indigenous and living with HIV only were 45-54 years, majority (55.6%) were males and most (63%) were also married in a polygamous setting. Among those co-infected with HIV and hepatitis B, majority (64%) were 15-29 years, males (64%) and married in a polygamous setting (63.6%). Among those with HIV/hepatitis C co-infection, majority (60%) was 15-29 years, male (80%) and most (60%) also married in a polygamous setting. Among those with HIV/hepB and C dual infections, majority (67%) were 15-29 years, females (67%) and all were married in a polygamous setting. There were more males than female PLHIV who are co-infected with HBV and HCV and the reverse is the case for HBV/HCV dual infection

Table II: Association of Age, Sex and family type and hepatitis B, C co-infection with HIV

Characteristics	HIV alone n=83	HIV/HBV n=11	p-value	HIV alone n=83	HIV/HCV n=5	p-value	HIV alone n=83	HIV/HBV/HCV n=3	*p*-value
Age									
<40yr	9(32)	11(39)	<0.001	9(32)	5(18)	<0.001	9(32)	3(11)	0.0021
>40yr	74	0		74	0		74	0	
Sex									
Male	46(55)	7(64)	0.7508	46(55)	4(80)	0.3845	46(55)	1(33)	0.5880
Female	37(45)	4(36)		37(45)	1(20)		37(45)	2(67)	
Family Type									
Polygamous	52(63)	7(64)	1.0	52(63)	3(67)	1.0	52(63)	3(100)	0.5502
Other	31(37)	4(36)		31(37)	2(33)		31(37)	0(0)	

†Pearson's $\chi 2$, Fisher's exact or mid-p exact as appropriate.
HIV: Human Immunodeficiency Virus, HIV; Hepatitis B Virus; hepatitis C Virus

Table II shows the association of age, sex and family type and hepatitis B and C co-infection with HIV. Young indigenous people, 40 years are more co-infected with both HIV and HBV than HIV only (39% versus 32%, p<0.001).Also younger indigenous people <40years are more likely to be mono-infected with HIV only than either HIV/HCV co-infected (32% versus 18%, p<0.0001) or HIV/HBV/HCV triple infected (32% versus 11%, p=0.0021).Although these were not significant, compared with females, a higher proportion of males were co-infected with HIV/HBV (64% versus 36%, p=0.7508) and with HIV/HCV (80% versus 20%, p=0.3845). However, a higher proportion females than males were dual infected with both HBV and HCV compared with males (67% versus 33%, p=0.5508) but this was not significant. Similarly, no significant findings in the co-infection or dual infection rate by family type.

Discussion

This study found HIV/HBV prevalence of 10.8%, HIV/HCV of 4.9% and HIV/HBV/HCV dual infection of 2.9% among indigenous people living with HIV (PLHIV) attending Federal Medical Center, Birnin Kebbi. Higher HBV/HIV prevalence of 75% has been reported among the native inner city women (Berger & Carver 2003). The lower finding of HIV/HBV and HIV/HCV prevalence in our study could be attributed to the low testing rate of 6% for Hepatitis B and C among the study population similar to low HIV/HCV prevalence reported among Canadian correctional facility inmates where about 70% were unscreened for HCV (Correctional Services Canada 2002). Although PEPFAR through USAID provided chemistry machines and reagents to run the test, the administrative cost not covered and the availability of human resources to conduct the test limits universal access to hepatitis testing in this setting. This finding then suggests the need to scale up universal screening for hepatitis B and C among indigenous PLHIV.

Lower HIV/HCV prevalence of 0% was reported among Native Americans attending two North Dakota facilities (Hossain etal 20014). The zero prevalence reported could be because the primary subjects were HCV infected patients evaluated for treatment initiation. However, higher HIV/HCV prevalence rate of 10% and 33% have been reported among American Indians/Alaska native and Australian Aboriginal/Torres Islander respectively (Hossain etal 20014; PHAC 2016). A much higher HIV/HCV prevalence of 42.5% and 87% were reported among aboriginal prisoners in Northern Spain and Canada respectively (Pallas 1999; Remis 2008). HCV/HIV co-infection tends to vary by injection Drug Use (IDU) status, incarceration status and sexual practices. Within the indigenous HIV infected population, subgroups using injection drugs and men who have sex with men (MSM) are mostly affected and are propagators of the epidemic. For instance, among Australian aboriginal prisoners, the authors noted that

98% of co-infected were also IDUs and many have shared needles, a major risk factor for HCV/HIV co-infection not explored in our study (Remis 2008). Future research in Africa need to examine in detail these indigenous subgroups that are affected by both HIV and viral hepatitis.

Indigenous patients 40 years and younger were more likely to be co-infected with HIV and HBV than being HIV mono-infected and this was significant. Also in our study, younger participants <40 years were more likely to be HIV mono-infected than being co-infected with HCV or dual infected with HCV and HBV. There are reports from multiple West African countries showing higher HCV prevalence in older populations due to iatrogenic contamination during mass vaccination or treatment campaigns many years ago. Similar to our results, **one s**tudy from Northeastern Nigeria found that up to 87% of indigenous rural people from eastern Nigeria carry at least one HBV marker by age 40 years (Amazigo 1990). This may be because indigenous young men involve in more aggressive contact sports like football with possible exposure to body fluids such as sweat and blood. Additionally, aside from the speculation of bloody and sweaty sport (which is extreme speculation), vertical HBV transmission is frequently reported in African and Asian countries and is the commonest route of HBV transmission. Similar to our finding, indigenous male British Columbian subjects above 45 years were likely to be co-infected with HIV and HCV (Craib etal 2003). Contrary to our finding, study from Vancouver demonstrated that younger aboriginal IDUs were more co-infected with HIV and HCV (Carmen etal 2014).

