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Prevalence and Factors Associated with Hypertension among People Living with HIV Receiving Care in Three Large HIV Clinics in Nasarawa State, Nigeria

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Abstract

In the last decade, the long-term survival among people living with HIV (PLHIV) has significantly improved. This is accompanied by an increased burden of non-communicable diseases such as hypertension due to the combined effect of the aging population and the metabolic effect of the Human Immuno-deficiency Virus (HIV) virion and antiretroviral therapy. This study aims to assess the prevalence and factors associated with hypertension among people living with HIV in three large health facilities in Nasarawa State, Nigeria. A descriptive cross-sectional study employed a multistage sampling technique to select 309 adults with HIV, 18 years and above, receiving HIV care in three large health facilities in Nasarawa State. The outcome variable was the participants' self-reported history of hypertension, confirmed through a positive history of hypertension treatment. Exposure variables included the participant's socio-demographic characteristics, lifestyle factors, and HIV care and treatment history. Data were presented using frequency tables. Factors associated with hypertension were assessed using binary logistic regression at a 0.05 level of statistical significance. A total of 309 adults living with HIV were sampled. A larger percentage of the participants were married 228 (73.8%), female, 191 (61.8%), within the age group 41 - 50 years, 141 (45.6%). Most of the participants had no family history of hypertension, 188 (60.8%). The prevalence of self-reported hypertension was 11.0% (34/309). Factors associated with hypertension at the bivariate level were age group 21 - 30 years, 41 - 50 years, being widow/widower, divorced, retired from employment or with family history of hypertension. Only participants age group 31 - 40 years

[Adjusted Odd Ratio (AOR): 0.18, 95%CI: 0.04 - 0.91, p = 0.04] and family history of hypertension [(AOR): 83.44, 95%CI: 15.75 - 442.11, p < 0.01] were found to predict hypertension among the study participants after adjusting for confounders. In conclusion, Hypertension remains a public health issue among PLHIV. Factors associated with hypertension among PLHIV include age and family history of hypertension. Regular screening for hypertension, its appropriate treatment and optimal control are essential in PLHIV.

Keywords

HIV, HIV Care, Hypertension, Hypertension Prevalence, Nigeria, PLHIV

1. Background

In Nigeria, approximately 1.8 million people are living with HIV based on the National AIDs Indicator and Impacts Survey 2022 [1]. This represents 9 percent of people living with HIV globally [2]. With the advancement in HIV therapeutics and the widespread antiretroviral treatment coverage, HIV-related mortality has decreased among PLHIV, thereby improving long-term survival in this sub-population in-country [3].

As survival improves among PLHIV, the incidence of non-AIDS complications such as cardiovascular disease (CVD) and risk factors are increasing, a trend comparable to the aging general population [4]. Potentiating this CVD risk in PLHIV was the chronic inflammatory effect of HIV virion and the metabolic effect of some antiretroviral therapy [5]. Globally, the burden of CVD has tripled over the past two decades [6] [7]. Studies showed a three-fold increase in the global burden of cardiovascular diseases among PLHIV between 1990 to 2015 and recent modeling showed that by 2030, 70 percent of PLHIV will be older than 50 years, with 78 percent of them having cardiovascular disease [6] [7]. Commonly reported cardiovascular risk factors among PLHIV are hypertension, hypercholesterolemia, and physical inactivity [8] [9]. According to a systematic review of 49 pieces of literature that reported on hypertension among PLHIV in 2017, the global estimate of hypertension among PLHIV was 25.2% (21.2% - 29.6%), with higher prevalence among antiretroviral drug (ARV)-experienced clients, 34.7% (27.4% - 42.8%), compared to ARV native clients, 12.7% (7.4% - 20.8%) [10]. Of note in the review was a reported increase in prevalence in the studies conducted after 2010, with an increase in the median age of the study population after 2010 [10]. The statistic is similar in Sub-Saharan Africa, with a pooled hypertension prevalence range of 19.6% [11]. The prevalence was also reported to be higher in PLHIV than in the general population [12] [13] [14]. In Nigeria, hypertension among adult PLHIV 18 years and above varies across geographical regions, with a reported prevalence of 16.8% and 19.3% among ARV naïve clients in Lagos [15] and Jos [16] respectively, to 20.3% [17],

24.9% [18], and 50.1% [16] among ARV experienced clients in Ondo, Uyo, and Jos respectively. Studies also reported increased odds of developing hypertension with increasing age and duration of use of ARV by PLHIVs [17] [18].

