Prevalence and Associated Factors of Elevated Blood Pressure among People Living with HIV Aged 35-65 Attending Kabutare District Hospital

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Abstract:

Background: The survival rate among People living with HIV has globally increased due to access to Antiretroviral therapies (ARTs). However, ARTs in turn resulted in emerging NCDs, including elevated blood pressure, where the Sub-Saharan Africa (SSA) is the Epicenter. The overall prevalence of Hypertension in Rwanda is 15.9% with expected increase to 17.78 in 2025. This study aimed at assessing the prevalence and associated factors of elevated blood pressure among adult people living with HIV attending Kabutare district hospital in the Southern Province, Rwanda.

Materials and Methods: A descriptive, cross-sectional study on 247 PLWHIV attending ARV clinic of Kabutare district Hospital aged (35-65 years) selected by a systematic sampling. Research data was collected using a structured questionnaire, categorized into sociodemographic, medical/clinical and psychosocial, and lifestyle behaviors regarding elevated blood pressure. Date were processed and analyzed using IBM SPSS, Statistics v.21 with descriptive statistics, bivariate and logistic regression analysis tested to significance with Elevated blood pressure at a 95% CI with the p <0.05.

Results: A total of 247 PLHIV attending KABUTARE DH, were recruited for this study between September to November 2022 of which 53% were female and 47% males with the median age of 26 years (IQR: 20–55) was recruited. The overall mean SBP was 131mmHg (IQR: 105-190), and the mean DBP was 79 mmHg (IQR: 56-116). The BMI was 29.1% normal, 36.0 % underweight and 34.4% overweight. Nearly to all; 99.6% of participants had been on ART for a period >5 years. The overall HTN prevalence was 16%, and greater in female 51.3% than males 48.7%. It was also greater among older age 60-64 years at 48.7% but there was no prevalence found in ages of below 40(0%). HTN was highly prevalent in Rural 64.1% than in Urban areas 35.9% and more than a half 22 (56.4) of the prevalence was among those on ART in the period ranging from 15-20 years. Factors significantly associated to HTN was the age, the Body Mass Index, the duration on ART, coping with HIV serological status, having a stressful job, and being physically active to care for themselves and dependents p<0.05). Variables that statistically significantly predicted elevated blood pressure among PLWH for a p<0.05 at a 95% CI, showed that at 95% CI; with positive association to the elevated hypertension the age 45-49 AOR .150 , 95% CI (0.02 - 0.82) ,p=.029 , the duration on ART of 10-15 years AOR 40.574 , 95% CI (3.19 - 51.78), p= .004 ,15-20 years AOR 15.286 , 95% CI (1.18 - 19.09), p=..037, 20-25 years AOR 32.328 , 95% CI (3.25 - 32.34) ,p=.003 coping with HIV serological status AOR .134 , 95% CI (0.03 - 0.47),p=.002,being physically active to care for oneself and dependents AOR .188 , 95% CI (0.04 - 0.73),p=.016 and having stressful job AOR 8.135 , 95% CI (1.776 - 37.25),p=.007 added significantly to the Elevated blood pressure, However the duration on ART <5 years is not associated to elevated blood pressure and so for the BMI (p=.144), added significantly to the Elevated blood pressure, However the duration on ART <5 years is not associated to elevated blood pressure and so for the BMI (p=.144).

Conclusions: *For all predicted duration on ART, increasing duration on ART was associated with an increased likelihood of exhibiting elevated blood pressure. However, the increasing coping with HIV serological status and being physically active to care for oneself and dependents was associated with the reduction of the likelihood to develop elevated blood pressure. There is a need to integrate a hypertension screening and monitoring in the continuum of health care to PLHIV, and foster psychosocial treatments and support for the promotion of safe coping strategies among PLWH to minimize Hypertension related impacts. The KABUTARE DH should collaborate with the Minister of health and other partners for the improvement of Quality of living of PLWHIV in the catchment area.*

Keywords: *Prevalence, Factors Of Elevated Blood Pressure, People Living With Hiv Aged 35-65, Kabutare District Hospital, Rwanda.*

I. Introduction

The World Health Organization estimates that by 2030, NCDs will afflict 55 million persons worldwide, and the LMIC of Africa bearing the largest burden (Nyaaba GN, 2017). The worldwide survival rate of people living with HIV has remarkably increased as result of Antiretroviral Therapy (ARTs) (Solomon, 2018), however the later resulted into the emergence of NCDs, including Elevated blood pressure (Antonello, 2015). The global estimation number of PLWH in 2018 was 38 million (UNAID, 2022) and with increased CVDs among older ones (UNAIDS, 2019).

The cross-sectional study done in Kenya with enrolled PLWH exposed to long term antiretroviral at Kisumu County Hospital found the general prevalence of elevated blood pressure of 22% (Mogaka JN, 2022). Recent similar study in Uganda with 2026 participants, found PLWH on antiretroviral therapy in stage 1 and 2 of Hypertension, 19.5% and 9.5% respectively and it was more prevalent in men 32.3% with either stage than women 27.8% (Gloria Lubega et al, 2021).

