

**COMPARING BLOOD PRESSURE CONTROL BETWEEN HIV POSITIVE AND
HIV NEGATIVE HYPERTENSIVE PATIENTS ATTENDING WEBUYE
COUNTY HOSPITAL, KENYA**

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DECLARATION

Declaration by candidate:

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This thesis has been submitted with our approval as university supervisors.

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DEDICATION

I wish to dedicate this research proposal to my loving husband Mr. Benson Mbuthia and my daughters Michelle Wambui and EllyJoy Mwendwa for their steadfast love, support and patience during the entire process. The Lord bless you abundantly.

ABSTRACT

Background: The prevalence of hypertension in Sub Saharan Africa has risen dramatically over the years. The burden is also rising among the HIV positive clients. Globally, hypertension control remains sub-optimal due to complex factors affecting blood pressure control and adherence to care. The multi-morbidity nature of HIV, including the pill burden may negatively affect adherence to antihypertensives. Conversely, intense adherence interventions targeting ARVs may positively influence hypertension medication adherence and control in hypertensive patients living with HIV.

Objective: To assess blood pressure control among HIV positive and HIV negative hypertensive patients on follow up at the medical outpatient clinic in Webuye County Hospital.

Methods: This was a cross sectional study. The study population comprised of hypertensive patients attending the medical outpatient clinic at Webuye County Hospital. Systematic random sampling was used to recruit 73 HIV positive hypertensive participants who were then matched 1:2 for age and gender with the HIV negative participants (146 participants). A structured interviewer guided questionnaire was administered to obtain demographic and socio-economic characteristics while the clinical information was obtained from the patient files. Questionnaires were checked for errors and completeness before entry of data into access database. Blood pressure was considered controlled if the average of two previous and enrollment Bp reading was less than 140/90 mm Hg, while adherence to medication was assessed using adherence questionnaire in the patient encounter form.

Descriptive data were presented as means and standard deviation (SD), median with inter quartile range (IQR), or number with percentage as appropriate. Chi-squared test and Fisher's exact test were used to check for association between the categorical variables. The results were presented in form of tables. A p-value of <0.05 was considered statistically significant.

Results: A total of 219 participants were included in the analysis (73 HIV positive and 146 HIV negative). The mean age was 55 years, while 54.8% were females. Majority (78.1%) of the participants were married. More than half (53%) had a family history of hypertension, 36% had history of alcohol intake, and only 10% had history of cigarette smoking. 40% had a BMI above the recommended levels and 43% lived a sedentary lifestyle. 20% of HIV negative and 23% of HIV positive participants had controlled BP with a p value of 0.592 (95% CI: -8.5, 14.9). Adherence to hypertensive medication was 68.95% and 69.4% among the HIV negative and HIV positive participants respectively p value = 0.887 (95% CI: -12.4, 13.9).

Conclusion: There was no difference in adherence to hypertensive medication among the HIV positive and the HIV negative participants. The HIV positive participants had better Bp control, though not statistically significant.

Recommendation:

Further study on determinants and optimization of blood pressure control should be conducted

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ABBREVIATIONS AND ACRONYMS

ABPM- Ambulatory Blood Pressure Monitoring

AIDS- Acquired Immunodeficiency Syndrome

AMPATH- Academic Model Providing Access to Healthcare

BMI- Body Mass Index

BP – Blood Pressure

DALY - Disability-Adjusted Life Year

DASH - Dietary Approaches to Stop Hypertension

HAART- Highly Active Antiretroviral Therapy

HbA1c- Glycated hemoglobin

HIV- Human Immunodeficiency Virus

JNC 8 - Eighth Joint National Committee

KDHS-Kenya Demographic and Health Survey

LDL-C – Low Density Lipoprotein Cholesterol

MOH- Ministry of Health

MOPC- Medical Outpatient Clinic

NCD- Non-Communicable Disease

NGO- Non-Governmental Organization

PLWH- People Living with HIV

RAAS- Renin Angiotensin Aldosterone System

WCH- Webuye County Hospital

WHO- World Health Organization

DEFINITION OF TERMS

Hypertension: In the Kenyan national guidelines for cardiovascular disease management hypertension has been defined as persistently elevated, systolic and/or diastolic blood pressure (BP) of 140/90 mm Hg or more in people aged 18 years and above. This definition also applies to those individuals who are already taking anti-hypertensive medications even if their current blood pressure is less than 140/90 mm Hg (MOH, 2018).

Controlled Blood Pressure: Blood pressure below 140/90 mm Hg in patients on treatment for hypertension (MOH, 2018).

Prevalence: Prevalence is the proportion of the population with specific characteristics within a given time period (NIH, 2021).

Medical Outpatient Clinic: A clinic which handles medical cases for example diabetes, hypertension and HIV.

Adherence: This is defined as the extent to which a patient's behavior (e.g., taking medications with respect to timing, dosage and frequency corresponds with agreed-upon recommendations from a healthcare provider (Sawkin et al., 2015).

White Coat Hypertension: White coat hypertension is defined as elevated blood pressure values that occur in a clinical setting but are otherwise normal in other settings such as at home or with regard to mean twenty-four-hour value (Sierra A. 2013).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

Cardiovascular disease is one of the leading causes of morbidity and mortality among people living with HIV (PLWH), with hypertension being a major modifiable risk factor for cardiovascular disease (Mills et al., 2020).

Worldwide estimates suggest that 1.13 billion people have hypertension, most of whom (two-thirds) live in the low- and middle-income countries, and that one in four men and one in five women had hypertension in 2015 (Mills et al., 2020). About forty six percent of adults with hypertension are unaware of their condition (WHO, 2021).

According to World Health Organization (WHO) about three quarter of all non-communicable disease deaths (NCD) take place in the low- and middle-income countries which account for about 28 million deaths and this is attributed to inadequate health care systems which lead to increased rates of deaths prematurely. In Kenya non-communicable diseases accounted for around 31 percent of deaths in 2015, with 51 percent of them considered as premature deaths (people under 70 years of age) (NCD Kenya, 2015).

In Kenya studies have reported the prevalence of hypertension to be between 18.4 to 32.6% (Mohamed et al., 2018).

Approximately 37.9 million people were living with HIV in 2018 with a global HIV prevalence of 0.8% among adults. The prevalence of hypertension among PLWH on HAART was 29.7% among the Norwegian's (Bergersen, B. M et al., 2003) and 21% among PLWH on HAART in a study in Ethiopia (Fiseha, T., Belete, A. G.,

Dereje, H., & Dires, A., 2019). A study in Western Kenya showed the prevalence of hypertension among PLWH to be 9.8% and 11.8% in men and women respectively (Akiko S., Mohamed K. & Yasuhiko K., 2020).

Globally blood pressure control remains a challenge. For instance, trends of blood pressure control among US adults showed that the proportion of blood pressure control increased from 31.8% in 2007-2008, to 53.8% in 2013-2014, and then declined to 43.7% in 2017-2018 (Muntner et al., 2020) whereas in a study in an HIV outpatient clinic in New York city among people living with HIV (PLWH) 43% of the participants had hypertension. Three- quarter of the patients were on treatment for hypertension and 57% had controlled blood pressure (Tripathi et al., 2020). In sub-Saharan Africa, meta-analysis and systematic review of 13 studies with about 5226 hypertensive patients by Amare et al, noted the prevalence of uncontrolled hypertension was 48% (Amare et al., 2020).

Globally, less than 25 percent of the people with hypertension have their hypertension controlled (WHO, 2021).

Hypertension control at follow-up visits in Uganda was higher among PLWH compared to the HIV negative participants at follow-up visits (48% vs 46%) (Kwarisiima et al., 2019). In addition, hypertension control has been shown to be sub optimal in several studies in Kenya: In a study in Nyeri Provincial General Hospital among the 452 hypertensive patients only 33.4% had their blood pressure readings within the recommended levels (Mutua et al., 2014). In a district hospital in Mombasa for instance, the level of control of blood pressure was 7.4% among hypertensive patients on treatment (Jenson, et al., 2011). In Western Kenya among people living with HIV (PLWH) poor blood pressure control (Systolic blood pressure above 140 mm Hg or diastolic blood

pressure above 90 mm Hg) was reported in 10% of men and 7% of women respectively (Bloomfield et al., 2014).

As the HIV population live longer due to the combination of antiretroviral therapy (Vachiat et al., 2017) there is concern for an increasing number of degenerative cardiovascular diseases among HIV positive patients in sub-Saharan Africa. This has been attributed to the changing patterns of traditional cardiovascular risk factors in the region, increased prolonged exposure to HAART and obesity already being highly prevalent among HIV positive patients in Western Kenya (Bloomfield et al., 2011). Unlike HIV, where viral suppression is achieved by treatment with HAART, hypertension is usually not controlled by medications alone. Other known measures that contribute to hypertension control include self-care activities such as use of healthy food and exercises may be necessary (Monroe et al., 2013). Patients who smoked, had too much alcohol intake, inadequate vegetable and fruit consumption, high stress levels and poor adherence to prescribed medication had a higher incidence of uncontrolled blood pressure (Pereira et al., 2016). Also ineffective treatment, difficulty in accessing the health services, cost of medications, low treatment adherence and inappropriate approach to clients have been observed as contributing to the low blood pressure control rate in men (Pereira et al., 2016).

Hypertension has been associated with several complications including stroke, chronic kidney disease, vascular dementia, and atherosclerotic cardiovascular disease. Globally about 3.5 billion adults had their systolic blood pressure levels between 110 mm Hg and 115 mm Hg and 874 million adults had systolic blood pressure of 140 mm Hg and above (Curfman, Bauchner, & Greenland., 2020).

Hypertension affects 23% of Kenyan adults and is the most common modifiable risk factor for cardiovascular disease (Temu et al., 2017). What is of concern in Kenya is that hypertension awareness is low and adherence to regular treatment is very low this has been attributed to the lack of recognition of the silent chronic nature of hypertension and campaigns similar to those used to advocate for Highly Active Anti- Retroviral Therapy (HAART) adherence in HIV clinics should be adapted for hypertension drug adherence (Temu et al., 2017).