Factors associated with hypertension in PLHIV are multifactorial including the traditional risk factors such as sociodemographic factors (older age, male sex, family history), lifestyle and behavioral factors (smoking, alcohol consumption, excess salt intake, sedentary lifestyle, overweight and obesity) [19] [20] [21] [22] [23] and HIV specific risk factors such as CD 4 clinical status, viral suppression status, client's antiretroviral regimen, and duration of HIV and ARV [24] [25] [26]. Over the years, there has been an increasing trend in the prevalence of lifestyle risk factors for hypertension in Low Middle-Income Countries (LMIC) attributed to emerging urbanization and industrialization in the continent [27]. These factors have been reported to synergistically interact with HIV-specific risk factors in PLHIV, increasing the risk for CVD among PLHIV by 20 times compared to non-PLHIV [28]. In this study, we aim to assess the prevalence and contextual factors associated with hypertension among adult PLHIV on antiretroviral therapy in three large hospitals in Nasarawa State, Nigeria.

2. Methodology

2.1. Study Design

A cross-sectional study aimed at assessing the prevalence and factors associated with hypertension among adults living with HIV (18 years and above) in three large facilities in Nasarawa State.

2.2. Study Location

The study was done in three local government areas (LGAs) in Nasarawa State, Nigeria; Toto, Karu, and Lafia LGAs. Nasarawa State is one of the states in the North Central region bordered to the West by the Federal Capital Territory of Nigeria. It is the second least populous state in the country, with an estimated population of 2.5 million as of 2016 [29]. The state has 13 LGAs with the state capital in Lafia. Nasarawa is diverse in ethnicity and religion. 61% of the state's population are Muslims with the remaining 39% being Christian [29]. According to the National AIDS Indicator Survey 2018, Nasarawa is the 8th HIV-prevalent state in Nigeria, with an estimated HIV prevalence of 2.0% [30]. The state has about 300 Health care facilities providing HIV care and treatment with support from two US President's Emergency Plan for AIDs Relief (PEPFAR) implementing partners, Institute of Human Virology, Nigeria (IHVN) and AIDS Healthcare Foundation (AHF).

Karu LGA is the economic center of Nasarawa State. It shares a boundary with the Federal Capital Territory and has an estimated population of 333,800 as of 2023, with an annual growth rate of 2.8 [31]. Lafia LGA is the state capital and largest city of Nasarawa State, with an estimated population of 374,000 as of

2023 and an annual growth rate of 3.6% [32]. It is located in the eastern part of the state. Lastly, Toto LGA has an estimated population of 119,077. It is located in the western region of the state, sharing boundaries with the Federal Capital Territory [33].