Rwanda counted around 227,134 PLWH In 2022 (PEPFAR, 2022). Recent study findings have highlighted the link between ART and having an elevated blood pressure among PLWH. In 2018, the study among 7116 participants found the national prevalence of hypertension of 15.3% with 16.4% and 14.4% male to female proportion respectively (Nahimana, 2018). Again, similar study involving PLWH done in Kibagabaga District Hospital found the hypertension was prevalent at 15.6% with the age above 61-education level, physical inactivity and being overweight or obese as significant associated factors (Bakesha Nicole Alexandrine, 2020). The present study assessed the prevalence of elevated blood Pressure and its associated factors among PLWH attending Kabutare District Hospital. The main objective of this research was to determine prevalence and associated factors of elevated blood pressure for PLWH aged 35-65 at Kabutare DH. The specific objectives that guided this thorough research are:

i. Assess the elevated blood pressure prevalence among PLWH at KABUTARE District Hospital.
ii. Determine the factors associated with elevated blood pressure among PLWH at KABUTARE District Hospital.

II. Theoretical Literature

Definition and Classification

Hypertension is a condition in which the blood vessels have persistently raised pressure above the normal. The blood circulating in the vessel exerts the force on arteries walls known as the blood pressure; this pressure is measured as systolic and or diastolic pressure (WHO 2021). The systolic pressure is the top number on reading on the measurement instrument and the diastolic pressure is in the bottom. The systole denotes a period of ventricular contraction and diastole shows the ventricular relaxation (Pollock & Makaryus, 2022). The recent classification of blood pressure denotes four stages: Normal, Elevated, Hypertension grade 1 and Hypertension Grade 2. Normal Blood pressure was considered as the systolic blood pressure <120 SBP and <80 DBP mmHg. Elevated BP (120-129/<80 mm Hg), and two stages of hypertension, stage 1 (130-139/80-89 mm Hg) and stage 2 (≥140/≥90 mm Hg) (Whelton PK, 2022).

Hypertension categorized into various class ranges as hereunder indicated:

Table 2.1.Classification of Hypertension on basis of BP measurements

Category	Systolic (mm/Hg)		Diastolic (mm/Hg)
Normal BP	<120	And	< 80
Elevated	120-129	And/or	80
Stage 1 HTN	130-139	And/or	80-89
Stage 2 HTN	≥ 140	And/or	≥ 90

Source. Harmonization of the American College of Cardiology/American Heart Association (ACC/AHA) and European Society of Cardiology/European Society of Hypertension (ESC/ESH) blood pressure/hypertension guidelines: (Whelton PK, 2022).

Hypertension Burden
The number of people living with hypertension has doubled to 1.28 billion since 1990 with increase from 650 million to 1.28 billion in the last thirty years among adults aged 30–79 years. Hypertension is a major cause of premature death worldwide, with upwards of 1 in 4 men and 1 in 5 women over a billion people having the condition. The world Health organization also warns that 700 million people are with untreated Hypertension (WHO, 2021). Recent study carried in Kirehe District , has revealed that 21.2% had an elevated BP at screening; and among individuals not previously known to have HTN at 18.7% ,and among those with prior diagnosis of HTN, 62.2% of them had an uncontrolled blood pressure (Ntaganda, 2022).

HIV/AIDS Burden
Fact sheets from the UNAIDS in 2021 have shown that 28.2 million people were accessing antiretroviral therapy as of 30 June 2021, where 37.7 million [30.2 million–45.1 million] people globally were living with HIV in 2020. Again 1.5 million [1.0 million–2.0 million] people became newly infected with HIV in 2020 and 680 000 [480 000–1.0 million] people died from AIDS-related illnesses in 2020. Since the start of the epidemic 79.3 million [55.9 million–110 million] people have become infected with HIV and 36.3 million [27.2 million–47.8 million] people have died from AIDS-related illnesses (UNAIDS, 2021).

Diagnosis
The international society of Hypertension considers diagnostic and clinical tests as backbone in health care and management of elevated blood pressure. It concerns with medical history BP, risk factors, and co-morbidities, signs/symptoms of secondary elevated blood pressure, physical Examination (circulation, heart, and othersystems), laboratory investigations and the electrocardiography (ISH, 2020). The present study adopted the diagnosis by medical history and by point of care blood pressure measurement during their visit at the HIV clinic.

Management and treatment of Elevated Blood Pressure
Elevated blood pressure is manageable; pharmacological and non - pharmacological approaches are options to lower the blood pressure level (Gluckman TJ, 2016).

Pharmacological Treatment
The WHO guidance on treatment of Hypertension in adults bases on the BP threshold for the initiation of pharmacological treatment for hypertension, initial and longer-term visit intervals for follow-up of treated patients, treatment target BP levels, and the best use of health care workers for management of hypertension (Akram Al-Makki, 2022).

Most patients with an average SBP ≥140 or DBP ≥90 mmHg are at high risk for CVD and initiation of antihypertensive drug therapy is indicated. Although helpful, cardiovascular disease risk assessment is not mandatory before initiating antihypertensive drug treatment. CVD risk assessment is most important for guiding decisions about initiating pharmacological treatment for hypertension in those with a lower average SBP (130–139

mmHg). In all adults with hypertension, it is important that other risk factors for CVD be identified and treated appropriately to lower total cardiovascular risk (WHO, 2021).

The WHO Essential Medicines List includes ACE (angiotensin-converting enzyme) inhibitors, calcium channel blockers, angiotensin receptor blockers, and thiazide diuretics for management of hypertension. In June 2019, single-pill combination antihypertensive medications were added to the WHO Essential Medicines List (WHO, 2021) . The combination therapy must be chosen from three classes namely, the diuretics (thiazide or thiazide-like), ACEIs and long-acting dihydropyridine calcium channel blockers (CCBs) (Xue H, 2015).

