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Prevalence of Hypertension among HIV/AIDS Patients Attending a Tertiary Hospital in North-East Nigeria

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Abstract

The HIV disease and its several antiviral agents have over the years been showing some associations with hypertension. While the HIV programme in sub sub-Saharan Africa including Nigeria, which is largely donor driven, focuses on the provision of HIV care only, the evolving trend of hypertension in this population goes unrecognised and neglected. The objective of the study was to establish the burden of hypertension in the HIV population as an evolving unrecognised comorbidity calling for attention. The variables of age, marital status and ethnicity were evaluated and appear to have some bearings with hypertension. This was a retrospective, descriptive study conducted at Modibbo Adama University Teaching Hospital, Yola, Adamawa Nigeria through a review of past medical records of HIV patients attending the infectious disease clinic during a 10-year period. The retrieved data were entered into and analysed using the IBM SPSS version 20.0 statistical software. Prevalence was expressed in percentage. Bivariate analysis was performed using the Chi-square test for association between socio demographics and hypertension status. A value of $p < 0.05$ was considered significant Twenty-two per cent (22.1%) of the study population were found to be hypertensive. Older age, marital status and ethnicity were found to be significantly associated with hypertension among the HIV population ($p<0.001$). This finding draws attention to the high burden of hypertension among people living with HIV/AIDS. Health policy makers and other stakeholders should therefore design and implement a wholistic HIV programme that incorporates care for non-communicable diseases such as hypertension.

Keywords: *Hypertension, HIV, prevalence.*

Introduction

The HIV pandemic still remains a global public health challenge with 38.4 million people living with HIV/AIDS across the world as at the end of 2021 [https://www.who.int/data/gho/data/themes/hivaids accessed on 13th January 2023] Approximately 28.7 million HIV positive patients were taking antiretroviral therapy as at 2021 [https://www.unaids.org/en/resources/fact-sheet accessed on the 13th of January 2023]. Nigeria recorded a burden of 1.9 million people (ages 15-49) living with HIV in 2021 [https://www.unaids.org/en/resources/fact-sheet accessed on the 13th of January 2023]. Adamawa state has a HIV prevalence of 1.3% [https://www.unaids.org/en/regionscountries/countries/Nigeria accessed on 13th January 2023]. On the other hand, the prevalence of hypertension in Nigeria is estimated at 27.5%. with cardiovascular diseases among its major complications [1].

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The introduction and subsequent scaling up of highly active antiretroviral therapy HAART coverage has remarkably reduced HIV associated morbidity and mortality and increased the life expectancy of people living with HIV (PLWH). However, this gain seems to be counteracted by the rising incidence of hypertension among this PLWH [2]. Furthermore, contributing to this trend is the phenomenon of epidemiologic transition. Globally, infectious diseases which previously dominated the disease landscape are now being surpassed by rising non-communicable diseases NCDs with cardiovascular diseases CVDs taking the lead. CVDs which have hypertension as the single most important risk factor, account for 17 million deaths a year [3, 4]. Globally, there is a growing trend of cardiovascular outcomes and metabolic complications in the HIV infected population. Accounting for 10% of non- AIDs related mortality, CVD are a major cause of morbidity and mortality amongst HIV subjects [2]. The lifelong CVD risk that trails HIV infection provides the premise for such study [5]. It is increasingly being observed that CVD outcomes are occurring at higher proportion in the HIV infected population than in the HIV negative control subjects [6]. A study reported an observation of subclinical atherosclerosis which is a harbinger of CVD in 18% of Ugandan HIV positive subjects [7].

There is paucity of data exploring the association of HAART and hypertension in Africa which bears the heaviest burden of the pandemic [5]. In addition, the relative higher CVD rates in ART experienced patients than that in ART naïve HIV positive subjects depicts a probable association between ART and CVD risk of which hypertension is one of the most frequently observed CVD risks. In Limbe, Cameroon, research finding noted a higher prevalence of hypertension in ART experienced subjects than in ART naïve people [5].

A Spanish study revealed a statically significant rise in both systolic and diastolic BP in a cohort of HIV patients upon exposure to HAART for 48 weeks [8]. CVDs including hypertension, coronary artery diseases, stroke, and cardiac failure have been found to be more frequent in HIV subjects in low- and medium-income countries [9].

Several pathogenic mechanisms have been implicated in the association of hypertension and HIV. Conceptually, they fall into 3 dimensions. Firstly, mechanisms that are attributed to the direct impacts of the virus on the systemic vasculature. They include endothelial dysfunction, lipid abnormalities, viral proteins mediated endothelial cell activation, and Systemic inflammatory cytokine-chemokine dysregulation respectively. Elevated systemic inflammatory markers accelerated, and premature atheroma formation, endothelial dysfunction and hypercoagulability are thought to arise from the prolonged viremia [10-14]. Nadir CD4 cell-count<50 cells/μL have been implicated and were believed to result from hypertension [15].