3. Sampling Technique and Study Participants Recruitment

A total of 309 adults (18 years and above), who were receiving HIV care in three large HIV clinics in Nasarawa State were studied. The sample size was calculated using Cochran's sample size formula for a single proportion with a normal standard deviation of 1.96 for a 95% confidence interval, a margin of error of 0.05, and a hypertension prevalence rate of 24.9% among people living with HIV in a study in Uyo, Akwa State [18]. Participants were selected using a multistage sampling technique. Three LGAs; Karu LGA, Toto LGA, and Lafia LGA, were selected using simple random sampling from a sampling frame consisting of all the 13 LGAs in Nasarawa State. A list of all comprehensive ART sites in each of the LGAswas generated and one facility was selected per LGA; General Hospital, Nasarawa, MarabaGurku Medical Center, Karu, and DalhatuAraf Specialist Hospital (DASH). Sample sizes were apportioned to each facility using proportionate allocation to size, considering the facility treatment number. Participants were enrolled for the study in each clinic over a period of one month. The number of participants to be enrolled per day was computed by dividing the clinic apportion sample size by the number of clinic days for the one month of data collection (28 days). A systematic sampling technique was employed to enroll study participants in each of the facilities for each day. This was done by dividing the expected sample size for the facility for each day (numerator) by the number of patients expected for clinic appointments in the facility for that day (denominator) for computation of the kth interval. Eligibility criteria included all consented adult PLHIV (18 years and above) enrolled in the study sites who had clinic appointments during the period of data collection.

4. Assessment Tools and Data Collection Procedure

Data were collected using a pre-tested Interviewer-administered, semi-structured questionnaire. The questionnaire had 3 parts: the first part elicited information on the sociodemographic characteristics of the participants, the second part elicited information on the participants' behavioral characteristics and study outcome, and the third part was used to extract information from the clinics' electronic monitoring record on the participants' HIV care and treatment history. The primary outcome for this study was verbally reported presence of hypertension in participants, confirmed using hypertension treatment history. This was measured using the question Have you been diagnosed with hypertension in the past, with a dichotomous response of "Yes" or "No". If yes, "Are you on any antihypertensive drug". Data were collected by the study investigator, with support from a trained research assistant. This study was done between October 2022 to

July 2023, with data collection done between January to March 2023.

4.1. Data Analysis

Data cleaning and analysis were done using Statistical Package for Social Sciences (SPSS) IBM version 23. Descriptive findings were presented using charts and tables. Factors associated with the study outcomes were examined at the univariate and multivariate levels using a logistic regression model with the level of statistical significance set at 0.05.

4.2. Ethical Consideration

Informed consent was obtained from all patients who participated in the study, evidenced by signed consent forms. Ethical approval for the study was obtained from the Bingham University Ethical Board. In addition, the study complied with the Declaration of Helsinki on conducting research among human subjects.

5. Results

5.1. Background Characteristics

A total of 309 adults living with HIV were sampled. All participants (100%) responded to key outcome and exposure variables. A larger percentage of the participants were married 228 (73.8%), female, 191 (61.8%), within the age group 41 - 50 years, 141 (45.6%). Most had no family history of hypertension, 188 (60.8%) (Table 1). Few respondents reported positive history of smoking 4 (1.3%) and alcohol intake 15 (4.9%). Two-fifth posited that they engage in daily physical exercise, 129 (41.7%). The majority of the participants were on Dolutegravir-based ARV, 305(98.7%), and were virally suppressed with a viral load count of less than 50 copies/ml, 271 (87.7%). About half of the participants had been on antiretroviral drugs for more than 10 years, 153 (49.5%) (Table 2).

5.2. Prevalence of Hypertension and Associated Factors

The prevalence of self-reported hypertension among the study participants was 11.0% (34/309) (Table 3). At univariate regression level, participants that were within the age group 21 - 30 years [Crude Odd Ratio (COR): 0.07, 95%CI: 0.01 - 0.56, p = 0.01], 31 - 40 years [COR: 0.15, 95%CI: 0.05 - 0.45, p < 0.01], 41 - 50 years [COR: 0.30, 95%CI: 0.13 - 0.70, p = 0.01] had lower likelihood of hypertension when compared to the participants within the age group 51 years and above. Furthermore, participants who were widow/widower [COR: 16.00, 95%CI: 2.97 - 86.23, p < 0.01], divorced [COR: 7.33, 95%CI: 1.20 - 44.96, p = 0.03], retired from employment [COR: 5.11, 95%CI: 1.47 - 17.75, p = 0.01] or with a family history of hypertension [COR: 50.48, 95%CI: 14.63 - 174.18, p < 0.01], were more likely to have hypertension compared to the counterparts who were single, employed in civil service work or had no family history of hypertension respectively (Table 1). Other factors; sociodemographic, HIV-specific factors,