The ideal drug characteristic of elevated blood pressure should consider the following according to the ISH:

i. Evidence based practice
ii. One daily dose for BP control
iii. Affordability and cost effectiveness of treatment
iv. Tolerance to treatment
v. Benefit of use among recipients (Poulter, 2020).

Non-pharmacological Treatment

Non-pharmacological interventions help reduce the daily dose of antihypertensive medication and delay the progression from pre-elevated blood pressure to elevated blood pressure stage (ISH, 2020). They include but not limited to lifestyle modifications like dietary modifications, exercise, avoiding stress, and minimizing alcohol consumption; the Dietary Approaches to Stop Elevated blood pressure (DASH) only has the same effect as hose of the single drug therapy (Mahmood, 2018).

Psychosocial treatment and support

As far as psychological aspect of oriented to a good mindfulness may influence the increase or lower elevated blood pressure, the psychological care is one of key preventive and management intervention which is even practiced at a family and community level. The Psychosocial care of PLWH in Rwanda is summarized into important objectives:

i. Supporting the affected in matter of stress and psychosocial disturbances.
ii. Help them adopting essential safe behavior of infection prevention and controls
iii. Community awareness to avoid stigmatization and discrimination.
iv. Making them responsible for infection control; and
v. Educate neighbors to the patience in supporting him adhering to his/her antiretroviral treatment (MOH, 2011)

III.   Conceptual Framework

The age as one of the key hypertension associated factor has been demonstrated to be synergically be taken to be a problem in older HIV positive adults as it constitutes a medical co-morbidity problem which is to be associated to the prevalence of Elevated Blood pressure. This calls an early detection of Hypertension and treatment at all ages in order to promote HIV disease outcome (Rodriguez-Penney, 2013). Understanding psychosocial care needed for the well-being of the individual patient helps in support, assistance to adoption of safe behaviors, preventing any form of discrimination and in social education needed for the appropriate management control (MOH, 2011). Insufficient or inadequate Psychosocial care to PLWH may contribute to hypertension prevalence in that group.

This goes together with pinpointing on the available comorbidities to HIV, which worsens the health status of patients, and associated elevated blood pressure helps in elaborating compliance requirements in regard to HTN management policy (Brathwaite R, 2022). Early detection of comorbidity to HIV infection and those associated with the would help identifying their effects on the prevalence what has been underlined as relevant to Hypertension treatment interventions (Rodriguez-Penney, 2013).

Lack of physical exercise has been highlighted as key factor to hypertension. Assessing the compliance of PLWH in the engagement to a regular exercise of 150 minutes a week of moderate exercise or 75 min vigorous exercise in a week for a cardiorespiratory fitness would help in having the picture on risk or chance to be free from elevated blood pressure as recommended by the World Health Organization (Diaz, 2017).

Seeking care for Hypertensive patients in LMIC imposes cost and other financial capabilities to both the patient and his family which lays a serious load on family significant burdens wellbeing (Subramanian S, 2018) ;For instance, people with chronic diseases in Kenya face barriers related to affording medication (Rachlis B, et al., 2016). Having the knowledge on the affordability of healthcare associated costs would help identifying risk of hypertension among PLWH.

Tracking the changes which the Antiretroviral therapy contributes to the heart disease risks is vital to the best and public health interventions (Care, 2018). Moreover, establishing the current behavior or lifestyle in relation to prevention and or non-pharmacological treatment of elevated blood pressure will help calling attention to best behavioral practices and interventions which are to be envisaged in the prevention or stop of HTN (Gluckman TJ, 2016).

To understand the health-related behaviors at a great extent, which is connected to the development and progression of cardiovascular, risk demands to utilize a conceptual framework; and is helpful in increasing the chance of interventions success (Latino E., 2013). The below mentioned is a map or a rudder that guided the researcher towards realizing this research objectives (Testpinoy, 2022). The conceptual framework as below mentioned graphically displays the chief ideas and associations between variables (Ravitch, 2017).
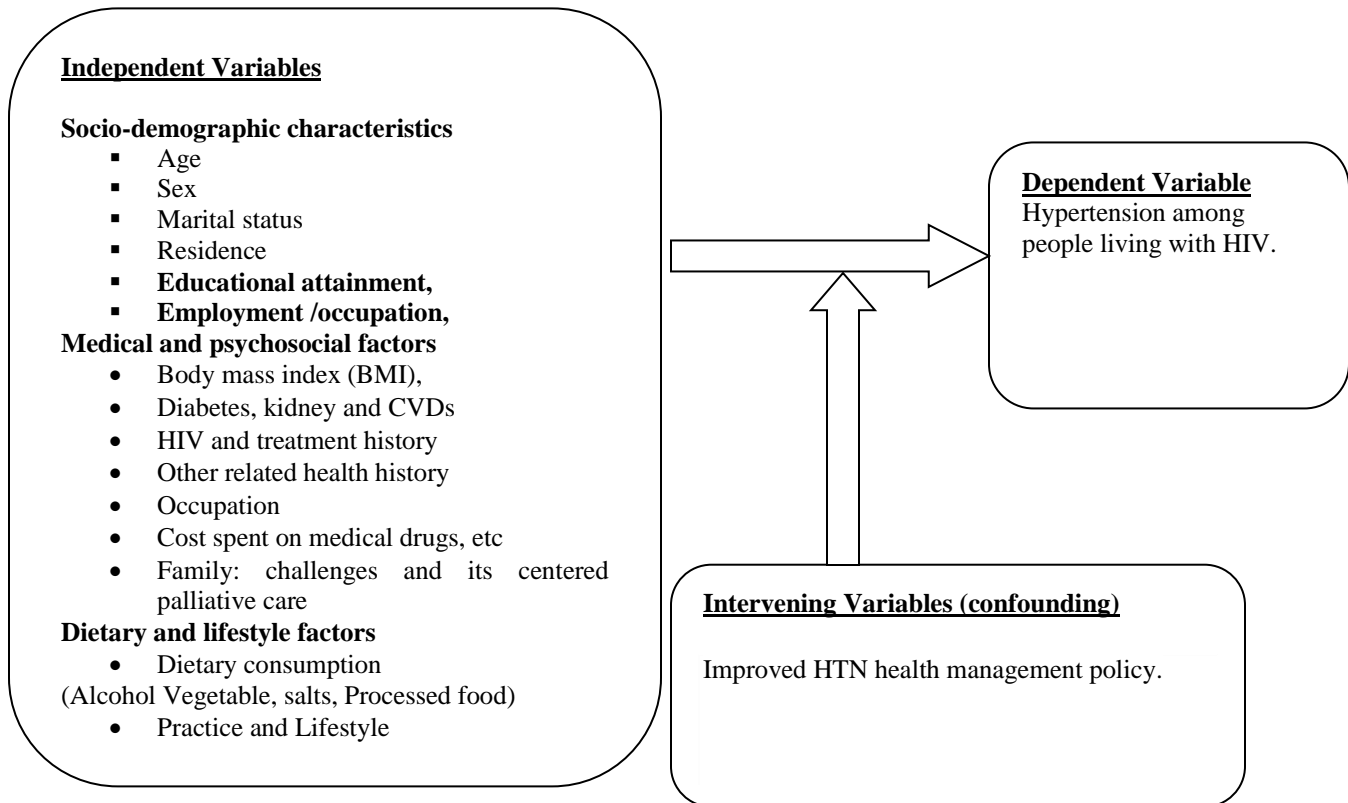

