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Original Article

Hypertension and Associated Factors among People Living with HIV on Anti-Retroviral Therapy in Njinikom Catholic Hospital Cameroon: A Cross-Sectional Study

Hypertension et Facteurs Associés chez les Personnes Vivant avec le VIH sous Traitement Antirétroviral à l'Hôpital Catholique de Njinikom au Cameroun : Une Etude Transversale

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ABSTRACT

Background. Life expectancy among people living with HIV has significantly increased on account of increased coverage of anti-retroviral therapy (ART). However, morbidity and mortality is increasingly linked to cardiovascular diseases. We aimed to determine the prevalence of hypertension (HTN) among PLHIV on ART in a rural setting, and to determine the relationship and effects between HIV-related/traditional risk factors and hypertension. **Results.** Prevalence of hypertension was 26.3% (95% CI: 21.4, 31.3). Age, ($p<0.01$) marital status, ($p=0.008$) family history of HTN, ($p<0.01$) and BMI, ($p<0.01$) were significantly associated with HTN. Age > 40 years had more than 2-fold increased risk for HTN, p=0.01, AOR=2.60, (95%CI: 1.86, 3.34), being currently married was associated with about 3-fold increased risk p=0.01, AOR=2.91, (95%CI: 2.06, 3.76), a positive family history of HTN had a 5-fold increased risk, AOR=5.06, $p< 0.001$, (95%CI: 4.45, 5.67) while BMI-defined overweight/obesity had a greater than 2-fold increased risk, AOR=2.55, p=0.002, (95%CI: 1.97, 3.13). **Conclusion.** The prevalence of HTN among patients on ART in Njinikom Catholic Hospital is high. Traditional risk factors seem to contribute significantly. Systematic screening of all patients in ART dispensation centres and counselling on lifestyle modification are recommended.

RÉSUMÉ

Contexte. L'espérance de vie des personnes vivant avec le VIH a considérablement augmenté en raison de la couverture accrue du traitement antirétroviral (TAR). Cependant, la morbidité et la mortalité sont de plus en plus liées aux maladies cardiovasculaires. Nous avons cherché à déterminer la prévalence de l'hypertension (HT) chez les PVVIH sous TAR en milieu rural, et à déterminer la relation et les effets entre les facteurs de risque traditionnels ou liés au VIH et l'hypertension. **Résultats**. La prévalence de l'hypertension était de 26,3 % (IC à 95 % : 21,4 ; 31,3). L'âge ($p<0.01$), l'état matrimonial (p=0,008), les antécédents familiaux de l'HT, ($p<0.01$) et d'IMC, ($p<0.01$) étaient significativement associés à l'HT. L'âge > 40 ans présentait un risque plus de 2 fois plus élevé de l'HT, p=0.01, AOR=2.60, (IC à 95% : 1,86 ; 3,34), le fait d'être actuellement marié était associé à un risque environ trois fois plus élevé p=0,01, AOR=2,91, (IC à 95 % : 2,06 ; 3,76), les antécédents familiaux positifs de l'HT présentaient un risque 5 fois plus élevé, AOR = 5,06, $p < 0,001$, (IC à 95 % : 4,45 ; 5,67), tandis que le risque de surpoids/obésité défini par l'IMC était 2 fois plus élevé, AOR = 2,55, p = 0,002, (IC à 95 % : 1,97 ; 3,13). **Conclusion.** La prévalence du l'HT chez les patients sous TAR à l'hôpital catholique de Njinikom est élevée. Les facteurs de risque traditionnels semblent y contribuer de façon significative. Un dépistage systématique de tous les patients dans les centres de traitement antirétroviral et des conseils sur la modification du mode de vie sont recommandés.

HIGHLIGHTS

What is already known on this topic
Morbidity and mortality among people living with HIV/AIDS (PLWHA) is increasingly linked to cardiovascular diseases.

What question this study addressed
The prevalence of hypertension among PLWHA on ART in a rural setting and the relationship and effects between HIV-related/traditional risk factors.

What this study adds to our knowledge.

1. Prevalence of hypertension was 26.3% (95% CI: 21.4, 31.3).
2. Age, (p<0.01) marital status, (p=0.008) family history of HTN, (p<0.01) and BMI, (p<0.01) were significantly associated with HTN.

How this is relevant to practice, policy or further research.
There is a need for improvement in awareness through education and repeated patient follow-up in this rural setting.