and lifestyle factors such as Smoking, alcohol use, physical exercise, and salt intake, were not significantly associated with self-reported hypertension at the univariate level (Table 1 & 2). Potential risk factors such as age, sex, and other factors found to be significant at p of 0.05 at the univariate level were introduced into the multivariate regression model to examine their prediction ability (Table 4). Only participants' age group 31 - 40 years [Adjusted Odd Ratio (AOR): 0.18, 95%CI: 0.04 - 0.91, p = 0.04] and family history of hypertension [(AOR): 83.44, 95%CI: 15.75 - 442.11, p < 0.01] were found to predict hypertension among the study participants after adjusting for the confounders (Table 4).

Table 1. Participant's socio-demographic risk factors for hypertension among PLHIV.

Variable(s)	Frequency	Percent	Odd Ratio (95% CI)
Age in completed years			
Less than 20	8	2.6	0.00 (0.00 - 0.00)
21 - 30	35	11.3	*0.07 (0.01 - 0.56)
31 - 40	85	27.5	*0.15 (0.05 - 0.45)
41 - 50	141	45.6	*0.30 (0.13 - 0.70)
51 and above	40	12.9	1
Total	**309**	**100.0**	
Gender			
Male	118	38.2	1
Female	191	61.8	0.51 (0.25 - 1.04)
Total	**309**	**100.0**	
Marital status			
Single	46	14.9	1
Married	228	73.8	2.12 (0.48 - 9.38)
Widow/widower	19	6.1	*16.00 (2.97 - 86.23)
Divorced	16	5.2	*7.33 (1.20 - 44.96)
Total	**309**	**100.0**	
Religion			
Christianity	174	56.3	1
Islam	130	42.1	1.22 (0.60 - 2.49)
Traditional	5	1.6	0.00 (0.00 - 0.00)
Total	**309**	**100.0**	
Highest level of education			
No formal education	53	17.2	1
Completed primary education	29	9.4	0.90 (0.25 - 3.29)
Completed secondary education	111	35.9	0.50 (0.18 - 1.37)
Completed tertiary education	116	37.5	0.71 (0.28 - 1.83)
Total	**309**	**100.0**	
Employment status			

Continued

Civil servant	78	25.2	1
Artisan/business	171	55.3	0.79 (0.33 - 1.88)
Farmer	15	4.9	1.18 (0.23 - 6.10)
Unemployed/student	30	9.7	0.26 (0.32 - 2.18)
Retired	15	4.9	***5.11 (1.47 - 17.75)**
Total	**309**	**100.0**	
Household monthly income			
Less than N30,000	119	38.5	1
N30,000 - N50,000	127	41.1	1.18 (0.54 - 2.56)
N50,000 and above	41	13.3	0.88 (0.27 - 2.87)
Don't know	22	7.1	0.39 (0.05 - 3.13)
Total	**309**	**100.0**	
Family history of hypertension			
No	188	60.8	1
Yes	19	6.1	***50.48 (14.63 - 174.18)**
Don't know	102	33.0	0.84 (0.31 - 2.28)
Total	309	100.0	

*Significant at p value of less than 0.05.

Table 2. Participant's lifestyle and HIV specific risk factors for hypertension among PLHIV.