Figure 1. Conceptual framework on Elevated blood pressure among PLWH in Kabutare DH
Source: Tespinoy 2022

IV.   Research Materials and Methods

Research Design

This is a cross-sectional study to assess the prevalence and associated factors of elevated blood pressure among PLWH carried out at an HIV/ARV service of KABUTARE DH, located in the Southern Province of Rwanda, Huye District.

Study Population

The study targeted 500 people living with HIV who attends outpatient's HIV Clinic to Kabutare District Hospital for ART during this study period of three months in the age ranges of 35-65.

Sample Size

To calculate the sample size, on basis of the 500 PLWH attending KABUTARE ARV clinic, and we used the Taro Yamane sample size formula of $n = N/(1+N(e)2$ (Yamane, 1967).

Where:

n = the sample size

N = the population of the study

e = the margin error in the calculation

$n = N/(1+N(e)2$.

$n = 500/ (1+500(0.05)2$.

$n = 500/ (1+500(0.0025)$

$n = 500/ (1+1.25)$

$n = 500/2.25$, n = 222

The calculated sample size was 222 people living with HIV attending Kabutare DH. As the consent form is concerned and expecting the non-response rate of 10 %. To increase the power, I referred the formula where the adjusted sample size is equal to the effective sample size over one minus non-response rate anticipated (Suresh, K., & Chandrashekara, S., 2012). So, the final sample size was 222/ (1-0.1) what yielded into 246.66, ≈ 247 participants.

Inclusion Criteria

Only data concerning PLWH attending Kabutare DH aged 35-65 years have been used in this study, To participate in the study was based on the fact of being in the study population and pre-determined age ranges, and the willingness to consent to the study.

Exclusion criteria

i. People living with HIV not falling in the targeted group and the age boundaries (35-65 years),

ii. Any person fulfilling the inclusion criteria but who does not consent to participate.

Sampling Technique

To select study participants systematic random sampling was performed on the study population visit days. The interval calculated was the K=N/n, where the i: Interval, N: the population and, n: the sample. The interval in the population was 500/247 which was 2.02. The interval used during sampling was 2. The study potential participants were selected on the list during their visits at the HIV clinic.

Data Collection Methods

After getting permission to do research from MKUR and from the administration of Kabutare District Hospital the pretested questionnaire was administered which went with taking key vital and anthropometric measurements: The BP measurement was done twice using a digital blood pressure monitor for each potential participant. The BP was measured twice, with a 15-minute interval between the two measurements with a digital Blood pressure monitor and the average pressure will be retained. During measurement of the BP we tried to optimize good conditions in order to avoid any interference on results (Diaz, 2017).

In this study, elevated blood pressure was adapted to the AHA 2022 Guidelines, where elevated BP (120-129/<80 mm Hg), and two stages of hypertension, stage 1 (130-139/80-89 mm Hg) and stage 2 ($\geq$140/$\geq$90 mm Hg). Normal Blood pressure was considered as the systolic blood pressure <120 SBP and <80 DBP mmHg. (Whelton PK, 2022) Anthropometric measurements were done where height without shoes measured in centimeters using a stadiometer/shorrboard and weight, with light clothing and without shoes, and weight measured in kilograms on a mechanical weighing scale or SECA where applicable, then after the Body mass index (BMI) was computed using the formula of BMI = $W/(h)^2$. The body mass Index of greater than 30 was taken as an obesity indicator.