The European guidelines of 2018 define hypertension as systolic blood pressure (SBP) greater than or equal to 140 mm Hg and a diastolic blood pressure (DBP) of greater than or equal to 90 mm Hg whereas, US guidelines of 2017 define hypertension as SBP of greater than or equal to 130 mm Hg and a DBP of greater than or equal to 80 mm Hg (Curfman et al., 2020). However, the Kenyan ministry of health recommend treatment of hypertension to achieve a goal of blood pressure below 140/90 mm Hg as treatment of blood pressure below this has been shown to significantly reduce risk of stroke, coronary heart disease, chronic kidney disease, heart failure and death (MOH, 2018).

Among the measures that WHO has proposed to achieve a 25% reduction of the premature mortality occasioned by non-communicable diseases by 2025 include: reduction in tobacco use by 30%, harmful alcohol intake by 10%, salt consumption by 30%, prevalence of hypertension by 25%, control of CVD risk factors by at least 50% and stem the rising tide of obesity and diabetes. The United Nations have also adapted the sustainable development goals (SDGs) which aim to have a 33% reduction of the non-communicable diseases' mortality by 2030 (WHO, 2018).

1.2 Statement of the Problem

The prevalence of hypertension in sub-Saharan Africa has risen drastically over the years and poor blood pressure control has been observed worldwide. The proportion of blood pressure control among hypertensive patients has been shown to be between 57% and 7.7% respectively in the high-income countries and the low- and middle-income countries respectively (Tripathi et al., 2015; Jenson et al., 2011).

In East Africa blood pressure control remains sub optimal. For instance, in a study in Uganda, only 46% of PLWH had their blood pressure controlled (Kwarisiima et al., 2016). In Ethiopia blood pressure control among PLWH was 38 % (Melaku et al., 2020).

Poor blood pressure control is associated with various adverse consequences including stroke, heart attack, renal disease and limb amputation (Monroe et al, 2013). There is a linear association between uncontrolled blood pressure and composite cardio-vascular events such as stroke, coronary artery disease and heart failure with morbidity associated with hypertension increasing with uncontrolled hypertension.

Cardiovascular disease is among the largest public health concern in Kenya with close to a quarter of Kenyans having hypertension a major cardiovascular disease. Cardiovascular diseases account for over 50% of inpatients and about 40% of hospital deaths in Kenya (MOH, 2015). PLWH are living longer and have fewer complications due to viral suppression on HAART, this has subsequently led to the rising burden of HIV and hypertension (Godongwana et al., 2021). Few studies have been carried out to assess the blood pressure control between the PLWH and HIV negative hypertensive patients. By the time of writing the proposal of this study, hospital records showed that 1628 hypertensive and 1500 HIV positive patients were registered at Webuye County Hospital.

Our search did not yield any data on the level of blood pressure control among this group and therefore the study sought to assess the level of blood pressure control among the hypertensive patients who are HIV positive and those who are HIV negative.

People living with HIV (PLWH) have well organized comprehensive care clinics (CCC) which are better coordinated and have good social support but it is not clear whether this spills over to hypertension management. Although adherence to HAART is reinforced among PLWH, hypertensive patients who are living with HIV have a high pill burden and this may affect compliance with their hypertension medication.

1.3 Research question

What is the difference in blood pressure control between the HIV positive and HIV negative hypertensive patients in WCH?

1.4 Objectives of the Study

1.4.1 Broad Objective

To assess blood pressure control among HIV positive and HIV negative hypertensive patients on follow up for hypertension at the medical out-patient clinic at Webuye County hospital.

1.4.2 Specific Objectives

- (i) To determine the socio-demographic and clinical characteristics of patients on follow-up for hypertension at Webuye County Hospital.
- (ii) To appraise the blood pressure control among HIV positive and HIV negative hypertensive patients on follow up for hypertension at the medical out- patient clinic at Webuye County Hospital.

- (iii) To assess adherence to anti-hypertensive medication among the HIV positive and the HIV negative hypertensive patients on follow up for hypertension at the medical-outpatient clinic at Webuye County Hospital.

1.5 Justification of the Study

The prevalence of hypertension is increasing and is projected to rise to 29.2% by 2025 which will account for a total of 1.56 billion adults (Mills et al., 2020). With the widespread availability of HAART, PLWH are living longer (Jensen et al., 2013) this has led to the rising burden of hypertension among PLWH (Islam et al, 2012). In addition, prolonged use of HAART is a risk factor for hypertension among PLWH (Chepchirchir et al., 2017).

Adherence interventions in HIV care are more pronounced leading to good outcomes for example viral load suppression is about 88.3% (Conan et al., 2021). Although studies have been carried out on blood pressure control, few studies have been done to compare blood pressure control among hypertensive patients who are HIV positive and those who are HIV negative. The results from this study would help us know which group has better control of hypertension and if interventions within HIV clinics with regards to adherence to HIV management also spill over to hypertension control. There was need to understand if adherence efforts in HIV benefit blood pressure as this would help inform blood pressure control strategies.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Estimates suggest that 1.13 billion people Worldwide have hypertension, most of whom (two-thirds) live in the low- and middle-income countries, with one in four men and one in five women having hypertension in 2015 (Mills et al., 2016). Hypertension is projected to rise to 29% by 2025 (29% males and 30% females). Overall, about 1.56 billion adults will have hypertension by 2025, this will account for a 60% increase (Mills et al., 2020).

Sixteen million of NCD deaths occur before the age of 70 years with 82% of these "premature" deaths occurring in the low- and middle-income countries (WHO, 2015). Most (two thirds) of the people with hypertension live in the low and middle income countries (WHO, 2021).

Hypertension being a global phenomenon, affects approximately 970 million people in developing and developed countries (Chen et al., 2016). A study by Ataklte et al, in sub-Saharan Africa demonstrated that the expected prevalence of hypertension for participants aged 30, 40, 50, and 60 years was 16%, 26%, 35%, and 44% respectively, this accounted for a pooled prevalence of 30% (Ataklte, Erqou, & Kaptoge., 2015).

Globally, people living with HIV (PLWH) were estimated to be 36.9 million in 2014, 15.8 million of them were accessing treatment in 2015. 2 million people were newly infected with HIV in 2014 and 1.2 million people died of AIDS-related illnesses (AIDS by the numbers, 2015).

Hypertension accounts for increased cardiovascular mortality when compared to other modifiable risk factors and is the leading cause of mortality and also adjusted disability life years worldwide (Rosas et al., 2018).

Normal blood pressure according to JNC 7 has been defined as the average systolic blood pressure (SBP) of less than 120 mm Hg and the average diastolic pressure (DBP) of less than 80mmHg.

Classification of hypertension (MOH, Kenya 2018).

Category	Systolic blood pressure	Diastolic blood pressure
Optimal blood pressure	Less than 120 mm Hg	Less than 80 mm Hg
Normal blood pressure	120 and 129 mm Hg	80 and 84 mm Hg
High normal Bp	130 and 139 mm Hg	85 and 89 mm Hg
Grade 1 hypertension	140 and 159 mm Hg	90 and 99 mm Hg
Grade 2 hypertension	160 and 179 mm Hg	100 and 109 mm Hg
Grade 3 hypertension	Bp $\geq$ 180 mm Hg	Bp $\geq$ 100 mm Hg
Isolated systolic hypertension	SBP $\geq$ 140 mm Hg	Bp $\leq$ 90 mm Hg

Accurate blood pressure measurement entails an average of two blood pressure recordings obtained on two separate occasions. Out of office blood pressure recordings are important to confirm hypertension as well as medication titration.

Monitoring of patients on treatment for hypertension is carried out in a clinicians' office, this may not represent a persons' blood pressure accurately. For instance, individuals may have white coat hypertension despite their blood pressure being controlled. Therefore, measuring blood pressure out of office is more appropriate for monitoring of blood pressure among hypertensive patients on medication (Sierra A. 2013). This ambulatory blood pressure monitoring (ABPM) is performed by a device worn over twenty-four to forty-eight-hour period and takes the blood pressure measurement every fifteen to thirty minutes in the day and every thirty to sixty minutes during sleep. Blood pressure is recorded on the device and an average of day and night blood pressures are calculated by the computer. Another method of blood pressure monitoring is the self-blood pressure measurement which can be carried out at home or in the office, an individual records the blood pressure at a particular time of the day every day and records the blood pressure. Studies have shown that on average blood pressure at night is about 15 percent less than the values of blood pressure that are recorded during the day (Whelton et al., 2017). Inability of the blood pressure to fall by approximately 10 percent during sleep is known as non-dipping and is a very strong predictor of adverse cardiovascular outcomes than the blood pressure recorded during the day (Unger et al., 2020).

There are two types of hypertension

Primary hypertension also called essential hypertension is defined as high blood pressure in which secondary causes of hypertension such as phaeochromocytoma, renal failure or other causes of secondary hypertension are absent and accounts for about 90 to 95% of hypertension whereas, secondary hypertension account for 2 to 10% of the hypertension cases (Carey et al., 2018).

Although the cause of essential hypertension is unknown, there are several risk factors that are associated with its development, which include: advancing age, weight gain and obesity. Genetic variations account for about 30% of blood pressure variations in different populations and hypertension is twice as common among individuals who have one or two parents with hypertension. Other factors that have been described as associated with essential hypertension include: excessive salt intake more than 3 grams per day of sodium chloride, excessive consumption of alcohol, physical inactivity as well as reduced number of nephrons occasioned by genetic factors (Whelton et al., 2018).

Complications of hypertension include: left ventricular hypertrophy, congestive cardiac failure, chronic kidney disease and intracerebral hemorrhage (Curfman, Bauchner, \$ Greenland, 2020). Management of hypertension is based on the comorbidity present for instance, a patient with hypertension and diabetes the choice of drug for the management of the hypertension in order to reduce progression of diabetes nephropathy include the angiotensin receptor blockers which includes enalapril (Carey et al., 2018).