Variable(s)	Frequency	Percent	Odd Ratio (95% CI)
Do you smoke?			
No	305	98.7	1
Yes	4	1.3	0.00 (0.00 - 0.00)
Total	309	100.0	
Do you take alcohol			
No	294	95.1	1
Yes	15	4.9	0.00 (0.00 - 0.00)
Total	309	100.0	
How frequent are you involved physical exercise?			
No physical exercise	104	33.7	1
At least once a week	76	24.6	1.03 (0.41 - 2.58)
Everyday	129	41.7	0.86 (0.37 - 1.97)
Total	309	100.0	
What is your average daily salt consumption level?			
Half tablespoon	89	28.8	1
Full tablespoon	220	71.2	1.14 (0.51 - 2.55)
Total	309	100.0	

Continued

Basal metabolic index			
Less than 18.5	26	8.4	0.00 (0.00 - 0.00)
18.5 - 24.9	215	69.6	0.96 (0.21 - 4.44)
25 - 29.9	50	16.2	1.76 (0.34 - 9.03)
30 and above	18	5.8	1
Total	309	100.0	
Duration of ART use			
Less than 12 months	2	.6	5.96 (0.36 - 98.74)
12 - 36 months	20	6.5	0.00 (0.00 - 0.00)
37 - 72 months	36	11.7	0.17 (0.02 - 1.31)
5 - 10 years	98	31.7	0.68 (0.31 - 1.50)
More than 10 years	153	49.5	1
Total	309	100.0	
ARV regimen			
DTG-based regimen	305	98.7	2.75 (0.28 - 27.18)
Non-DTG based regimen	4	1.3	1
Total	309	100.0	
Viral load suppression status			
< 50 copies/ml	271	87.7	1
50 - 999 copies/ml	32	10.4	0.83 (0.24 - 2.89)
≥ 1000 copies/ml	6	1.9	1.61 (0.18 - 14.22)
Total	309	100.0	

Table 3. Prevalence of self-reported hypertension.

Variable	Frequency	Percent
Not hypertensive	275	89.0
Hypertensive	34	11.0
Total	309	100.0

Table 4. Multivariate analysis.

Variable(s)	Exp(B)	Sig.	95% C.I. for EXP(B)	
			Lower	Upper
Age in completed years				
Less than 20	0.00	1.00	0.00	
21 - 30	0.08	0.14	0.00	2.34
31 - 40	*0.18	0.04	0.04	0.91
41 - 50	0.45	0.18	0.14	1.47
51 and above	1			

Continued

Gender				
Male	1			
Female	1.10	0.87	0.37	3.29
Marital status				
Single	1			
Married	0.55	0.56	0.07	4.23
Widow/widower	1.87	0.62	0.16	22.26
Divorced	0.92	0.95	0.07	13.01
Employment status				
Civil servant	1			
Artisan/business	0.76	0.64	0.23	2.47
Farmer	2.42	0.35	0.39	15.20
Unemployed/student	0.55	0.69	0.03	10.98
Retired	1.81	0.53	0.28	11.66
Family history of hypertension				
No	1			
Yes	***83.44**	**<0.01**	**15.75**	**442.11**
Don't know	1.07	0.91	0.35	3.23

6. Discussion

This study purposed to better understand the hypertension prevalence and associated socio-demographic, lifestyle, and HIV-specific factors among adults living with HIV in three large health facilities in Nasarawa State, Nigeria. The findings from the study can help shape targeted interventions for the prevention, early identification, and management of hypertension among PLHIV.

6.1. Prevalence of Hypertension among Study Participants

In this study, we estimated a self-reported hypertension prevalence rate of 11.0 percent. This hypertension prevalence is similar to the prevalence obtained in two related studies done in Lagos and Jos in Nigeria [15] [16] among PLHIVs in 2017. However, these two studies were done among ARV naïve clients compared to our study that was done among ARV experienced clients. Similar studies in Nigeria that sampled experienced ARV-experienced participants reported higher hypertension prevalence rates in the range of 20.3% - 50.1% [16] [17] [18]. The lower prevalence reported in our study might be due to recall bias as the hypertension occurrence was self-reported. Previous studies that reported higher prevalence combined both self-reports and on-site clinical measurements of blood pressure and were able to combine incident hypertension at the point of the interview [16] [17] [18].