Instruments for Data Collection

The data collection sheet was used to collect anthropometric (weight, height and BMI) and vital measurements (Blood pressure) data whereas the questionnaire concerned primary data from the respondents to include: demographic factors, medical and psychosocial data, including HIV serological status and related historical information, cardiovascular disease, kidney, diabetes medical history and other treatment history, psychosocial situation and financial ability consideration of respondents. It also contained dietary and lifestyle behaviors which may contribute to elevated blood pressure or on its prevention and management.

Procedures of Data Collection

The questionnaire to be used was first written in English for academic purpose then after translated into Kinyarwanda to be suited to respondents with regards to research topic and specific objectives. Anthropometric and vital parameters (blood pressure) was collected using a separate data collection sheet. The study was conducted from September to November 2022.

V. Results

Presentation of Findings

Findings of the present research are presented in form of tables and figures with respective to the study objectives as follow:

Table 1. Socio demographic characteristics of Respondents
(n=247)

Variable	Frequency	Percentage (%)
Gender		
Male	116	47.0
Female	131	**53.0**
Age ranges (Years)		
35-39	20	8.1
40-44	40	16.2
45-49	36	14.6
50-54	30	12.1
55-59	66	**26.7**
60-64	55	22.3
Residence		
Urban	66	26.7
Rural	181	**73.3**
Marital status		
Single	60	24.3
Married	101	**40.9**
Divorced	25	10.1
Widow	56	22.7

No response	5	2.0
Last education attainment		
None	40	16.2
Primary school	162	**65.6**
Secondary	40	16.2
Tertiary	5	2.0
Have occupation		
Yes	168	68.0
No	79	32.0
Health insurance used		
RSSB/Ex- RAMA	5	2.0
RSSB/CBHIS	242	98.0

Note .IQR: Interquartile range, RSSB: Rwanda Social Security Board/ Rwandaise d'Assurance Maladies, CBHIS: Community Based Health Insurance Scheme

A total of 247 PLWH attending KABUTARE DH, were recruited for this study between July to October 2022. 53% of participants were female, whereas their male's counterparts were counted for 47 % and the modal age range group was 55–59 years. About 73.3% of the respondents were in rural areas versus 23,7% living in urban areas. Considering the marital status, 40,9 % were married, 24.3% single, 22.7% widow, and 10.1% divorced respectively. More than half of respondents 65.6% have attained the primary school education level and the secondary level having the same percentage as the ones lacking any kind of formal education 16.2%, whereas only 2.0% were tertiary graduates.68.0% had occupation/employment whereas 32.0 % were unemployed. The mostly used Health insurance is the Community health based Insurance scheme commonly known as Mutuelle se Santé 98% followed by RSSB/RAMA (2%).

Table 2.Health and behavioral Characteristics of Respondents

Variable	Responses	Frequency	Percent
Body Mass Index (BMI)	Underweight (<18.5 kg/m^2)	89	36.0
	Normal weight (18.5–24.9 kg/m^2)	72	29.1
	Overweight (25.0–29.9 kg/m^2)	85	34.4
	Obese ≥ 30 kg/m^2	1	4.0
How long on ART (Years)	≤ 5	1	.4
	6-10	40	16.2
	10- 15	96	38.9
	15-20	76	30.8
	20-25	34	13.8
Have been screened for HTN before and after Knowing their HIV serological status	Yes	96	38.9
	No	151	61.1
Have Diabetes n=237	Yes	25	10.1

	No	222	89.9
Have been stigmatized for living with HIV /AIDS	Yes	106	42.9
	No	141	57.1
Have financial support to other health costs n=237	Yes	41	16.6
	No	196	79.4
Are Physically active to care for themselves and to their dependents	Yes	73	29.6
	No	174	70.4

Among 247 recruited study participants, the mean Systolic blood pressure was 131mmHg (IQR: 105-190), and Diastolic pressure was 79 mmHg (IQR:56-116). Body Mass Index (BMI) measurements has revealed that 29.1 % have normal body weight, whereas 36.0 % were underweight and 34.4% overweight. Nearly to all, 99.6% of respondents have been on antiretroviral therapy for a period greater than five years. 61.1% have been screened for elevated blood pressure before and after knowing their HIV serological status whereas 38.9 % have not. PLWH who had diabetes was at 10.1

%, and those who were stigmatized for living with HIV was 42.9 %. Among 237 who reported on the financial ability, more than three forth 79,4% have no financial support to other health costs, and on the overall 247 participants, 70.4% are not physically active to care for themselves and their dependents.

Table 3.Prevalence of hypertension among PLWH

Variable	Responses		
		Frequency	**Percent**
Elevated blood pressure Status	Normal	208	84
	Hypertensive	39	16

The overall elevated blood pressure prevalence among 247 PLWH was found to be 39 (16%).

Table 4. Bivariate analysis on Associated factors to Elevated blood Pressure among PLWH

Variable		Elevated blood pressure classification		Chi-square	P-value
		Normal (%)	**Hypertensive (%)**		
Gender	Male	97 (46.6)	19 (48.7)	0.057	0.811
	Female	111(53.4)	20 (51.3)		
Age ranges	35-39	20 (9.6)	0(0.0)	33.344	**0.001**
	40-44	30(14.4)	10(25.6)		
	45-49	31(14.9)	5(12.8)		
	50-54	25(12.0)	5(12.8)		
	55-59	66(31.7)	0(0.0)		