The second mechanism is thought to arise indirectly from the impact of the antiretrovirals leading to some metabolic derangements which then set premise for the evolution of hypertension. They include increased oxidative stress, dysglyceamia, lipodystrophy, increased endothelial permeability. Hyperinsulinemia plays a role in the pathogenesis of hypertension by enhancing the effect of angiotensin 2 on aldosterone and vascular contraction [14, 16]. A Washington based study found that the Protease inhibitor lopinavir/ritonavir, is strongly associated with hypertension in HIV patients [17]. In addition, hyperinsulinemia which is frequently encountered in HIV diseases and a strong independent cardiovascular risk factor, has been implicated in metabolic syndrome which has hypertension as one of its components [18]. Insulin resistance which is one of the pathologies in HIV disease has been found to be a harbinger of hypertension in young lean Ethiopian immigrants in Israel [14].

However, association of age and other traditional risk factors of hypertension have been noted in the HIV cohort by some studies. This implies the HIV positivity alone might not be the sole driver of hypertension in them [19]. With 55% of African older adults being hypertensive, a recent systematic study revealed that the key determinants of systemic hypertension among African adults are older age group, overweight/obesity, history of stroke and female sex [20].

Current HIV/AIDS programme focuses on the provision of free ARVs to HIV infected population while neglecting the other comorbidities. Provision of ARVs alone falls short of holistic care. On the whole, the burdens of these neglected cormobidites appear to be unrecognised. This approach is associated with missed opportunities for diagnosis and control of hypertension and preventing its complications. The frequent observation of hypertension among these patients informed this study to determine the true prevalence of hypertension in this population. It should draw the attention of the health care managers of the need to allocate and integrate more resources into the programme to provide a holistic package. Moreover, data exploring the association between HAART, HIV and hypertension in Africa is grossly lacking [5]. The aim of the study was therefore to determine the burden of hypertension among the HIV population in a tertiary health centre in Northeast Nigeria.

Methods

Study Area, Design and Study Population

The study location was the Federal Medical Centre, Yola Adamawa State in North-eastern Nigeria. The centre came in to being following an agreement between the then Adamawa Sate government and the Federal Ministry of Health on the 21st of August 1998. This agreement led to the temporary conversion of the State Specialist Hospital infrastructure to the Federal Medical Centre in its first 9 years of its existence. Clinical services took effect on 15th May 1999, and it relocated in 2007 to its permanent site in Yola town. The Federal Medical Centre Yola is a 330-bed tertiary health centre that provides tertiary healthcare services and post graduate training. Being a third-level referral health institution, it runs various clinical and other supportive departments, serving patients from neighbouring North-eastern states and Cameroun respectively. With a total count of 10,927 patients who have been captured in its database since its inception as comprehensive sites for HIV/AIDS treatment, the centre currently has only 3,848 active patients accessing treatment. This database draws patients from both rural and urban centres of the north-eastern states of Adamawa, Taraba, Borno, Bauchi, Gombe, and Cameroun respectively. The secondary data used preceded the universal test and treat guideline which came into implementation in 2016 [21].

This was a retrospective, descriptive study conducted at FMC Yola through a review of past medical records of HIV patients attending the infectious disease clinic during a 10-year period from June 2008 through May 2018. The study population comprised adult HIV/AIDS patients [both ART-naive and ART- experienced] in the treatment centre.

Sample Size and Sampling Technique

The Rao soft online sample size calculator recommended a minimum sample size of 372 using a 5% margin of error, 95% confidence level, response distribution rate of 50% and 10,927population [22]. But in order to increase power, 750 were studied. Random sampling technique was used in selecting the study participants.

Data Collection and Analysis

Data was extracted from case files of patients enrolled into the HIV programme in the facility. Information retrieved were socio-demographic and clinical characteristics such as age, sex, marital status, place of residence, educational level, occupation, CD4, viral load, WHO stage at diagnosis, HAART regimen and duration as well as BP status and anti-hypertensive therapy.

The retrieved data was entered into and analysed using the IBM SPSS version 20.0 statistical software. Prevalence was expressed in percentage. Bivariate analysis was performed using the Chi-square test for association between socio demographics and hypertension status. A value of $p < 0.05$ was considered significant.

Case Definition

Hypertension was defined according to one of three criteria.

1. diagnosis [documented diagnosis of hypertension] or,
2. treatment [prescription of antihypertensive medications] or,
3. high blood pressure readings [last 2 readings at or above 140/90 mmHg].