INTRODUCTION

About 7.5 million people die around the world from hypertension (HTN) yearly, accounting for about 12.8% of mortality from all causes, thus making it a leading cause of death (World Health Organization [1]. It is estimated that between 1990 and 2010 the prevalence of HTN in Sub-Saharan Africa (SSA) increased by 67% [2,3]. In Cameroon, the prevalence of HTN spans from 5.7% in rural settings [4] to 47.5% in urban settings [5] with a national average survey of 31.0% [3]. Trends between 1994 and 2003 have shown that among men and women in rural and urban areas of Cameroon, the prevalence of hypertension increased by two to five fold [6].

HIV disease is fast becoming a chronic infection as a result of antiretroviral therapy (ART) that has greatly reduced mortality among infected patients [7]. Globally as the scale up of effective antiretroviral therapy intensifies, morbidity and mortality among people living with HIV is now increasingly linked with non-communicable diseases such as hypertension which is one of the most frequent risk factors for cardiovascular disease [8]. In 2018, 59.2% of the 8.9 (95% CI: 8.3–9.6) million PLWH with HTN globally were living in Sub-Saharan Africa [9]. Accurate estimates of the prevalence and determinants of hypertension in this population are key to inform efficient prevention and control policies. To the best of our knowledge available published studies [10,11,12,13,14] on the prevalence of HTN in this population have been conducted in urban settings only. Therefore we aimed to determine the prevalence of HTN and the contribution of traditional risk factors to the development of HTN among PLHIV enrolled on ART in Njinikom Catholic Hospital, a rural setting in the North West Region of Cameroon.

MATERIALS AND METHODS

Study Setting

This study was conducted in Njinikom Catholic Hospital which is one of 3 treatment centers located in Fundong health district in the North West Region of Cameroon and has about 970 PLHIV enrolled on ART. Njinikom is a rural community located along latitude 6º 13’ 59’’ N and longitude 10º 16’ 59’’ E with a population of about 8247 [15].

Study Design and Period

This was a hospital-based cross-sectional study that was conducted between February and May 2018.

Study Participants

The study involved PLHIV that were actively in care and treatment in Njinikom Catholic Hospital.

Inclusion Criteria

All PLHIV greater ≥ 21 years that had been on treatment for more than 12 months.

Exclusion Criteria

PLHIV with mental illness

Sampling

Participants were selected by convenient sampling technique.

Sample size

The minimum sample size was determined using the formula to estimate sample size for prevalence in cross-sectional studies [16]. Based on previous prevalence, we considered a prevalence of 24.8% [13]. Our minimum sample size was 287 but we recruited 300 patients after considering a non-response rate of 10%.

Technique and Instrument for data collection

The data collected included both primary and secondary data; all participants were subjected to a face-to –face interview and a physical examination. Data was collected using a standardized questionnaire. Information on age, gender, marital status, occupation, smoking habit, alcohol consumption, family history of hypertension, current CD4, duration of HIV infection, duration on ART, and current viral load status were obtained from both the interviews and the patients’ medical records.

One blood pressure (BP) measurement was taken on each participant on the left arm. An electronic automated clinically validated BP monitor (Omron M2, HEM- 7121-E) with a suitable size cuff (22-34cm). The BP for each participant was recorded and the diagnosis of hypertension was made for systolic BP ≥ 140mmHg and/or diastolic BP ≥ 90mmHg [17]. Weight was measured using a weighing scale (BRN 9311). Height (in meters to the nearest 0.5cm) was measured using a stadiometer. Body mass index (BMI)-defined underweight was defined as < 18.5kg/m ^{2}, normal weight as between 18.5 to 24.9kg/m^2, overweight considered as BMI between 25 to 29.9kg/m^2 and BMI-defined obesity as a BMI ≥ 30kg/m^2 [18]. Short duration on ART was defined as ≤ 5 years and long duration as > 5 years, low CD4 were values ≤ 350 cells/mm^3 and high CD4 >350 cells/mm^3, suppressed viral load was defined as viral load < 1000 copies/ml and unsuppressed viral load defined as viral load level ≥ 1000 copies/ml [19].

Data management and analysis

The data collected was entered into and analysed using SPSS for Windows version 17. Measures of central tendency (means, proportions) were used to describe the quantitative variables or characteristics of patients. The chi-square test was used to determine association between hypertension prevalence with ART regimen, duration on ART, duration of HIV infection, viral load suppression status, CD4 status, age, gender, marital status, occupation, family history of hypertension, cigarette smoking, BMI, and alcohol ingestion. Furthermore, a logistic regression model was built using variables that were found to be significantly associated with hypertension in bivariate analysis based on the chi square test. A p-value < 0.05 was considered as statistically significant.