6.2. Factors Associated with Hypertension

6.2.1. Socio-Demographic Factors

Socio-demographic factors observed to be associated with hypertension at univariate level in this study were age, marital status, employment status, and family history of hypertension. However, only age and family were observed to be significant at the multivariate level. Our study showed an increased risk of hypertension with an increase in PLHIV age. Numerous studies have consistently reported the association between age and hypertension both in PLHIV and the general population [16] [17] [18] [34] [35]. The incidence of hypertension increases in older age. This is in keeping with the biological plausibility of causation for hypertension as aging is characterized by gradual vascular stiffening which significantly increases blood pressure and risk of hypertension. In our study, we observed being a widow/widower or divorced/separated increased the odds of having hypertension among study participants by 16 and 7 folds respectively. This finding is similar to Adeke *et al.* study across six geopolitical regions in Nigeria, where it was reported that being widowed increased the odds of hypertension among the general Nigerian population [36].

Furthermore, in this study, participants who have retired from paid employment had higher odds of hypertension compared to currently employed civil servants. A similar finding was reported by Singh *et al.* in Urban Varanasi, where retired participants were demonstrated to have 3 times higher odds of hypertension compared to participants employed in private establishments [37]. Our study also showed that a positive family history of hypertension predisposes PLHIV to a higher risk of hypertension, corroborating similar findings from previous studies among PLHIV [34] [35]. Such association may be due to possible genetic inheritance of risk factors for hypertension and familial cultural/environmental factors [34]. The observed association begs the need for routine elicitation of family history of hypertension among PLHIV receiving ART care at enrolment and during clinic visits to aid in early identification of PLHIV who may be at a higher risk of hypertension. Effective routine screening and management interventions for hypertension among PLHIV should also be reinforced towards preventing hypertension among PLHIV.

6.2.2. HI-Specific and Lifestyle Factors

Similar to a study conducted in Kenya [38], our study revealed that ART regimens and duration of ART use were not associated with the risk of hypertension among PLHIV. This is, however, in contrast to some other studies [39] [40], which reported duration of ART use as a significant factor associated with hypertension. In our study, only 4 of the 309 PLHIV sampled were on non-Dolutegravir (DTG) based ART regimen as DTG-based regimen is the preferred 1st line ART regimen currently widely used in Nigeria under the test and treat policy of the National Guidelines for HIV prevention, treatment and care. Such a small number and proportion of the sampled PLHIV on a non-DTG-based regimen may impair the detection of significant associations between the ART regimen and hyper-

tension.

Contrary to some other studies [39] [41], our study did not reveal, smoking and alcohol intake to be strongly associated with hypertension among PLHIV. The inconsistency seen with lifestyle factors could be due to the low power available for the detection of such associations in this study. Only a small number and proportion of the respondents reported that they smoked (4/309) or consumed alcohol (15/309). Routine elicitation and documentation of smoking practices and alcohol consumption among PLHIV may prove valuable in the study of such associations in future research.

We did not delve into the management of hypertension in PLHIV who reported having hypertension in this study. Future research into the management of hypertension in PLHIV, including its financial implications and impact on PLHIV, will provide a more robust insight into what is needed to address the rising menace of HIV-NCD comorbidity.

7. Conclusion

Our finding of a high prevalence of hypertension among PLHIV further reinforces the need for improved integration of Non-Communicable Disease (NCD) management with the provision of HIV services. Such integration should encourage routine elicitation of a complete family history of hypertension among PLHIV while providing effective tailor-made interventions to promote hypertension screening among PLHIV. This will allow for the early identification, prevention, and management of hypertension in PLHIV.

Acknowledgments

Authors' Contributions

The study was conceptualized by Dr. Prosper Okonkwo with inputs from Oluseye Ajayi and Dimas Mercy Ezekiel. Data collection was conducted by Dimas Mercy Ezekiel. Data analysis and interpretation were carried out by Oluseye Ayodele Ajayi. All authors contributed to writing the draft of the manuscript. The final manuscript was reviewed and approved by all authors.