Ethical Issues

Ethical clearance was obtained from the HREC of the Adamawa State Ministry of Health Yola. Approval was obtained from the ART coordinator in the facility. Patients' personal identifiers were removed before data analysis.

Results

About two-third of the patients [57%] were within the age group of 20-30 years while the elderly, ≥60 years of age accounted for 21.7%. Three-quarter of the study population were female [75.5%]. About 8 out of every 10 participants were married while one-tenth were single. More than two-third of the study population reside in the urban area [Table 1].

Table 1. Socio-demographic Characteristics of Respondent

Variables	**Frequency**	**Percentage [%]**
Age group		
<20	13	1.6
20-39	458	57.4
40-59	307	38.5
60-79	19	2.4
≥89	2	0.3
Missing	1	-
Female	598	75.5
Marital status		
Single	93	11.7
Married	607	76.6
Widowed	72	9.1
Divorced/Separated	20	2.6
Missing Religion	8	-
Islam	366	47.9
Christianity	398	52.1
Ethnic group		
Hausa/Fulfulde	231	29.4
Bwate	78	9.9
Kilba	62	7.9
Michika	38	4.8
Marghi	30	3.8
Lunguda	28	3.6
Igbo	19	2.4
Yoruba	7	0.9

Others e.g Chamba,Verre	292	37.2
Missing 15 Educational Status		
No education	158	24.8
Primary	82	12.9
Secondary	281	44.2
Tertiary Missing 64	115	18.1
Occupation		
Farming	27	3.4
Full time housewife	258	32.5
Business	227	15.9
Civil servant	209	26.3
Unemployed	172	21.7
Missing 7 Place of residence		
Rural	175	22.1
Urban	617	77.9

Twenty-two per cent of the study population were hypertensive while about 80% were non hypertensive [Table 2]. There was a statistically significant association between age and hypertension in PLHIV. Hypertension among HIV patients increases with increasing age. The proportion of hypertension among the males is 26% compared with 21% in the female. However, this is statistically not significant. Regarding marital status, hypertension is commoner among the widowed population [32%] than their married counterpart 24%. Association between marital status and hypertension among PLHIV was statistically significant. There is also a statistically significant association between ethnicity and hypertension. Hypertension is highest among the Bwate ethnic group [31%] and lowest among the Hausa/Fulani [12%] [Table 3].

Table 2. Prevalence of Hypertension

Variable	Frequency	Percentage
Hypertension	176	22.1
Non-hypertension	620	77.9
Total	796	100.0

Table 3. Association between Socio-demographic Characteristics and Hypertension Status

Variables	Hypertension status No [%]	Non hypertension No [%]	X^2[P value]
Age group			
<20	0(0.0)	13 (100.0)	60.75(<0.001)
20-39	60(13.1)	398(86.9)	
40-59	108(35.6)	195(64.4)	
60-79	7 (36.8)	12(63.2)	
≥80	1 (50.0)	1(50.0)	
Sex			
Male	51(26.4)	142(73.6)	2.80(0.094)
Female	123(20.7)	472(79.3)	

Religion			
Islam	59(16.3)	303(83.7)	12.56(0.002)
Christianity	105(26.5)	291(73.5)	
Marital status			
Single	5(5.4)	88(94.6)	23.80(<0.001)
Married	144(23.9)	459(76.1)	
Separated/Divorced	1(5.0)	19(95)	
Widowed	23(31.9)	49(68.1)	
Ethnicity			
Hausa/Fulfulde	27(11.8)	202(88.2)	22.69(0.004)
Bwate	24(30.8)	54(69.2)	
Kilba	17(27.4)	45(72.6)	
Michika	9(23.7)	29(76.9)	
Marghi	8(26.7)	22(73.3)	
Lunguda	8(28.6)	20(71.4)	
Igbo	4(21.4)	15(78.9)	
Yoruba	2(28.6)	5(71.4)	
Others	77(26.5)	214(73.5)	
Educational status			
No education	25(19.4)	132(84.1)	7.34(0.112)
Primary	11(13.6)	70(86.4)	
Secondary	67(23.9)	213(76.1)	
Tertiary	26(22.8)	88(77.2)	
Place of residence			
Rural	43 (24.9)	130(71.5)	145 (0.698)
Urban	132(21.5)	481(78.5)	