RESULTS

Demographic and Clinical Characteristics of the Study Population

Out of the 300 participants recruited 63.7% (191) were females. Ages ranged from 25 to 80 years with a mean age of 45.8±10.1 years. Majority of the participants were between 35 to 54 years. The most frequently used nucleoside reverse transcriptase inhibitor (NRTI) regimens were the Zidovudine based regimens. Among the non-nucleoside reverse transcriptase inhibitors (NNRTI) and protease inhibitors (PIs), NNRTI regimens were the most frequently used with 94% of the population on this combination with 56.3% on Efavirenz and 37.7% on Nevirapine. Only 6% of patients were on protease inhibitor regimens.

DISCUSSION

This study is probably the first to be conducted among PLHIV in a rural setting in Cameroon and our findings demonstrate a high prevalence of HTN (26.3%) among PLWH receiving routine care at Njinikom catholic Hospital, with associated risk factors being age, family history of HTN, excess weight and being married. In a recent meta-analysis among PLHIV, a global prevalence of 23.6%, (95% CI: 21.6–25.5) was reported including a prevalence of 23.5% (16.6–31.0) for West and Central Africa [9]. In SSA, reported HTN prevalence in PLWH ranged from 12.5% to 28.5% [20,21,22]. Prevalence ranged from 24.8% to 41% across 6 previous studies in Cameroon [10,11,12,13,14,20]. Although our findings show a high prevalence of HTN in this population it is lower than the prevalence reported by Arrey et al for the general population in rural Cameroon [23] and Dzudie et al in the urban parts of Cameroon [5]. These differences may be because the studies for the general population were community-based studies having a higher probability of detecting more people with HTN. Additionally our findings were higher than the prevalence of 5.7% reported by Mbanya et al among the rural population [4] but more comparable with the prevalence of 31% reported by Arrey et al[23].

Table 1: Socio-demographic and clinical characteristics of study participants (n=300)

Characteristic	Category	Frequency (n=300)	Proportion (%)
Age (years), mean=45.8±10.1	≤ 40	98	32.7
	>40	202	67.3
	Male	109	36.3
Gender	Female	191	63.7
	Currently married	160	53.3
Marital status	Never married	66	22.0
	Separated/ Divorced	24	8.0
	Widowed	50	16.7
Occupation	Skilled	103	34.3
	Unskilled	197	65.7
Family history of hypertension	Positive family history	94	31.3
	No family history	206	68.7
BMI (kg/m^2), mean=25.2 (SD=3.7)	< 25	177	59.0
	≥ 25	123	41.0
Alcohol consumption	Yes	71	23.7
	No	229	76.3
Cigarette smoking	Yes	31	10.3
	No	269	89.7
Duration of HIV infection since onset of diagnosis (years)	1 to 5	139	46.3
	≥ 6	161	53.7
Duration of ART exposure (years)	1 to 5	148	49.3
	≥ 6	152	50.7
ART regimen	TDF+3TC+EFV	105	35
	TDF+3TC+NVP	8	2.7
	TDF+3TC+LPV/r	3	1
	TDF+3TC+ATV/r	10	3.3
	AZT+3TC+EFV	54	18
	AZT+3TC+NVP	105	35
	AZT+3TC+ATV/r	5	1.7
	ABC+3TC+EFV	10	3.3
CD4 count (cells/mm^3)	≤ 350	68	22.7
	>350	232	77.3
Viral load (copies/ml)	< 1000	286	95.3
	≥1000	14	4.7

TDF=Tenofovir, 3TC=Lamivudne, EFV=Efavirenz, AZT=Zidovudine, NVP=Nevirapine, ABC=Abacavir, LPV/r=Lopinavir/ritonavir, ATV/r=Atazanavir/ritonavir, NRTIs=TDF, AZT, 3TC and ABC, NNRTIs=NVP and NVP, PIs=LPV/r and ATV/r