In addition, the recommended blood pressure reduction in patients with diabetes is 130/80 mm Hg. For a patient with left ventricular hypertrophy due to hypertension the recommended medications are angiotensin converting enzyme inhibitor, calcium channel blockers and diuretics such as chlorthalidone and indapamide (Whelton et al., 2018).

Studies have shown that home blood pressure monitoring correlates closely to the daytime ambulatory blood pressure monitoring readings (Rosei et al., 2020). Nocturnal blood pressure monitoring is predictive of adverse cardiovascular outcomes and isolated nocturnal hypertension has a risk for cardiovascular outcomes similar to elevated daytime blood pressure monitoring (Lamirault et al., 2019). Ambulatory blood pressure

monitoring detects the non-dipping pattern of the blood pressure (less than ten percent nocturnal drop in blood pressure). The normal night time dipping is greater than or equal to ten percent and less than twenty percent, the non-dipping individuals have increased blood pressures in the morning and have an increased cardiovascular risk (Rosei et al., 2020).

Resistant hypertension has been defined as blood pressure above 140/90 mm Hg despite using three or more different classes of anti-hypertensive medications, these medications act by complimentary mechanisms and include a receptor renin angiotensin receptor blocker (either angiotensin converting enzyme inhibitor or angiotensin receptor blocker inhibitors), calcium channel blockers and a diuretic, these drugs should be optimally dosed. Thiazide like diuretics including indapamide, chlorthalidone or hydrochlorothiazide are first line diuretics used in hypertension, however, hydrochlorothiazide and indapamide need to be changed to chlorthalidone once the estimated Gfr is below 45ml/min/1.73m³. However, if the renal function is severely decreased to eGfr less than 30 ml/min/1.73m³ then loop diuretics such as bumetamide, torsemide or frusemide are preferred as first drugs of choice.

If blood pressure remains uncontrolled despite three anti-hypertensive medications which are optimally dosed, then addition of a fourth drug preferably spironolactone at a dose of 25 mg once a day (low dose) is recommended if the eGfr is below 45 ml/min/1.73m³ and the potassium levels are less than 4.5 mmol/l (Lamirault et al., 2015).

The pathophysiology of resistant hypertension has been described as sodium retention and excess fluid. The use of diuretics has been shown to be superior to the renin angiotensin system blocker in the control of blood pressure. In a study titled PATHWAY-

2 trial by William et al, which compared the different blood pressure effect among anti-hypertensive medications used in resistant hypertension, at twelve weeks of the study the blood pressure lowering effect of bisoprolol was 4.2 mm Hg, 4.9 mm Hg for doxazosin and 10.2 mm Hg for spironolactone (William et al., 2015). Addition of bisoprolol or doxazosin may be added as fifth line therapy or as an alternative to the spironolactone (Lamirault et al., 2015).

Ambulatory blood pressure monitoring is the gold standard to diagnose the resistant hypertension. If not feasible home blood pressure monitoring may be instituted (Rosei et al., 2020). Refractory hypertension has been described in a group of individuals with a severe form of resistant hypertension and has been defined as uncontrolled hypertension despite the use of five or more anti-hypertensive medications (Lamirault et al., 2015).

2.2 Socio-demographic and clinical characteristics of patients with hypertension:

Hypertension rarely causes symptoms in early stages and majority of cases are diagnosed late when complications have already set in. Even after diagnosis many do not adhere to treatment for various reasons hence they are not able to successfully control their blood pressure (Chen et al., 2016). Eight percent of the Kenyans aged between 40 and 69 years have a 30% or above risk of a cardiovascular disease. The common risk factors for cardiovascular disease are overweight and obesity ($BMI > 25 \text{ kg/m}^2$), current heavy smokers, elevated blood pressure with a $SBP > 140$ and/or $DBP > 90$ mm Hg or those on medication for elevated blood pressure, low level of physical activity and less than 5 servings of fruit and vegetables per day, of note is that only three percent of Kenyans had none of the above risk factors (WHO, 2013).

Hypertension is important not only because of its high prevalence but also because it is a major modifiable risk factor for cardiovascular and kidney disease (Kearny et al., 2005). WHO states that adults aged between 18 and 64 years should carry out moderate intensity daily physical activity throughout the week for at least 150 minutes, or perform vigorous intensity daily physical activity throughout the week for at least 75 minutes (MOH, 2015). Only 6.5% of Kenyans do engage in the recommended amount of physical activity (MOH, 2015). Temu et al, study among PLWH on beliefs on the causation of hypertension in Western Kenya documented that eating food containing fat and too much salt, not eating enough fruits and vegetables, overweight and obesity, excessive use of alcohol, physical inactivity, ageing, genetic factors, psychological stress, socioeconomic determinants and inadequate access to health care were associated with hypertension (Temu et al., 2017).

In a referral hospital in Northwest Ethiopia the factors reported to be strongly associated with hypertension among PLWH included; no physical exercise, older age and BMI greater than or equal to 25kg/m^2 (Gebrie, 2020). Malaza et al, also noted an association between widespread use of ART with obesity and hypertension at a population level (Malaza et al., 2012). Male gender and age above 40 years were significantly associated with HTN among PLWH (Dimala et al., 2016).

Non pharmacologic interventions offer complementary effect in lowering blood pressure. For instance, every one-kilogram weight loss has been shown to decrease blood pressure by 1mm Hg and adoption of a heart healthy diet such as Dietary Approaches to Stop Hypertension (DASH) diet for six months has been shown to decrease the systolic blood pressure by 11mm Hg (Cifu & Davis, 2017). In randomized trials, interventions that have

been shown to reduce systolic blood pressure by 5 to 10 mm Hg include; physical activity, potassium supplementation, weight loss for obese individuals and salt reduction (Cifu & Davis, 2017).

US centers for disease prevention and control as well as WHO have recommended five modules in the technical package to support governments manage cardiovascular disease which include; healthy lifestyle counselling, evidence-based treatment protocols, access to technology and essential medicines, team-based care and systems for monitoring (WHO, 2021). According to the American Heart Association, majority of fats recommended for good health are the monounsaturated or polyunsaturated fats in place of foods which contain trans fats or saturated fats (Eckel et al., 2013). Monounsaturated fatty acids are liquid at room temperature and have one double bond they include: canola oil, olive oil, peanut, sunflower and safflower, avocado oil, peanut butter, as well as most animal fats such as chicken, pork and beef. Polyunsaturated fatty acids are liquid at room temperature and usually have two or more double bonds examples include fish, soybean, flaxseed as well as liquid vegetable oil and corn oil. Saturated fatty acids have no double bonds and usually are solid at room temperature. The sources of saturated fatty acids include meat, dairy products as well as tropical oils including palm and coconut oils. *Trans* fatty acids are unsaturated fatty acids whereby sources include partially hydrogenated vegetable oils (Briggs et al., 2017).

Monounsaturated fatty acids trigger greater fat oxidation and thermogenesis induced by diet compared to saturated fatty acids (Krishnan et al., 2014). In a short-term trial whereby, five percent of energy from saturated fatty acids was substituted with polyunsaturated fatty acids the low density lipoprotein cholesterol (LDL-C) was reduced

was by 10mg/dl whereas the total cholesterol: high density lipoprotein (HDL-C) level was decreased by 0.16 (Mozaffarian et al., 2010).

In an analysis carried out between 1986 and 2000 showed that replacing five percent of energy from saturated fatty acids with polyunsaturated fatty acids was associated with a twenty five percent lowered risk of coronary heart disease (Li Y et al., 2015). Similarly, a prospective cohort studies carried out in America and Europe showed that replacing saturated fats with polyunsaturated fatty acids reduced coronary events including cardiovascular disease and coronary events (Jakobsen et al., 2009).

In addition, a meta-analysis of prospective cohort studies noted that replacing five percent saturated fatty acids with polyunsaturated fatty acids noted a reduction in coronary events risk by nine percent and coronary deaths by thirteen percent (Briggs et al., 2017). Evidence suggest that Mediterranean diet which is comprised of diets higher in fresh fruits, root and green vegetables, whole grains such as pasta, rice and bread, lean meat, fatty fish rich in omega 3 fatty acids and low fat dairy products, with an average of 32-35 percent total calories of moderate total fat, 9 to 10 percent of total calories of saturated fats and high fiber diet comprised of 27 to 37 grams per day and high in polyunsaturated fatty acids especially omega -3 diet reduced the blood pressure control by 6 to 7 mm Hg/ 2 to 3 mm Hg (Panagiotakos et al., 2006). In addition, strong evidence suggests that DASH diet which is high in vegetables, fruits, low in total fat, and cholesterol and also rich in magnesium, potassium and fiber lowered the blood pressure by 5 to 6 mm Hg/ 3 mmHg (Eckel et al., 2013).

Hypertension among Africans is characterized by low rennin levels. The use of diuretics and calcium channel blockers as the first choice of drugs is recommended due to the

blunted response of the rennin-angiotensin –aldosterone system (RAAS). Elevated systemic hypertension is documented to be more responsive to reduced salt intake than to medication that reduce pressure through inhibition of the pathways of RAAS (Cappuccio & Miller, 2016).

Studies have shown that lowering the systolic blood pressure to less than 120 mm Hg was associated with decreased cardiovascular events such as stroke, heart failure and heart attack by 25% compared to the 140 mm Hg target. This intense lowering of blood pressure is associated with decreased risk of death by 27%. However, it is also associated with many drug related side effects such as hypotension, electrolyte imbalance, syncope and acute kidney damage (Wright et al., 2015).