Table 4. Logistic Regression Model for Hypertension in People Living with HIV

Variables	**B**	**S. E**	**Exp [B]**	**95% C. I**	
				Lower	**Upper**
Age					
<25 [reference category]	-	-	1.0	-	-
25-44	.372	408	.689	.310	1.533
45-64	-1.378	429	.252	.109	.585
≥65	-1.260	735	.284	.067	1.198
Sex					
Male [reference category]	-	-	1.0	-	-
Female	.142	.230	.868	.553	1.362
Religion					
Islam [ref. category]	-	-	1.0	-	-
Christianity	.771	1.513	2.162	.111	41.965
Marital status					
Married [ref. category]	-	-	1.0	-	-
Single	-19.947	40191.18	.000	.000	-
Widowed	-18.690	40191.18	.000	.000	-

Divorced	-20.390	40191.18	.000	.000	-
Separated	-18.530	40191.18	.000	.000	-
Ethnicity					
Hausa/Fulfude [ref.category]	-	-	1.0	-	-
Yoruba	.882	.307	2.415	1.323	4.406
Igbo	-108	.889	.897	.157	5.123
Michika	.507	.618	1.661	.495	5.574
Kilba	.127	.445	1.135	.475	2.713
Marghi	-.179	.347	.837	.423	1.653
Bwate	276	.500	1.317	.494	3.513
Lunguda	-.214	.323	.807	.429	1.521
Others	-.167	.477	.846	.332	2.156

Discussion

A Ugandan based study found the prevalence of hypertension among the PLW to be 11% as against the prevalence of 14% in the Ugandan general population [23]. A Senegalese study reported among PLHIV reported the prevalence of hypertension to be 22% [24].

According to our study, the prevalence of hypertension as a co-morbidity in HIV stands at 22%. This finding is correlated by a Massachusetts based study which demonstrated an increased rate of comorbidities, including hypertension, diabetes, and dyslipidaemia, seen at rates of 21.2, 11.5, and 23.3 per 100 persons in a HIV cohort. The study clearly showed a relatively higher prevalence of diabetes and hypertension in the HIV cohort when compared with the non-HIV cohort [8]. The Prevalence of hypertension among HIV subjects on HAART in Tanzanian was found to be 28.7% [25]. Another study done in Ethiopia found a much higher prevalence of hypertension in the HIV population than in the general population [53% versus 20%, $P<0.0001$] [6]. A meta-analysis revealed a global prevalence of hypertension in HIV of 35% [26]. In Cameroon, a study also revealed a higher prevalence of hypertension [38%] in the HAART experienced patients than the HAART naïve. It established a significant and positive association between HTN and HAART even after adjusting for confounders [5].

Our study shows that the prevalence of hypertension increases with age which was also corroborated by the study in Cameroon [4]. The Cameroonian study further demonstrated that the HAART induced anthropometrical and metabolic changes [hyperlipidaemia] significantly increase the risk of hypertension in HIV patients. Ultimately, this implies that in the long run, hypertensive related diseases will be a major cause of morbidity and mortality in the HIV population as they now live longer [27].

The prevalence of hypertension was highest among the Bwate ethnic group. Race/ethnicity is an established non-modifiable risk factor for hypertension. Generally, hypertension is commoner among blacks than the white population. But the relative higher prevalence found in this particular ethnic group is difficult to explain and can form a basis for further research. Being a cross-sectional study predicated on secondary data, our study could not exclude possible confounders such as family history of hypertension, [renal causes] and pre-HIV established diagnosis of hypertension. Other risk factors associated with hypertension such as obesity, smoking, alcohol, and sedentary lifestyles which are the traditional risk factors for hypertension could not be excluded too.

Studies have documented association between marital status and health including hypertension. Being single [never married, divorced/separated, and widowed] has been found to have positive relationship with hypertension [28, 29]. A prospective study among African Americans however did not establish this association [30]. It is generally held that marriage has a protective effect on health due hugely to the social support it offers. In our study, hypertension was highest among the widowed, but it was also lowest among the never married and separated, being therefore higher in those married compared to these two classes of singles. However, the fact that more than three-quarter of our study population were married could possibly explain why the association is blurred in this case.

Against this background and limitation of being a cross sectional study, causality could not be inferred as there were no HIV negative controls. A prospective cohort study will be required in future to alienate this constraint in our study. In such context, excluding those with an established diagnosis of hypertension is cardinal to truly establish a correlation between the HIV disease, adverse event of anti-HIV drugs and hypertension. Being a research work on secondary data, BMI could not be integrated which constitutes one of the limitations of this work. Furthermore, the drug regimens of our Patients were not captured and integrated into the study. This could be a confounder lurking in the study.

Conclusion

HIV in PLWH remains a significant comorbidity that has gone unrecognized and could undermine the quality of life and life expectancy in them. Consequently, this may negate the advantage achieved with the HAART.

Paradoxically, the prevalence of hypertension among the PLWH falls below the national prevalence of 27.5% of hypertension in Nigeria.

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Conflict of Interest

No conflict of interest to disclose. No funding was received for this work.

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