Table 2: Risk factors of hypertension in 300 HIV-infected patients on ART

Risk factors for hypertension	Values	Participants n=300	HTN	P-value for chi square	Adjusted odds ratio	P-value for adjusted odds ratio	95% confidence interval
	≤ 40 years	98	12 (12.2%)			ref	
Age	>40 years	202	67 (33.2)	< 0.001	2.60	0.01	1.86-3.34
	Male	109	35 (32.1%)				
Gender	Female	191	44 (23%)	0.086			
	Currently married	160	54 (33.75)		2.91	0.01	2.06-3.76
	Never Married	66	8 (12.12%)		1.17	0.783	0.06-2.28
Marital Status	Separated/Divorced	24	6 (25%)	0.008	1.34	0.654	0.07-2.60
	Widowed	50	11 (22%)			ref	
	Skilled	103	29 (28.16%)				
Occupation	Unskilled	197	50 (25.38%)	0.604			
Family history of hypertension	Positive family history	94	45 (47.8%7)	< 0.001	5.06	<0.001	4.45-5,67
	No family history	206	34(16.5%)			ref	
	< 25	172	32 (18.60%)	<0.001		ref	
BMI (Kg/m^2)	≥25	128	47 (36.72%)		2.55	0.002	1,97-3.13
	Yes	71	24 (33.80%)				
Alcohol consumption	No	229	55 (24.02%)	0.102			
Cigarette smoking	Yes	31	10 (32.26%)	0.429			
	No	269	69 (25.65%)				
Duration of HIV infection since onset of diagnosis	1 to 5 years	139	30(21.58)				
	6 years and above	161	49 (30.43)	0.083			
Duration on ART exposure	1 to 5 years	148	32 (21.62%)				
	6 years and above	152	47 (30.92%)	0.067			
	NRTI-based regimens						
	Tenofovir-based regimen	127	25 (19.69%)				
	Zidovudine-based regimen	163	52 (31.90%)	0.058			
ART regimen	Abacavir-based regimen	10	2 (20%)				
	NNRTI and Protease-based regimen						
	Nevirapine-based regimen	115	34 (29.57%)				
	Efavirenz-based regimen	159	42 (26.42%)	0.169			
	Atazanavir and Lopinavir-based regimens	26	3 (11.54%)				
CD4 Count (cells/mm^2)	≤ 350	68	17 (25.00%)				
	>350	232	62 (26.72%	0.777			
Viral load	< 1000 copies/ml	286	73 (25,52%)	0.151			
	≥1000 copies/ml	14	6(42.86%)				

Ref=reference category

This difference between the earlier study and more recent findings are consistent with the rising trend in HTN over the years reported by Fezeu et al [24].

However this difference could partially be a result of the less sensitive higher blood pressure threshold for the diagnosis of HTN [25] prior to more recent guidelines in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure in 2003 [26].

Age above 40 years was associated with a heightened risk of hypertension. Similar results have been observed from other studies in Cameroon and other parts of Africa [11,21,27,28,29,30]. Aging is associated with a reduction in the elasticity of blood vessels which predisposes to hypertension [31]. Married patients were more likely to be hypertensive a finding that is corroborated by some studies in SSA and Asia [23,32,33]. In a married setting where the likely-hood of both partners being HIV positive as well as children is high, stress levels may be relatively higher for infected partners thus contributing to hypertension. Previous findings in India revealed that married HIV-infected couples suffer more from stress and anxiety compared to unmarried patients [34]. HTN was more likely to be found among patients with a family

history, an observation previously reported by Njeleka et al [21]. Genetic factors are largely responsible for this trend [35]. Obesity had a heightened risk of hypertension which is consistent with previous findings from studies in SSA including Cameroon [23,36,37].

This study is limited by the fact that HTN was defined based on one BP measurement taken during a single visit. However, a true diagnosis should be based on repeated measurements with at least one additional visit showing BP≥ 140/90 mmHg. This could have led to an overestimation of cases of HTN. Furthermore not all traditional risk factors for hypertension such as physical activity and excess salt ingestion were considered for assessment. Hence the assessment of risk factors of hypertension in the study population was not exhaustive. Additionally, this was a hospital-based study conducted in a small rural area whose findings may not necessarily apply to all rural Cameroonian or Sub-Saharan African communities of PLHIV.

CONCLUSION

Our findings showed that about one out of four PLHIV in Njinikom Catholic Hospital could be hypertensive. This demonstrates that this population has a high risk for cardiovascular disease. There is, therefore, need for improvement in awareness through education and repeated patient follow-up in this rural setting. Also, there is need for further research in other rural communities of PLHIV to assess trends and risk factors of hypertension.

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Authors' contributions

EC and NIC conceived, designed and conducted this study.EC conducted the data analysis and interpretation. EC drafted the work and all authors (EC, NIC, GN, MNC) reviewed the manuscript and revised it critically for important intellectual content. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Ethical approval and consent to participate in the study

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional review board of the Catholic University of Cameroon (CATUC), Bamenda. Informed consent was sought from all participants prior to data collection

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