According to Rosan et al, the prevalence of hypertension among PLWH was higher than among the HIV negative participants, about 48 percent of the PLWH and 36 percent of the HIV negative individuals had hypertension (Rosan et al., 2016). Medina et al, also noted that hypertension was common among PLWH. However, there was no association between use of HAART and the presence of hypertension in the large cohort of PLWH (Medina-Torne et al., 2012). This was different from what was observed in USA whereby the incidence of hypertension did not vary significantly between PLWH and those that were HIV negative in the longitudinal study carried out between 1994 to 2011 (Myerson et al., 2014). Bergersen's study in Norway, found that PLWH who were not on HAART, had lower BMI and lower prevalence of high blood pressure than the general population. When HAART was administered, some patients gained weight, became insulin resistant, and also developed truncal obesity, dyslipidemia and hypertension (Bergersen, Sandvik, Dunlop, Birkeland, & Bruun, 2003). In this Norwegian cohort of PLWH on HAART, the

prevalence of hypertension was similar to that of age- and gender-matched HIV negative controls however, the prevalence of hypertension was higher among PLWH on HAART compared to HAART naive patients, however the difference was not statistically significant (Bergersen, et al, 2003).

Palacios study in Spain on the influence of HAART on blood pressure noted that blood pressure increased after forty-eight weeks on HAART leading to increased prevalence of hypertension, the study was a prospective study comprised of immunosuppressed men who were around forty years of age (Palacios et al., 2006). In addition, Dimala et al, in Cameroon also documented that being on HAART was significantly associated with having hypertension. The adjusted odds ratio of having hypertension among the HAART group compared to the HAART naive group was 2.2 (Dimala et al., 2016) however, there was no association between CD4 cell count level and blood pressure (Dimala et al., 2018). Dimala et al, noted that the prevalence of hypertension was significantly increased in the HAART group, compared to a HAART naïve group at 38% and 19% respectively (Dimala et al., 2016).

With the widespread availability of ARVs, PLWH are living longer (Godongwana et al., 2021). According to Johnson et al, in a study on life expectancy of South African adults starting HAART was associated with an increased life expectancy. In men the life expectancy was increased by 27 years if age 20 years and 10 years if age 60 years, while estimates for women were 36 years if age 20 years and 14 years if age 60 years. The life expectancy of a 20-year-old woman was 43 years if the baseline CD4 count was ≥ 200 cells/ μ l compared to 29 years if the baseline CD4 count was < 50 cells/ μ l (Johnson et al., 2013) this was similar to what was observed by Islam et al, whereby mortality and

morbidity associated with HIV were decreasing owing to the advancement of HIV care and treatment (Islam et al., 2012). PLWH are living longer and have fewer complications due to viral suppression on HAART, this has subsequently led to the rising burden of hypertension (Godongwana et al., 2021). PLWH had an increased risk of CVD with the relative risk of CVD being 61% higher among PLWH compared to the HIV uninfected people (Islam et al., 2012).

The prevalence of hypertension among PLWH in Ethiopia was 14% among them 20% were underweight and 17% were obese/overweight, two fifth of the participants had waist circumference above the recommended cut off value (Gebrie, 2020). In addition, a study in South Africa noted an increase in the prevalence of hypertension from twenty-one percent in 1998 to seventy-seven percent in 2008 (Ntuli et al., 2015). The increase was attributed to increased aging population, increase in psychosocial stressors, lifestyle changes and diet as well as rapid urbanization that led to negative implications such as health systems in developing countries focus on maternal and child health care and acute illness and the health systems for chronic diseases such as hypertension have low funding, poor infrastructure and inadequate infrastructure (Ntuli et al., 2015).

The prevalence of hypertension in Uganda was 14% among HIV negative adults and 11% among PLWH, 46% of PLWH had their blood pressure controlled (Kwarisiima et al., 2016). Another study in Uganda documented an overall prevalence of hypertension among PLWH of 24% with a rising prevalence by year from 16% in 2009 to 32% in 2013 (Kalyesubula et al., 2016). Increased risk of cardiovascular disease among PLWH is one of the several risk factors for non-AIDS related morbidity and mortality. This has been attributed to the introduction of highly active antiretroviral therapy (HAART) (Medina-

Torne et al., 2012). Bloomfield et al, also documented an increasing number of degenerative cardiovascular disease among PLWH in sub-Saharan Africa (Bloomfield et al., 2011).

Chepchirchir et al, study in Kenyatta National Hospital noted the prevalence of hypertension among PLWH as 23.2% (Chepchirchir et al., 2017). In a study in Western Kenya among PLWH the systolic blood pressure and diastolic blood pressure was within normal range 110 to 119 and 60 to 79 mm Hg respectively for 46% of women and 39% of men (Bloomfield et al., 2014). Hypertension and obesity were documented to be highly prevalent among PLWH in Western Kenya (Bloomfield et al., 2011).

2.3 Blood pressure control among HIV positive and HIV negative hypertensive patients.

Blood pressure control remains sub optimal in several studies, for instance; in a study on hypertension and dyslipidemia among PLWH in an outpatient clinic in New York City 43% of the patients had hypertension among them, 75% were on treatment and only 57% had controlled blood pressure. The study also noted that PLWH received poorer care than those without HIV for their coexisting conditions, the study aimed to fill the gap on the level of blood pressure control among the PLWH and HIV negative participants (Tripathi et al., 2015).

Study by Melaku et al, on blood pressure control among the PLWH and HIV negative patients noted the prevalence of uncontrolled blood pressure control was 60.2% among PLWH and 53% among the HIV negative hypertensive participants, the study used prospective cohort design (Melaku et al., 2020). This prevalence of uncontrolled blood

pressure was higher than what was observed in a meta-analysis and systematic review of 13 studies in Ethiopia which demonstrated a pooled prevalence of uncontrolled blood pressure of 48% among the hypertensive participants, other studies noted a 63% prevalence of uncontrolled blood pressure in 2016 and 59% in 2015 (Amare et al., 2020).

The study on awareness, control, prevention and determinants of hypertension among the primary care nurses in South Africa noted that the prevalence of hypertension was fifty-two percent. Forty-one percent of the participants were not aware of their hypertension status and among those aware only thirty-eight percent had their blood pressure controlled. The study recommended incorporation of effective health programs at the work place for the health care workers (Monakali et al., 2018).

In Kenya, more than half (56 percent) of Kenyan adults have not had their blood pressure measured, and only 22.3 percent of those diagnosed with hypertension are currently on medication (MOH, 2015).

A study in Nyeri Provincial General Hospital indicated that of the 452 hypertensive patients on follow up at the hospital only 33.4% had their blood pressure controlled within the recommended levels (Mutua et al., 2014). Whereas, in a study in a district hospital in Mombasa by Jenson et al, the level of control of blood pressure was 7.4% among hypertensive patients on treatment (Jenson et al., 2011).

According to Mohammed et al, the prevalence of uncontrolled hypertension among participants on medications for hypertension was slightly over fifty percent, the rate of uncontrolled hypertension was attributed use of counterfeit medications; it was estimated that close to fifty percent of medications in sub-Saharan Africa were counterfeit (Mohammed et al., 2018). The low levels of hypertension treatment noted in the study

(only one quarter of the participants were on treatment) was associated with high cost of treatment (Mohammed et al., 2018). In a similar study carried out in Namibia by Hendriks et al, having an insurance cover was associated with better control of hypertension (Hendricks et al., 2012). About twenty percent of Kenyans have medical insurance with NHIF comprising of eighty-five percent of them (Mbau et al., 2020).

Several studies have documented some of the causes of uncontrolled hypertension as physicians' inertia to optimize blood pressure treatment, non-adherence by patients to the clinic visits which is occasioned by lack of transport and unavailability of drugs (Melaku et al., 2020). Other studies have quoted affordable health care financing, reduction of the cost of medication and having routine place of care as factors which increase hypertension control and adherence (Maimaris et al., 2013). WHO through their Global action plan has committed to improve access to affordable essential medication of the non-communicable diseases by 2025 (WHO, 2013), however, Maimaris highlighted the need to evaluate other aspects of health care systems such as governance and service delivery in addition to financing in order to know best ways to effectively deal with the public health crisis posed by hypertension (Maimaris et al., 2013).

2.4 Adherence to anti-hypertensive medication among the HIV positive and the HIV negative hypertensive patients.

A number of factors have been associated with non-adherence to medications leading to poor control of hypertension (Byakika et al., 2019). These include: out of pocket expenses of patients, side effects of medications and poor patient provider relationship which include; lack of trust in the clinician providing care, not seeing the clinician as needed, patient being uncomfortable in asking questions and also patients' not being

involved in decision making (Van der Laan et al., 2017). Study by Temu et al, noted a limited understanding among people living with HIV (PLWH) of hypertension causes, treatment and prevention (Temu et al., 2017).

Monroes' study on HIV patients in Maryland, USA in 2013 found a strong motivation of adherence among those with HIV-related illness and physical manifestation of hypertension (Monroe et al., 2013).

In the study by Nguyen et al, on medication adherence among PLWH who had either hypertension or diabetes mellitus, it was found that physical manifestation of the illness was a motivation to adherence to the prescribed medications and that achieving blood pressure control was necessary in order to avoid complications. This study also stated that the adverse consequences of poor hypertension control included; limb amputation, chronic renal failure and heart attack (Nguyen et al., 2017). Monroe et al, noted that adherence to blood pressure medications was associated with good control of hypertension and factors that increased adherence to anti-hypertensive medications in the study included; patient understanding the health condition and the medications, social support and simple drug regimens which had fewer side effects (Monroe et al., 2013). In a study in the United States among participants aged between 35 and 64 years noted that about 50% of patients were adherent to their hypertension medication. Awareness of complications arising from hypertension was cited as the main reason for adherence to therapy (Nguyen et al., 2017). The females were more likely to be adherent to their medications than males with an odds ratio of 1.5. In addition, age was also significantly associated with an odds of 1.036 times (95% confidence interval: 1.002 to 1.072) (Nguyen et al., 2017). In Nigeria, Okwuonu et al, reported that only 23.4% of the

participants knew the consequences of poor blood pressure control while 68.7% had low adherence to medication. The reasons reported for poor adherence included forgetfulness, financial constraints, high pill burden, side effects of medication, and low measured blood pressure (Okwuonu, et al, 2014). A meta-analysis by Van der Laan et al, showed that interventions tailored towards patients' intake barriers such as use of generic medications to reduce cost, fixed dose combination of medications to minimize side effects as well as offering communication skills training to health care providers would minimize dissatisfaction with communication expressed by patients. In addition, involvement of patients in decision making, collaboration and trust would enhance patient provider relationship and consequently, enhance good adherence to medications (van der Laan et al., 2017). Okwuonu et al, also noted that good adherence was enhanced by patients' active participation in a therapeutic alliance established between the clinician and the patient (Okwuonu et al., 2014). In addition, Monroe's study on medication adherence noted that providers need to align the patients' beliefs on the causes, symptoms, control, and consequences of their illness with medical knowledge so as to allow patients to have a more productive self-management plan by developing an adaptive understanding of their illness (Monroe et al., 2013).