Data Availability

The survey data is available upon reasonable request.

Competing interests

The authors have no financial or non-financial interests to disclose.

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Questionnaire

Table A1. Prevalence and factors associated with hypertension among people living with HIV receiving care in three large HIV clinics in Nasarawa state, Nigeria.

s/n	Questions	Responses	Skip Pattern
	Section A: Respondents' Socio-Demographic Characteristics		
101	Age (in completed years)		
102	Sex	☐ Male. ☐ Female	
103	Marital status	☐ Single ☐ Married ☐ Widow/Widower ☐ Divorced/Separated	
104	Highest level of education	☐ No Formal Education ☐ Completed Primary Education ☐ Completed Secondary Education ☐ Completed Tertiary Education	
105	Occupation	☐ Civil Servant ☐ Self-employed/Business ☐ Retired ☐ Others_specify (____)	
106	Religion	☐ Christianity ☐ Islam ☐ Traditional	
107	What is your daily income level	☐ Less than 500 naira ☐ 500 - 1000 naira ☐ More than 1000 naira	
108	What is your household monthly income level?	☐ Less than 30,000 naira ☐ 30,000 - 50,000 naira ☐ More than 50,000 naira	
109	What is the size of your household?	☐ Less than 5 ☐ Less than 10 ☐ 10 and above	
	Section B: Health-Related Characteristics		
201	Respondents weight (__Kg)	-	
202	Respondent's height (__meter)	-	
203	BMI (Kg/m²)	-	
204	Do you know your HIV status?	☐ Yes ☐ No	
205	What is your HIV status?	☐ Positive ☐ Negative	Skip if no to Q 204
206	Are you on ARVs?	☐ Yes ☐ No	Skip if the response to Q 205 is negative
207	If yes, for how long have you been on ARVs	☐ 0 - 1 years ☐ 1 - 2 years ☐ 3 - 5 years ☐ 6 - 10 years ☐ >10 years	Skip if no to Q 206

Continued

208	What is your ART regimen?	☐TDF/3TC/DTG ☐ABC/3TC/DTG ☐ AZT/3TC/ATVr ☐ TDF/3TC/LPVr ☐ Others_specify ( )	
209	Do you know your viral load results in cps/ml?	☐ Yes ☐ No	
210	What is your most recent viral load count?	☐ Less than 50 cps/ml ☐ 50 - 999 cps/ml ☐ 1000 and Above	Skip if no to Q 209
211	Are you a known hypertensive client	☐ Yes ☐ No	
212	If yes, are you on any antihypertensive drugs?	☐ Yes ☐ No	Skip if no to Q 211
213	If yes, do you take your drugs daily?	☐ Yes ☐ No	Skip if no to Q 212
214	If No, why?	☐ I forget ☐ Pill burden ☐ Financial constraint ☐ Others, specify	Skip if yes to Q 213
215	How long have you been hypertensive?	☐ Before ART commencement ☐ After ART commencement	
216	Duration of antihypertensive	-	
217	Do you have a family history of hypertension?	☐ Yes ☐ No ☐ Don't Know.	

Section C: Respondent Lifestyle Characteristics		
301	What is your average daily salt consumption level?	☐ Full Teaspoon ☐ Half tablespoon
302	How could you classify your level of physical exercise?	☐ No physical exercise Daily ☐ Once a week ☐ Atleast 2 - 3 times weekly ☐ Daily
303	Do you drink alcohol?	☐ Yes ☐ No
304	If yes, what type of alcohol do you consume?	☐ Local brew ☐ Beer ☐ Spirits ☐ Red wine
305	If yes, how often do you consume alcohol?	☐ Once a week ☐ Atleast 2 - 3 times weekly ☐ Daily
306	Do you smoke?	☐ Yes ☐ No
307	If yes, how often?	☐ Once a week ☐ Atleast 2 - 3 times weekly ☐ Daily

End of Interview. Thank you for your time and patience