	60-64	36(17.3)	19(48.7)		
Residence	Urban	52(25.0)	14(35.9)	1.992	0.178
	Rural	156(75.0)	25(64.1)		
BMI	Underweight	72(34.6)	17(43.6)	18.043	**0.001**
	Normal weight	60(28.8)	12(30.8)		
	Overweight	75(36.1)	10(25.6)		
	Obese	1(0.5)	0(00.0)		
Duration on ART (Years)	<5	1(0.5)	0(0.0)	23.427	**0.001**
	5-10	30(14.4)	10(25.6)		
	10- 15	90(34.3)	6(15.4)		
	15-20	54(26.0)	22(56.4)		
	20-25	33(15.9)	1(2.6)		
Has relative with HTN	Yes	102(49)	15(38.5)	1.474	0.225
	No	106(51.0)	24(61.5)		
Are in state of coping with HIV serological status	Yes	172(82.7)	24 (61.5)	8.970	**0.003**
	No	36(17.3)	15 (38.5)		
Have financial support to other health costs	Yes	32(16.2)	9(23.1)	1.089	0.297
	No	166(83.8)	30(76.9)		
Have family close support	Yes	121(58.2)	25(64.1)	0.478	0.489
	No	87(41.8)	14(35.9)		
Has experienced the stigma for living with HIV AIDS	Yes	72(93.5)	24(82.8)	3	0.091
	No	5(6.5)	5(17.2)		
Have a stressful job which can raise the BP	Yes	16(7.7)	9(23.1)	8.545	**0.003**
	No	192(92.3)	30(76.9)		
Like too oiled or fried food	Yes	75(36.1)	5(12.8)	8.098	**0.004**
	No	133(63.9)	34(87.2)		
Are Physically active to care for themselves and dependents	Yes	70(95.9)	3(4.1)	10.632	**0.001**
	No	138(79.3)	36(20.7)		
Have the habit to performing Physical exercise	Yes	41(80.4)	10(19.6)	0.705	0.401
	No	167(85.2)	29(14.8)		

The prevalence of Elevated blood pressure was greater in female 20 (51.3%) than males 19 (48.7%). With more than quarter being overweight 25.6%. The Elevated blood pressure has also been found to be more prevalent in older ages 60-64 years at 48.7% and there was no prevalence found in ages below 40 (0%). The prevalence of HTN was also observed in Urban than in rural 25 (64.1%) and 14 (35.9) respectively. The elevated blood pressure was also more than a half 22 (56.4) prevalent among PLWH on ART in the age group ranging from 15-20 years.

The big number of participants had no family history of HTN 15 (38.5), however they reported Having a family close support at 64.1%. With context to other health related costs, the majority asserted not having financial support to afford health related costs 30 (76.9). 82.8% self -reported to have experienced the stigma related to living with HIV AIDS. 36 (20.7%) of 167 who reported being physically inactive to care for oneself and their dependents have elevated blood pressure, and 14.8% of those reporting not to have the habit of performing regular physical exercise have Elevated blood pressure. The factors significantly associated to elevated blood pressure was the age (p=.001),

the Body Mass Index (p=.001), the length on ART (p=.001), Coping with HIV serological status (p=.003), having a stressful job (p=.003), and being physically active to care for themselves and dependents respectively. p=.001).

Table 5 Binary Logistic Regression analysis on Predictors of Elevated blood Pressure among PLWH

Variables		COR	95% C.I Lowe Upper	AOR	95% C.I Lower Upper	P Value
	Age					
	35-39			Ref		
	40-44	.402	0.07 - 1.14	.308	0.08 - 1.12	.074
	45-49	1.007	0.03 - 0.97	.150	0.02 - 0.82	**.029**
	50-54	.923	0.11 - 2.16	.854	0.19 - 3.66	.832
	BMI	1,223	0.22 -1.25	.651	0.12-1.25	.144
	Duration on ART (Years)					
Step 1[a]	<5 Years			Ref		
	10 - 15	32.45	3.29 - 4.34	40.57	3.19 - 51.78	**.004**
	15 -20	11.27	3.25 - 3.34	15.28	1.18 - 19.09	**.037**
	20-25	24.43	1.11 - 1.29	32.32	3.25 - 32.34	**.003**
	Coping with one's HIV serological (1)	2.98	1.42-6.24	.134	0.03 - 0.47	**.002**
	Being physically active to care for oneself and dependents (1)	6.08	1.81-20.46	.188	0.04 - 0.73	**.016**
	Having a stressful job (1)	.728	0.113-0.658	8.135	1.77 -37.25	**.007**

a Variable(s) entered on step 1: Age (45-49), BMI, Duration on ART: years, (<5, 5-10, 10-15, 15-20) Coping with one's HIV serological status, Being Physically active to care for oneself and dependents, Having stressful job.
(1) Variables in yes Category. *Significant predictors of Elevated blood pressure are **bold** indicated.*

The overall regression model was statistically significant, X^2 (97.979), df =15, p <.05, and correctly predicted 88.7% of cases. The results underscores that the age 45-49 AOR .150 , 95% CI (0.02 - 0.82) ,p=.029 , the duration on ART of 10-15 years AOR 40.574 , 95% CI (3.19 - 51.78), p= **.**004 ,15-20 years AOR 15.286 , 95% CI (1.18 - 19.09), p=**.**037, and 20-25 years AOR 32.328 , 95% CI (3.25 - 32.34) ,p=.003 coping with HIV serological status AOR .134 , 95% CI (0.03 - 0.47),p=.002,being physically active to care for oneself and dependents AOR .188 , 95% CI (0.04 - 0.73),p=**.**016 and having stressful job AOR 8.135 , 95% CI (1.776 -37.25),p=.007 added significantly to the Elevated blood pressure, However the duration on ART <5 years is not associated to elevated blood pressure and so for the BMI (p=.144),

For all predicted duration on ART, increasing duration was associated with an increased likelihood of exhibiting elevated blood pressure. However, the increasing coping with HIV serological status and being physically active to care for oneself and dependents was associated with the reduction of the likelihood to develop elevated blood pressure.