Nationally in Kenya the viral suppression rate among PLWH is 59%. This can be attributed to reinforced adherence to HAART (Maina et al., 2020). However, the control of hypertension has been shown to be less than 50% in several studies (Bowling et al., 2021). To guide action beyond 2020, USAID through PEPFAR has envisioned to achieve 95-95-95 target for control of HIV pandemic by 2030 by ensuring that 95 % of the population know their HIV status, 95% of PLWH sustain HAART and also 95% to

achieve suppression of viral load (USAID, 2018). Leventhal's Common Sense Mode of self-regulation notes that adherence is driven by patients' conceptualization of their illness and the clinician should take note that adherence isn't consistent across co-morbid conditions in an individual (Temu et al., 2017).

There are both direct and indirect methods to monitor adherence (Erdine & Arslan, 2013). Direct methods can be defined as assessment of treatment response or level of drug or its metabolite in blood, urine and body fluid (Erdine & Arslan, 2013). Directly observed methods usually are expensive, burdensome to the clinician and are also subject to distortion (Osterberg & Blaschke, 2005). Indirect methods require several instruments which include; questionnaires, devices, reports and monitors. Some of these methods are costly to undertake in a clinic set up and when dealing with many patients for example, electronic monitoring where equipment is used to establish the number of times the drug containers are opened by the patient within a given period (Osterberg & Blaschke, 2005). Adherence can be defined as taking at least 90 % of the prescribed drugs (Sawkin et al., 2015).

Validated instruments have been developed to estimate compliance to hypertension treatment through eliciting patients' reported compliance related activities for example Hill-Bone Compliance to High Blood Pressure (HBP) therapy Scale (Hill et al., 2000). The scale consists of 14 items each of which is graded to a four point Likert scale (Hill et al., 2000; Kimuyu, 2014).

Adherence has been defined as the ability of a patient to follow accurately the prescribed treatment, in research adherence has been defined as the ability of a patient to take successfully the prescribed doses of medications. A common metric to define adherence

is taking at least ninety percent of the prescribed doses of medications (Sawkin et al., 2015). In a study by Ameh et al, adherence to treatment was assessed subjectively based on the anti-hypertensive medications that were remaining from last clinic visit brought forward during the clinic visit and adherence was documented as good or poor during the patients' clinic record (Ameh et al., 2017).

2.5 Conceptual Framework

Good relationship between patients and physicians are among the health system related factors that affect the blood pressure control. Support from family, cost of the drugs as well as social groups are among the socio-economic related factors that affect blood pressure control (Borzucki. A M. Oliveria, S A.. A Berlowitz. D. R 2005).

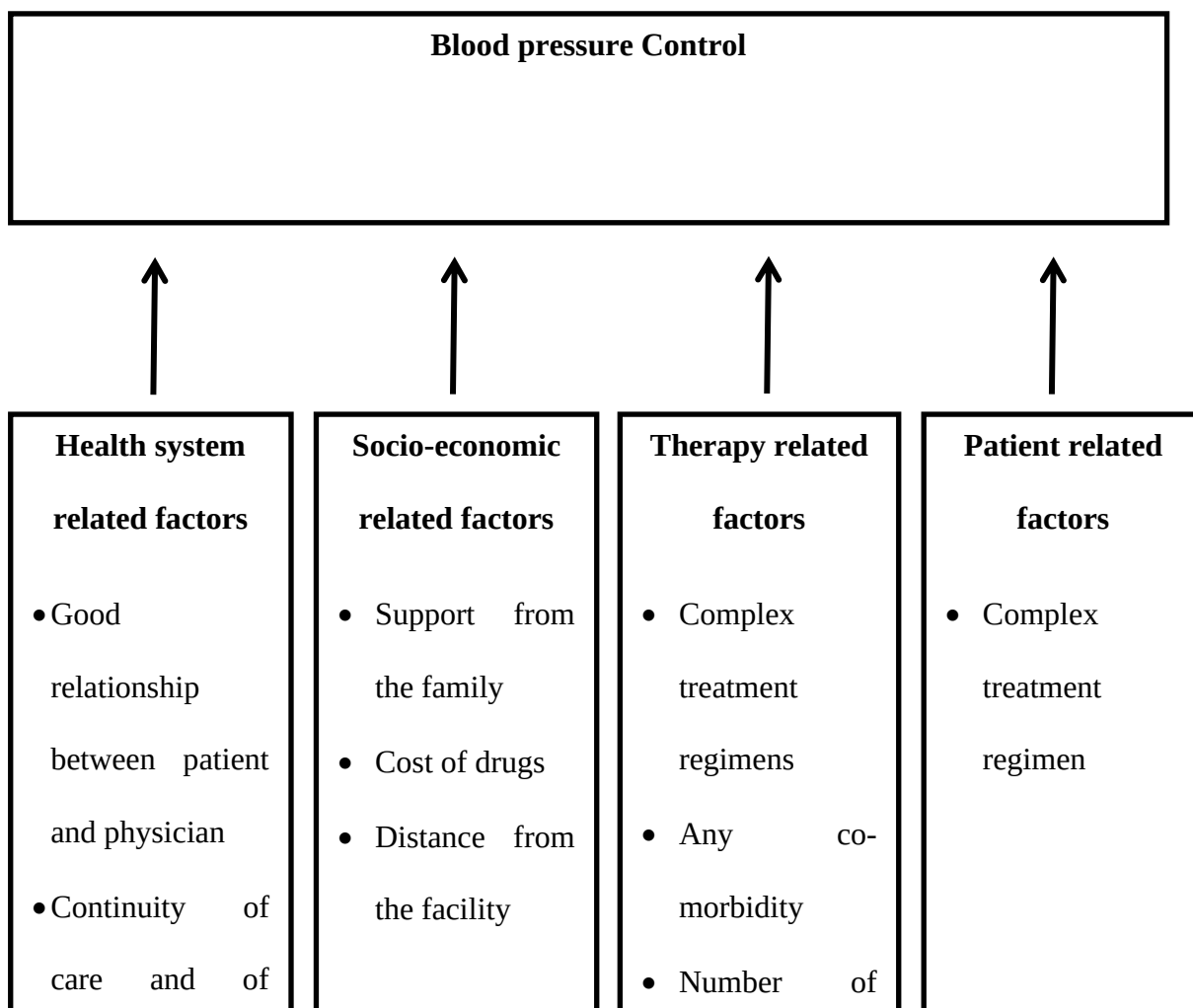


Figure 1: Conceptual Framework

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Site

Webuye County Hospital is a level IV health facility in Bungoma County in the Western region of Kenya with a catchment population of 98,494. Due to its strategic position, it serves both Bungoma County and the neighboring counties. The hospital has a bed capacity of 217 with approximately 150% bed occupancy throughout the year. On a daily basis, between 150-200 patients with diverse conditions are seen at the outpatient department. The hospital also runs an HIV clinic under AMPATH which provides comprehensive care for the HIV infected individuals.

3.2 Study Design

A cross sectional study design was used.

3.3 Study Population

The study population comprised known hypertensive patients on regular follow up for at least six months in the medical outpatient clinic. As at December 2016, there were 1628 hypertensive patients on regular follow up in the medical outpatient clinic at the WCH. Among them, around 150 were living with HIV and on HAART.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

- Those who had attended hypertension follow up clinic regularly for at least six months preceding the study as well as the HIV clinic and had been on HAART for more than six months.
- Eligible patients who consented for the study and signed the consent form.

- The participants who were 18 years and above.

3.4.2 Exclusion Criteria

- Those who were too ill and required admission.

3.4.3 Sample Size Determination

The study sought to find out if there was a significant difference in hypertension control among hypertensive patients who were HIV positive and those who were HIV negative. The sample size was estimated using sample size formula by Fleiss (Fleiss J.L, 1981). This formula is used in comparison studies where you have two proportions that you are comparing, in our study we were comparing the level of blood pressure control between the PLWH and HIV negative hypertensive patients. It has been used by Fleiss et al., in comparative cross sectional studies as well as case control studies (Fleiss J.L, 1981).

$$n \geq \frac{(1+r) \bar{p}(1-\bar{p})(Z_{\beta} + Z_{\frac{\alpha}{2}})^2}{r(p_1 - p_2)^2}$$

Where;

n = minimum sample size for one group

r = ratio (1:2)

$\bar{p}$ = pooled prevalence $(P_1+P_2)/2$, (P1 was 0.46, P2 was 0.267) $0.46 + 0.267 = 0.727/2 = 0.3635$

Z_{β} = critical value corresponding to 80% power (0.84)

$Z_{\frac{\alpha}{2}}$ = critical value corresponding to 0.05 type I error (1.96)

p_1 = prevalence of controlled blood pressure among HIV positive hypertensive patients

p_2 = prevalence of controlled blood pressure among HIV negative hypertensive patients

$$n \geq \frac{(1 + 2) 0.3635(1 - 0.3635)(0.84 + 1.96)^2}{2 (0.46 - 0.267)^2}$$

= 73 participants.

Using this formula, with an expected difference of 19.3% (46% Blood pressure control among HIV positive hypertensive patients (Kwarisiima et al., 2016) and 26.7% Blood pressure control among hypertensive patients who are HIV negative attending MOPC at Mulago hospital (Ssinabulya et al., 2016) the minimum sample size was 219 (73 hypertensive patients who are HIV positive and 146 HIV negative hypertensive patients).