HIV infected male indigenous participants were more co-infected with HBV and HCV than female while HIV/HCV/HBV triple infected females were more than male although this was not significant. In the contrary, indigenous studies in northern Alberta, Canada and British Columbia have reported higher HIV/HCV prevalence in females more than males (Rourke etal 2012; Craib etal 2003; Irisena etal 2002). In these studies, more co-infected female subjects reported to have shared needles and indulge in injection drugs, a major risk factor for HCV/HIV co-infection not popular among indigenous women in our study population probably as a result of cultural and religious influence.

Studies assessing HIV co-infection with viral hepatitis in the general population vary in results. For instance, higher HIV/HBV co-infection rates of 28.7% and 70.5% were found in Jos and Kano respectively (Nwokedi 2006; Sungkanuparph etal 2004). Lower HIV/HBV prevalence of 8.7% and 9.2% were reported from studies in Thailand and Lagos, Nigeria respectively (Lesi etal 2007; Otegbayo etal 2008). Lower prevalence rate of 0.3% has also been reported for triple HIV/HBV/HCV infection among the general population in Nigeria (Ojide etal 2015). The sample size and testing technique influence prevalence rate in many of these studies. One study among the general population reported similar higher but non-significant HIV/HBV co-infection in male than female (17.8% vs 14.7%) but contrary to our finding, the same study found higher HCV in females than males (7.1% vs 6.7%).

The current study has some limitations and further large scale study will be necessary. The retrospective nature of the study means the findings could be influenced by the screening methods and preferential testing of symptomatic or those at higher risk of infection rather than universal screening. The sample size has also been reduced as a result of 94% indigenous PLHIV not screened for hepatitis despite national guideline that stipulates viral hepatitis screening for all PLHIV. Furthermore, comparison with non-indigenous population in the same HIV clinic would have been better rather than from studies outside the location. In the same way, this is a hospital based study and the study participants only represent a small percentage of the indigenous population as many are poor and will lack the resources necessary to access health systems even when they are sick. Hence a large population based study will be relevant. There is also no consideration for the window period of the Australian antigen (disappearance of HBsAg and appearance of anti-HBs). Although useful, IgM anti-HBc serological marker not considered in detecting those in the window period. Despite the limitations the study, it is the first to specifically look at the issue among indigenous population in Nigeria .The study therefore provides insight and stimulate further research particularly among indigenous IDUs.

Conclusion and Recommendations

HBV and HCV co-infections are common among HIV-infected indigenous PLHIV in Nigeria. Younger indigenous males are significantly affected. Access to hepatitis screening among indigenous PLHIV is low making it difficult to obtain an accurate quantitative description of the prevalence of HIV/AIDS and co-infection with viral hepatitis B and C among

indigenous subjects. Particular efforts should be made to conduct targeted HBV screening with priority for indigenous males and the younger population. The findings highlight the need for opportunistic HBV screening of Indigenous people to identify people who would benefit from vaccination or treatment ensuring physical environments and culturally appropriate initiatives that reduce spread of the disease through indigenous practices that promotes vertical transmission. Mass hepatitis B screening need to be scaled up among indigenous population while access to health need to be improved through universal coverage and other form of social protection. Further assessment is required to determine rates of HBV and HCV co-infection among HIV-infected indigenous IDUs and identify effective strategies to link individuals to care and treatment. Education on HBV and HCV risk factor for indigenous people in Nigeria need to be integrated into the national and subnational HIV intervention programs as both diseases share similar risk factors and mode of transmission. National viral hepatitis plans need to include specific strategies to facilitate access to prevention, care and treatment for indigenous populations and minorities

Summary

- Poor access to testing for viral hepatitis screening for indigenous people living with HIV and the need for scaling up universal access to Hepatitis testing among this subpopulation. Innovative measures such as laboratory revolving funds need to be strengthened to complement PEPFAR support and increase universal access to hepatitis testing among PLHIV.
- High prevalence of HIV/HBV co-infection among indigenous people particularly younger males below 40 years hence the need for early screening and improvement on hepatitis vaccination programs for the indigenous people.
- Low prevalence of HCV/HIV co-infection as well as HIV dual infection with HBV and HCV among the study population unlike higher prevalence elsewhere around the world hence the need for further research on the true prevalence among indigenous IDUs and the incarcerated

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Authors Contributions

AVA, CO, AO, IJ, KU and EF conceived and designed the study. OV, OJ, OAH conducted data collection. AVA, CO, AO and EU-C analyzed and interpreted the data and wrote the first draft of the manuscript. All authors carefully reviewed and revised the manuscript for intellectual content. All authors read and approved the final manuscript.

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