VI.   Discussion

The present study aimed to assess the prevalence and associated factors of elevated blood pressure among People living with HIV attending KABUTARE District Hospital. The study surveyed 247 potential participants. This study finding has shown the prevalence of elevated blood pressure of 16 %, which is slightly greater to the prevalence rate of 15.6% reported at KIBAGABAGA District Hospital, Rwanda (Bakesha Nicole Alexandrine, 2020). and lower than 17% found conducted at Sir Yahaya Memorial Hospital, a specialist hospital in Kebbi State, Nigeria (Oluwaseun Badru, 2022)   and 18.4 in Livingstone Central Hospital (LCH) ART clinic in Zambia (Robert Musekwa et Al, 2021).

Our findings are also far lower than the prevalence of 50% recently found in South Africa (Okyere, 2022). Compared to other East African countries, the findings from this study are higher than those found in Uganda 11% (Kwarisiima D, 2016) and in HAART Naive HIV-infected adults in Dar -es – Salaam, Tanzania, 12.5% (Njelekela, 2016) and in Ethiopia 14% (Gebrie. A, 2020) but low compared to the findings of the similar study in Burundi 17.5% (Harimenshi D. N., 2022). However in Rwanda ,findings are lower to those found in CHUK /HIV Clinic with the predominance of Elevated blood pressure as a NCD among PLWH at 22% (Turikumwe, 2020) ,and in the region , this prevalence rate is lower than those of studies conducted in a metropolitan Nairobi, Kenya which was 25% (Grace W Mbuthia, 2021). Again being the lowest prevalence than in other continents where the one conducted in a public Hospital in Malaysia on PLWH on HAART which was 45.6% (Nazisa Hejazi, 2014) and in a Referral center in Amazon ,Brazil (Costa AN, 2020).

In this research, the age range 45-49, p=0.037 was identified as the factor positively associated to Elevated blood pressure among study participants, the findings closer to that in Uganda which stated that the prevalence of hypertension among HIV positive adults raised with increasing age(Gloria Lubega et al, 2021).Age also has been found as a predictor of Elevated blood pressure among PLWH in Zambia p = 0.001 (Robert Musekwa et Al, 2021) .The study findings are with the similar findings as those found in Burundi where PLWH older than 45 years were 4 times more likely to suffer from elevated blood pressure (Harimenshi, 2022). Findings which has also been revealed in Kenya where age >40 years was a predictor of Elevated blood pressure (AOR 2.80, p≤0.001) (Grace W Mbuthia, 2021) and in Nigeria β 0.050;p<.05(Oluwaseun Badru, 2022) .with previous demonstration in similar studies (Antonello, 2015), and   (Njelekela, 2016). Living with HIV has been found to predispose the patient to inflammatory biomarkers even in viral suppressed individuals which may lead to atherosclerosis and Elevated blood pressure increasing with age (Ekrikpo UE, 2018).

The age in which the elevated blood pressure was found may be also correlate to the women menopausal transition which most often begins between ages 45 and 55 and lasts about seven years but can be as long as 14 years (NIH, 2021) with prevalent hypertension among women 51.3 % than in men. This finding is supported by the research facts that by age the hypertension increases and with definite links between increases in blood pressure (Erica Ramirez, 2022) and the changes a person's body undergoes when they experience early and late menopausal transition by the increase in both Systolic and Diastolic Blood pressure (Son, 2015).

Some epidemiological studies have echoed this finding that there is a linear change in blood pressure (BP) leading to increased CVD with the advancement of age from predominantly diastolic BP (DBP) in the young to predominantly systolic BP (SBP) in the old, the change caused by the stiffening of the large arteries and the loss of elastic recoil as a result of replacement of the elastic fibers with collagen fibers. The result of this ageing process leads to an increase in pulse wave velocity and widening of pulse pressure (Steven G. Chrysant MD, 2014).Recently, it has been suggested that in treating elevated blood pressure, the age of the person should be considered because of the hemodynamic changes of BP with age (Vishram JK, 2012).

The Body Mass Index (BMI) have been shown to be associated to elevated blood pressure but did not significantly predict the hypertension (p=.144).This finding is different to that observed in Nigerian where the increasing weight was established as a predictor of elevated blood pressure among the participants and higher the weight, the higher the odds of elevated blood pressure β 0.050; p < .05 (Oluwaseun Badru, 2022).

Global reviews and meta analyses have shown the relationship of HIV and hypertension prevalence (Davis, 2021) and some ART regimens as significant factors associated with elevated blood pressure among PLWH (Tsuro U, 2022) .The binary logistic regression analysis on ART duration as a factor associated with hypertension in this study has demonstrated that there is an significant association of the duration on ART on the likelihood of developing Elevated blood pressure from a period of 10 – 20 years (p<0.5) among PLWH. Previous studies ARTs have underscored the affect the body fat metabolism induced by ART regimen where women get more weight than men which in turn increases the chance to get heart diseases (Bares SH, 2018) supported by Kazooba study on cardiometabolic risk among HIV positive adults in Uganda , (Kazooba P, 2017) and echoed by African wide findings where HAART was found to be among predictors of cardiovascular disease in African HIV population like batcaver, Protease inhibitor and nucleoside reverse transcriptase inhibitors
 (Dimala CA, 2017).