3.4.4 Sampling Technique

Systematic random sampling was used to select the 73 files of the patients who were HIV positive and hypertensive which involved selecting every second file of these participants, there were about 150 patients who were both HIV positive and hypertensive in the clinic, by dividing 150 by 73 participants we got 2.05. The files were matched conveniently with the files of the HIV negative participants. The files were selected from the medical out-patient clinic. Matching of the HIV negative hypertensive patients was done according to age and gender, for every one HIV positive hypertensive patient two HIV negative hypertensive patients were selected (ratio 1: 2) which was similar to a study by (Melaku et al., 2020) this was to increase the power of the study and also to account for the confounders.

3.4.5 Instruments

Structured, interviewer-administered questionnaires were administered to the study participants who had consented to the study.

Quantitative data collected include: the patients' demographic information, level of education, socioeconomic status as well as lifestyle behaviors which included smoking, drinking and physical activity, direct method of checking two previous blood pressures was used (Erdine & Arslan, 2013) and data was extracted from patients' medical charts.

The questionnaire's objective one involved socio-demographic characteristics of the participants, it was adapted from the Kenya STEP wise survey for non-communicable diseases (NCD) (MOH, 2015) and modified to the study objectives. This tool was developed by the WHO stepwise management approach chronic disease risk factor surveillance (STEPS tool) (Riley et al., 2016).

Objective two of the questionnaire involved assessment of blood pressure control whereby blood pressure measurement was taken after a 15 minutes' rest while the participant was seated. Three blood pressure measurements were taken 3– 5 min apart. The average of the last two blood pressure readings was considered as the final reading for analysis. The blood pressure recordings at each visit was recorded and the prevalence of controlled blood pressure was determined by the average recent blood pressure recordings across the three previous months (Fedaku et al., 2021).

Blood pressure was considered controlled if the average of three recent blood pressure readings was less than 140/90 mm Hg.

Those with systolic blood pressure >140 mm Hg and or diastolic blood pressure >90 mmHg while on treatment were classified as having uncontrolled hypertension according to the JNC 7 report and the CDC definitions. The ascertainment of whether a client is truly a case was done based on the previous two or three blood pressure readings as recorded in the medical records.

Objective three involved assessment of adherence to blood pressure medications by way of self-report using a tool from the Ministry of Health encounter form as used by a study by Kuria (Kuria et al., 2018). Participants were asked how many medications they had missed in the last one month and seven days prior to the clinic visit. If no medication was missed the participant was declared adherent, if any of the doses of medication was missed, medication adherence rate was calculated by dividing the number of doses taken in the previous seven days by the total number of doses available, and medication adherence rate of greater than or equal to ninety percent was considered adherent whereas a participant with the medication adherent rate of less than ninety percent was declared non-adherent (Sawkin et al., 2015).

The study questionnaires were pretested before the study was carried out by administering the questionnaires to about 10 participants who were HIV positive and 20 participants who were HIV negative in a different hospital.

The tool was translated into Kiswahili and back into English with the help of '*Google Translate*' and thereafter being refined by the principal investigator.

3.5 Data Collection Procedures

Data was collected by the principal investigator assisted by three research assistants (clinical officers who are trained and certified by the principal investigator). Informed consent was obtained from eligible participants, then matching was done for age and gender. For every one hypertensive participant who was HIV positive two hypertensive patients who were HIV negative were enrolled in the study. Afterwards, the questionnaires were administered by the interviewer. Medical information including the

previous blood pressure was obtained from the patient file. Blood pressure measurement was taken after a 15 minutes' rest while the participant was seated. Three blood pressure measurements were taken 3– 5 min apart. The average of the last two blood pressure readings was considered as the final reading for analysis. Anthropometric measurements obtained directly during examination was entered into the structured questionnaire. The questionnaire was checked daily for completeness and filed.

The data was kept under lock and key by the principal investigator so as to limit unauthorized access.

3.6 Validity and Reliability

Reliability is the degree to which an assessment tool for instance the questionnaire produces stable and consistent results whereas validity refers to how well the test, in this case the questionnaire, accurately measures what it is purported to measure. These were achieved by pre-testing the questionnaire, and by training the research assistant.

3.6 Data Management and Analysis

3.6.1 Data management

Filled questionnaire were checked for errors and completeness before entry of data into access database. After all data had been entered into the database, the database was cleaned and checked for completeness and the data was exported to SPSS-IBM version 21 for analysis.

3.6.2 Data Analysis

For descriptive data numerical data was presented as mean $\pm$ SD (standard deviation), median with inter-quartile range (IQR), or number with percentage as appropriate. Chi-square and Fisher's exact test was used to check for association for the categorical

variables. Variables with statistical significance in the univariate analysis were included in bivariate regression analysis. The results are presented in form of tables. A p-value of <0.05 was considered statistically significant.

3.7 Study Limitations and Bias Minimization

The information on adherence to anti-hypertensive medication was obtained through self-report which is prone to recall bias. To minimize recall bias participants were asked questions that they were likely to remember within one week.

To minimize the social desirability bias participants were asked questions that had been validated.

3.9 Ethical Considerations

Ethical approval was provided by the Institutional Research and Ethics Committee (IREC) of Moi University. Permission to conduct the study at Webuye County Hospital was sought from the Medical Superintendent and the AMPATH program. Informed consent was sought from the patients. Participants' identity in the questionnaire was concealed and the data collected was kept under lock and key. The research document was double password protected.

CHAPTER FOUR

4.0 RESULTS.

4.1 Objective 1: Characteristics of the participants

Table 1: Socio demographic characteristics of the participants by HIV status

	Negative (N=146)	Positive (N=73)	Total (N=219)	p value
Age (yrs)				0.835 ¹
Count	146	73	219	
Median	56.000	55.000	55.000	
Q1,Q3	47.000, 64.000	47.000, 64.000	47.000, 64.000	
Gender				0.640 ²
Male	65 (44.5%)	34 (47.9%)	99 (45.6%)	
Female	81 (55.5%)	37 (52.1%)	118 (54.4%)	
Marital status				0.983 ³
Married	115 (78.8%)	57 (78.1%)	172 (78.5%)	
Single	7 (4.8%)	3 (4.1%)	10 (4.6%)	
Widow	21 (14.4%)	12 (16.4%)	33 (15.1%)	
Divorced/separated	3 (2.1%)	1 (1.4%)	4 (1.8%)	
Education level				0.550 ³
None	3 (2.1%)	0 (0.0%)	3 (1.4%)	
Primary	74 (50.7%)	35 (47.9%)	109 (49.8%)	
Secondary	45 (30.8%)	28 (38.4%)	73 (33.3%)	
Tertiary	24 (16.4%)	10 (13.7%)	34 (15.5%)	
Employment status				0.149 ²

Formal	26 (17.8%)	17 (23.3%)	43 (19.6%)	
Self-employed	89 (61.0%)	48 (65.8%)	137 (62.6%)	
None	31 (21.2%)	8 (11.0%)	39 (17.8%)	
Income (Ksh)				< 0.001 ¹
Count	146	73	219	
Median	15000.000	20000.000	15000.000	
Q1,Q3	5000.000, 21750.000	15000.000, 40000.000	6000.000, 25000.000	
Distance from home to hospital				0.320 ²
<5 km	56 (38.4%)	23 (31.5%)	79 (36.1%)	
>5 Km	90 (61.6%)	50 (68.5%)	140 (63.9%)	

1. Kruskal-Wallis rank sum test
2. Pearson's Chi-squared test
3. Fisher's Exact Test for Count Data

On average patients were aged 55 years and females were slightly more (52.1%) than the males. Majority of the participants were married (78.1%) and were self-employed (62.6%). Majority 63.9% of the participants were residing more than 5KM away from the facility. The HIV positive patients compared well with HIV negative patients in terms of socio-demographic characteristics like age, gender, marital status, education level, employment status, and distance to hospital ($p>0.05$). HIV positive patients had higher incomes which were statistically significant ($p<0.001$) than the HIV negative patients.

Table 2: Clinical Characteristics of the participants by HIV status

	Negative (N=146)	Positive (N=73)	Total (N=219)	p value
Family history of Hypertension				0.339 ¹
Yes	80 (54.8%)	35 (47.9%)	115 (52.5%)	
No	66 (45.2%)	38 (52.1%)	104 (47.5%)	
Ever hospitalized				0.244 ¹
Yes	28 (19.2%)	19 (26.0%)	47 (21.5%)	
No	118 (80.8%)	54 (74.0%)	172 (78.5%)	
Side effects				0.739 ¹
0	109 (74.7%)	56 (76.7%)	165 (75.3%)	
1	37 (25.3%)	17 (23.3%)	54 (24.7%)	
Comorbidities				0.523 ²
N-Miss	69	25	94	
Yes	2 (2.6%)	0 (0.0%)	2 (1.6%)	
No	75 (97.4%)	48 (100.0%)	123 (98.4%)	

1. Pearson's Chi-squared test
2. Fisher's Exact Test for Count Data

Majority (78.5%) of the participants had no history of hospitalization, more than half (54.8%) of the HIV negative participants had a family history of hypertension compared to 47.9% who had a family history of hypertension and were HIV positive and 75.3% of the participants did not report side effects related to the use of anti-hypertensive medications.

Table 3: Risk factors by HIV status

	Negative (N=146)	Positive (N=73)	Total (N=219)	p value
Smoking history				0.874 ¹
Yes	15 (10.3%)	7 (9.6%)	22 (10.0%)	
No	131 (89.7%)	66 (90.4%)	197 (90.0%)	
Alcohol history				0.091 ¹
Yes	47 (32.2%)	32 (43.8%)	79 (36.1%)	
No	99 (67.8%)	41 (56.2%)	140 (63.9%)	
Support				< 0.001 ²
Yes	146 (100.0%)	73 (100.0%)	219 (100.0%)	
Nutrition (the previous day)				0.191 ¹
Veges, Starch	125 (85.6%)	67 (91.8%)	192 (87.7%)	
Animal protein	21 (14.4%)	6 (8.2%)	27 (12.3%)	
Nutrition (last week)				0.498 ¹
Veges, Starch	87 (59.6%)	40 (54.8%)	127 (58.0%)	
Animal protein	59 (40.4%)	33 (45.2%)	92 (42.0%)	
Physical activity				0.147 ³
Extremely Inactive	3 (2.1%)	0 (0.0%)	3 (1.4%)	
Sedentary	57 (39.0%)	37 (50.7%)	94 (42.9%)	
Moderately active	22 (15.1%)	5 (6.8%)	27 (12.3%)	
Vigorous	64 (43.8%)	31 (42.5%)	95 (43.4%)	
Count	146	73	219	

BMI	Negative(N=146)	Positive(N=73)	Total(219)	0.468 ⁴
Median	23.842	23.389	23.661	
Q1,Q3	21.855, 26.851	21.708, 26.235	21.810, 26.584	
BMI in categories				0.323 ³
Normal	83 (56.8%)	48 (65.8%)	131 (59.8%)	
Obese	15 (10.3%)	3 (4.1%)	18 (8.2%)	
Overweight	46 (31.5%)	22 (30.1%)	68 (31.1%)	
Underweight	2 (1.4%)	0 (0.0%)	2 (0.9%)	
Waist Circumference				0.899 ⁴
Count	146	73	219	
Median in centimeters	91.000	92.000	91.000	
Q1,Q3	80.000, 95.000	82.000, 94.000	80.000, 95.000	
Hip Circumference				0.814 ⁴
Count	146	73	219	
Median in centimeters	107.500	107.000	107.000	
Q1,Q3	103.000, 115.000	104.000, 113.000	103.000, 115.000	

1. Pearson's Chi-squared test
2. Chi-squared test for given probabilities
3. Fisher's Exact Test for Count Data
4. Kruskal-Wallis rank sum test

More than half (59.8%) of the participants had a normal BMI, with 8.2% of the participants being obese, 31.1% of the participants were overweight. In addition, 31.5 % of the HIV positive participants were overweight compared to 30.1 % of the participants who were HIV negative. Less than half (43.4 %) of the participants had a vigorous

physical activity compared to 42.9 % of the participants who had a sedentary lifestyle. Only 10% of the participants had history of smoking cigarettes and 36% of the participants had history of alcohol intake. About 88% of the participants had a diet comprised of mainly starch and vegetables in the last one day, prior to interview whereas 58% of the participants had a diet comprised of mainly vegetables and starch in the last one week.

4.2 Objective 2: Blood pressure control among HIV positive and HIV negative hypertensive patients on follow up for hypertension at the medical out- patient clinic at Webuye County Hospital

A participant was considered to have controlled blood pressure if their blood pressure was below 140/90. Table 4 shows BP control by HIV status.

Table 4 Blood pressure control by HIV status

	Not controlled (N=171)	Controlled (N=46)	p value
HIV status			0.592
Negative	115 (79.9%)	29 (20.1%)	
Positive	56 (76.7%)	17 (23.3%)	

About 20.1% of the HIV negative participants had their blood pressure controlled compared to 23.3% of the HIV positive who had their blood pressure controlled. We observed that there was no statistically significant difference in proportion with controlled BP between HIV positive and HIV negative ($p>0.05$).

4.3 Objective 3: Adherence to anti-hypertensive medication among the HIV positive and the HIV negative hypertensive patients.

Overall 150 (68.8%) of the patients were adherent to medication. We compared the proportion by HIV status and observed there was no statistically significant difference in adherence between those who were HIV positive and those who were HIV negative. The results are shown in Table 5.

Table 5: Adherence by HIV status

	Not adherent (N=68)	Adherent (N=150)	p value
HIV status			0.887
Negative	46 (31.5%)	100 (68.5%)	
Positive	22 (30.6%)	50 (69.4%)	

Bivariate analysis

Table 6: Factors associated with BP control: Socio demographic

	HIV negative (N=171)	HIV positive (N=46)	p value
Age (yrs)			0.759 ¹
Count	171	46	
Median	56.000	54.500	
Q1,Q3	47.000, 64.000	47.250, 64.750	
Gender			0.661 ²

Male	78 (80.4%)	19 (19.6%)	
Female	92 (78.0%)	26 (22.0%)	
Marital status			0.689 ³
Married	135 (79.4%)	35 (20.6%)	
Single/Widowed/Divorced	36 (76.6%)	11 (23.4%)	
Education level			0.093 ³
1	93 (83.8%)	18 (16.2%)	
2	56 (76.7%)	17 (23.3%)	
3	22 (66.7%)	11 (33.3%)	
Employment status			0.205 ²
Formal	33 (78.6%)	9 (21.4%)	
Self-employed	112 (81.8%)	25 (18.2%)	
None	26 (68.4%)	12 (31.6%)	
Distance from home to hospital			0.142 ²
<5 km	58 (73.4%)	21 (26.6%)	
>5 Km	113 (81.9%)	25 (18.1%)	

1. Kruskal-Wallis rank sum test

2. Pearson's Chi-squared test

3. Fisher's Exact Test for Count Data

At bivariate level none of the socio-demographic characteristics such as age, marital status, employment status and distance to the hospital was significantly associated with blood pressure control. However, those who lived ≤ 5 km from the health facility had high

proportion (26.6%) of controlled blood pressure compared to those who lived >5 km (18.1%). Though not significant the proportion of those with controlled blood pressure increased with the increase in level of education.

Table 7: Factors associated with BP control: Clinical

	Not controlled (N=171)	Controlled (N=46)	p value
HIV status			0.592 ¹
Negative	115 (79.9%)	29 (20.1%)	
Positive	56 (76.7%)	17 (23.3%)	
Adherence to medication			0.213 ¹
No	57 (83.8%)	11 (16.2%)	
Yes	113 (76.4%)	35 (23.6%)	
Smoking history			0.360 ¹
Yes	19 (86.4%)	3 (13.6%)	
No	152 (77.9%)	43 (22.1%)	
Alcohol history			0.547 ¹
Yes	64 (81.0%)	15 (19.0%)	
No	107 (77.5%)	31 (22.5%)	
Support			0.716 ¹
Veges, Starch	149 (78.4%)	41 (21.6%)	
Animal protein	22 (81.5%)	5 (18.5%)	
Nutrition (yesterday)			0.064 ¹

Veges, Starch	93 (74.4%)	32 (25.6%)	
Animal protein	78 (84.8%)	14 (15.2%)	
Nutrition (last week)			0.761 ²
Extremely Inactive	3 (100.0%)	0 (0.0%)	
Sedentary	75 (80.6%)	18 (19.4%)	
Moderately active	22 (81.5%)	5 (18.5%)	
Vigorous	71 (75.5%)	23 (24.5%)	
Physical activity			0.297 ³
Count	171	46	
Median	23.671	23.200	
Q1,Q3	21.810, 26.719	21.745, 25.311	
BMI			0.361 ²
Normal	100 (76.3%)	31 (23.7%)	
Obese	13 (81.2%)	3 (18.8%)	
Overweight	57 (83.8%)	11 (16.2%)	
Underweight	1 (50.0%)	1 (50.0%)	
Waist Circumference			0.449 ³
Count	171	46	
Median in centimeters	91.000	91.000	
Q1,Q3	80.000, 94.500	84.000, 94.000	
Hip Circumference			0.485 ³
Count	171	46	
Median in centimeters	108.000	107.000	

Bp control			0.471 ¹
Yes	92 (80.7%)	22 (19.3%)	
No	79 (76.7%)	24 (23.3%)	
Family history of Hypertension			0.232 ¹
Yes	40 (85.1%)	7 (14.9%)	
No	131 (77.1%)	39 (22.9%)	
Ever hospitalized			0.211 ¹
0	126 (76.8%)	38 (23.2%)	
1	45 (84.9%)	8 (15.1%)	
Side effects			0.439 ²
Yes	1 (50.0%)	1 (50.0%)	
No	92 (75.4%)	30 (24.6%)	

1. Pearson's Chi-squared test

2. Fisher's Exact Test for Count Data

3. Kruskal-Wallis rank sum test

The proportion of those with BP control was slightly high (23%) among HIV positives compared to the HIV negatives patients (20%). Also the proportion of those with BP control was slightly high (24%) among those adherent to medication compared to non-adherent (16%).

CHAPTER FIVE

5.0 DISCUSSION

5.1 Socio-demographic and clinical characteristics of patients on follow-up for hypertension at Webuye County Hospital.

This study noted that having a higher level of education was associated with better control of hypertension (33.3%) though not statistically significant. Participants who lived closer to the facility had better control of the blood pressure (26.6%) compared to those living further (>5 km) the difference was however not statistically significant. Risk factors for hypertension include: history of hypertension in the family, cigarette smoking, alcohol consumption, inadequate exercise levels as well as having raised BMI and waist circumference (MOH, 2018). In our study 52.5 percent of the participants had a history of hypertension in the family this was close to 50.2 percent documented by Horsa in his study on blood pressure control and factors associated with control of blood pressure (Horsa et al., 2019). Perhaps the similarity could be explained by the similarity in the tools used in the study. 10% of the participants had history of smoking similar findings were observed by Achieng et al, in a study in Kenyatta national hospital who noted 11% of the participants had history of smoking (Achieng et al., 2009). The similarity could be attributed to similarity in the geographical region and also similarity in the study design used in the study. In addition, a study by Ntuli et al, noted that 13 percent of the participants had history of smoking (Ntuli et al., 2015) the similarity could be attributed to a similar study design that was used in the study and also the questionnaire used in the study was adapted from the WHO STEP wise questionnaire which was similar to the questionnaire used in our study. The results in our study noted low rate of smoking (10% of the participants). However, despite not engaging in smoking participants had a higher

proportion of hypertension. The results in our study showed that 36% of the participants had history of alcohol consumption, this was higher compared to a study by Melaku et al, who documented that 22.8% of the study participants had a history of alcohol consumption (Melaku et al., 2020) the difference could be attributed to the difference in the study design in that Melaku's study was a prospective study whereas our study was cross sectional in design, and was also higher than the 20 percent prevalence of alcohol intake observed in the South African study by Ntuli et al. (Ntuli et al., 2015). Normal BMI according to WHO is between 18.5 kg/m² and 24.5 kg/m² (MOH, 2018) and that overweight and obesity increase the risk of having hypertension, our study showed that about 40% of the participants had a BMI above the recommended levels. Similar findings were demonstrated by Auma et al, in a cross-sectional study whereby, 41% of the participants had BMI above the recommended levels (Auma et al., 2016).