Being on some ART regimens has been found to be the predictors to developing elevated blood pressure. A study conducted in Zambia found that the Integrase Strand Transfer Inhibitors (INSTIs) , dolutegravir ART regimen was predictors of elevated blood pressure among PLWH (Robert Musekwa et Al, 2021) and in North west Ethiopia , where Zidovudine (AZT)-based ART regimen were significant predictors for the development of elevated blood pressure (Mulugeta H, 2021). This finding is however different to other recent studies where the duration on ART was not predictors of Elevated blood pressure like in Nigeria (Oluwaseun Badru, 2022), and in rural Uganda (Niwaha, 2021). However our findings portrays the similar picture of the association of the duration on ART with elevated Hypertension the region and in period as recent published data in Burundi the duration of >10 years had a significant association (Harimenshi D. N., 2022).

Being in state of coping with HIV serological status has been shown to have an impact on Elevated blood pressure p=. 002.This is exemplified by the fact that even looking about associations, those who self- reported were in a state of coping or not with their HIV serological status ,24 (61.5%) and 15 (38.5%), respectively, the association with elevated blood pressure was significant, at a p=0.003.

As earlier mentioned, women have higher prevalence of elevated blood pressure and coping with HIV serological status is key to improvement of Quality of life among PLWH .Studies have revealed that HIV-infected women had a higher need for support compared to HIV-infected men (Rzeszutek M, 2016).Carolina in her study findings emphasized that both illness perception and coping strategies were proved to have effect on the QOL which in turn can impact on Cardiovascular diseases (Carolina C, 2017). As far as the quality of life is concerned, studies have revealed that coping significantly predict physical, psychological, social relationship, environmental spirituality domains and overall p<.0.5 (Osamika, 2019)

VII.   Conclusions

The prevalence of Elevated blood pressure among people living with HIV at KABUTARE DH

The study findings on the prevalence of Elevated blood pressure among 247 People living with HIV, aged 35-65 years attending KABUTARE DH HIV clinic was found to be 39 (16%) whereas 208 (86%) were normotensive at the period of study.

Factors associated to elevated blood pressure among People living with HIV

Factors associated to elevated blood pressure, included, the socio-demographic characteristics, associated medical factors Socio-economic and psycho- social characteristics, and Factors related to lifestyle and practice concerning related to elevated blood pressure among targeted population were statistically analyzed. The association in Bivariate analysis has shown that the age range, the Body Mass Index, having stressful job, being Physically active to care for themselves and dependents, being in a state of coping with HIV serological status, Duration on ART, and liking too oiled or fried food as associated factors of Elevated blood pressure p <.05.

Multivariate analysis findings showed that at 95% CI, age 45-49 AOR .150 , 95% CI (0.02 - 0.82) ,p=.029 , the duration on ART of 10-15 years AOR 40.574 , 95% CI (3.19 - 51.78), p= .004 ,15-20 years AOR 15.286 , 95% CI

(1.18 - 19.09), p=.037, 20-25 years AOR 32.328 , 95% CI (3.25 - 32.34) ,p=.003 coping with HIV serological status AOR .134 , 95% CI (0.03 - 0.47),p=.002,being physically active to care for oneself and dependents AOR .188 , 95% CI (0.04 - 0.73),p=.016 and having stressful job AOR 8.135 , 95% CI (1.776 -37.25),p=.007 added significantly to the Elevated blood pressure, However the duration on ART <5 years is not associated to elevated blood pressure and so for the BMI (p=.144), added significantly to the Elevated blood pressure, For all predicted duration on ART, increasing duration was associated with an increased likelihood of exhibiting elevated blood pressure. However, the increasing coping with HIV serological status and being physically active to care for oneself and dependents was associated with the reduction of the likelihood to develop elevated blood pressure.

The prevalence of Elevated blood pressure was 16% and not too higher compared to regional, continental, and other countries on the globe, but not negligible in the battle of prompting the quality of Living of People living with HIV in Rwanda which strives to have a healthy people for a wealthy Nation. Elevated blood pressure is associated with risk factors like age, the Body Mass Index, having stressful job, being Physically active to care for themselves and dependents, being in a state of coping with HIV serological status, Duration on ART, and liking too oiled or fried food as associated factors of Elevated blood pressure. The predictors of Elevated blood pressure were found be the age 45-49, the duration on ART above 5 years, coping with HIV serological status, being physically active to care for oneself and dependents, and having stressful job added significantly to the Elevated blood pressure, For all predicted duration on Antiretroviral therapy (ART), increasing duration was associated with an increased likelihood of exhibiting elevated blood pressure. However, the increasing coping with HIV serological status and being physically active to care for oneself and dependents was associated with the reduction of the likelihood to develop elevated blood pressure.

VIII. Recommendations

To the Ministry of Health

- Integration of a national hypertension management program into a National HIV care initiatives on access to cardiovascular related care in all age ranges People living with HIV.
- Monitor and evaluate the achievement of Psychosocial treatment and support care in relation to coping strategies to minimize cardiovascular related impacts on PLWH.

To KABUTARE DH HIV clinic

- Having a routine monitoring and key health data collection mechanism and inform the Ministry of Health on needed intervention for the wellbeing of PLWH.
- To partner with various agencies in finding out the sustainable implementation of life improvement policies among PLWH group in its catchment area.

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