One quarter of the participants had waist circumference greater than the recommended waist circumference which is a waist circumference of less than 88 cm for women and less than 102 cm for men (MOH, 2018). Hypertensive patients are advised to take a diet that has low dairy fat product, a lot of vegetables, soluble fibre and dietary fibre, proteins especially from plant source, whole grain and fresh fruits. In our study, 87% of the participants had taken a diet rich in vegetables and starch compared to the 58% of the participants who had taken vegetables and starch in the previous week (MOH, 2018).

Poor lifestyle behaviors which include smoking, obesity and alcohol intake have been cited as common causes of uncontrolled hypertension (Pender et al., 2019).

Hypertensive patients are also advised to have a 30 minutes' brisk walk for five days in a week (MOH, 2018), our study showed that 43% of the participants lived a sedentary lifestyle. No statistically significant association was found between lack of blood pressure

control and socio-demographic characteristics which was similar to a study on factors associated with lack of blood pressure in South America by (Portela et al., 2016).

In our study family support was associated with controlled blood pressure. Similar findings were documented by Ntuli et al, who noted that poor partner support including marital conflict was associated with increased blood pressure (Ntuli et al., 2015).

5.2 Blood pressure control among HIV positive and HIV negative hypertensive patients on follow up.

The blood pressure control in our study was 23% among PLWH and 20% among the HIV negative hypertensive participants. Blood pressure control remains sub optimal in several studies globally (Muntner et al., 2020; Amare et al., 2020). In our study sub-optimal blood pressure was observed and about 43% of the participants lived a sedentary lifestyle in addition, 53% of the participants had a family history of hypertension. WHO has recommended that adults aged between 18 and 64 years should carry out moderate intensity physical activity for about 150 minutes or perform vigorous physical activity daily throughout the week for about seventy five minutes which is equivalent to at least thirty minutes brisk walk for five days in a week (MOH, 2018) these measures have been put in place in order to guide Kenyans on the recommended physical activity however, our study noted that slightly more than half of the participants were adherent to the recommendation. Sub optimal blood pressure control could also be attributed to the high burden of treatment of hypertension, cost of care including; the cost of investigations, drugs and also health seeking behavior which could affect the control of hypertension.

Studies in the developed countries such as the USA have also noted sub optimal blood pressure control for instance (Muntner et al., 2020) in a cross-sectional study on the trends of hypertension control among adults in the USA showed that the proportion of blood pressure control increased from 32% in 2007-2008, to 54% in 2013-2014, and then decreased to 44% between 2017 and 2018. The higher prevalence rate of controlled blood pressure documented by Muntner et al, could be attributed to the difference in the geographical location with the USA being a high-income country and that majority of the participants (more than 60%) having a private insurance. In a meta-analysis and systematic review of 13 studies in the sub-Saharan Africa with about 5226 hypertensive participants by Amare et al, the prevalence of uncontrolled hypertension was 48% (Amare et al., 2020). A cross sectional study in South Africa by Pender et al, on the control of blood pressure and associated burden of treatment showed that blood pressure control between the initial visit and the third visit was 40 percent and 39 percent respectively this was higher than the percentages noted in our study, the difference could be explained by the population in which the study was carried out which was predominantly white however participants who were divorced had increased likelihood of having higher systolic blood pressure (Pender et al., 2019).

In a study in Ethiopia by Horsa et al, the prevalence of controlled blood pressure was 26.2% which was close to the prevalence that we found in our study which was 23% among the HIV positive hypertensive participants and 20% among the HIV negative hypertensive participants. Horsa's study was a cross sectional study carried out in Zewditu Memorial Hospital which used a study design similar to what we used (Horsa et al., 2019). In addition, a study in Uganda by Kwariisma et al, on hypertension

control in an integrated HIV and chronic diseases clinic whereby 34,704 adults were screened, participants with hypertension were linked to the integrated care clinic and were followed up for over three years. The study was a prospective study which compared blood pressure control between the HIV positive and HIV negative participants. Hypertension control increased from 15% at baseline visit to 48% and 46% at the follow up visit. Hypertension control at follow-up visit was higher among PLWH compared to the HIV negative participants at follow-up visit (48% and 46% respectively) (Kwariisma et al., 2019).

From this study hypertension control was low at baseline and improved significantly at the follow up visits the improvement in blood pressure control was achieved by integration of hypertension and HIV care services under the same roof in a one stop shop for patients and availability of health work force as well as improved infrastructure (Kwarisiima et al., 2019). These interventions can be leveraged in our clinic in order to improve blood pressure control. A modifiable systems factor whereby more frequent clinic visits occasioned by drug stock outs was identified as one of the barriers to hypertension control. In a retrospective cohort study in Uganda of all PLWH in three HIV clinics between 2014 and 2017 of the 1649 participants who were enrolled to the HIV clinic 98.5% were initiated on HIV medications, 90.3% of them had achieved control (viral suppression). Of the 28% of the participants who were screened for hypertension, 47% were diagnosed, only 24.3% achieved blood pressure control, their blood pressure control was almost similar to what we found in our study which was 23% control of blood pressure among PLWH, from the results in the study, management of hypertension did not negatively impact care of HIV as the control of

HIV approached global targets whereas hypertension control was sub optimal. Hypertension care cascade demonstrated quality gaps in the study which included; unavailability of blood pressure machines, failure to record the blood pressure reading and clinicians not prioritizing previous diagnosis (Muddu et al., 2019). This study had been carried out in Uganda which is close to Kenya and is similar to Kenya geographically.

In Uganda a study by Musinguzi et al, noted the prevalence of controlled blood pressure was 20 percent (Musinguzi et al., 2015) this was similar to our study this could be explained by similarity in the geographical region and the method used was cross sectional study which was similar to the method used in our study.

In Kenya hypertension which is one of the cardiovascular diseases is becoming a big public health concern. Non communicable diseases account for over 50% of inpatients and about 40% of hospital deaths in Kenya (MOH, 2019). In Nyeri Provincial hospital the blood pressure control among the hypertensive patients was 33.4% (Mutua et al., 2014) and at Kenyatta National hospital in 2009 the blood pressure control among hypertensive patients on follow up at the hospital was 26% (Acheing et al., 2009) these were slightly above the levels that were observed in our study. However, in a study on assessment of blood pressure control in a district of Mombasa by Jenson et al, showed that 46.5% of all the hypertensive participants were aware of their hypertension diagnosis, 31.3% of the participants were on anti-hypertensive medications and only 7.4% of the hypertensive persons had their blood pressure under control which was lower than what was observed in our study (Jenson et al., 2011). The low hypertension control rate can be attributed to the silent nature of hypertension and its impact to

cardiovascular disease, stroke, renal disease and morbidity. To achieve blood pressure control patients must be educated about hypertension, adherence to the pharmacological and non-pharmacological methods of managing hypertension and also be able to access the anti-hypertensive medications (Monroe et al., 2013). HIV programs have functional supply chains which ensure high stocks of medications as well as consistent funding to ensure the comprehensive care. In addition, the drugs are fixed dose combinations which are administered at particular time of the day which helps in enhancing adherence to medications.

Hypertension care is occasioned by numerous barriers which include: drug stock outs, multiple drug prescriptions, expensive drugs all of which lead to poor blood pressure control. Furthermore, the burden of treatment of hypertension incorporates the tasks an individual patient is required to carry out in order to achieve good outcomes in their disease management and effects their well-being and functionality. HIV programs also have non physician health workers who foster linkage between the patients and the health facility who can also contact patients for follow up through mobile phones which has enhanced adherence to HAART medications. These aspects can be leveraged for care for hypertensive patients (Vedanthan et al., 2017). Our study aimed to fill the gap by studying the blood pressure control among the PLWH and HIV negative participants. In our study we found low rate of blood pressure control at 23% among PLWH and 20% among the HIV negative participants. This study underscores the need for further studies to establish the cause of poor blood pressure control among hypertensive patients. Initiatives to implement blood pressure control strategies which include health education in a language that they understand, accessibility of the health care providers, minimal

follow up of patients in that continuity of follow up is not well established, limited understanding of the treatment goals, inadequate understanding of patient self-care and self-monitoring are advised in order to increase blood pressure control in developing countries (Seedat Y.K, 2012). According to Pereira et al, many factors have been associated with poor blood pressure control which include physician inertia to optimize care, unavailability of drugs, non-adherence to medications and deficiencies in the health care system (Pereira et al., 2016). Ameh et al, noted that integrated chronic disease management model had a significant increase in controlling patients' blood pressure among the HIV positive and hypertensive participants this was attributed to the reduced HIV stigma in the integrated care as reported by the qualitative sub-study (Ameh et al., 2017). Strengthening of health systems with the incorporation of integrated chronic disease management model is necessary to achieve optimal health outcomes in Kenya. Interventions in health systems should focus on structural and social components of building blocks in the health systems. In addition, people centered models which target hypertensive individuals could increase awareness on the complications of poor compliance with medications and better self-management by the patients (Ameh et al., 2017).

5.3 The difference in blood pressure control between HIV positive and HIV negative hypertensive patients.

The blood pressure control in our study was 23% among PLWH and 20% among the HIV negative hypertensive participants. Blood pressure control remains sub optimal in several studies globally (Muntner et al., 2020; Amare et al., 2020). The study by Jackson et al, noted the prevalence of hypertension among PLWH was 25.2% and the control of blood

pressure was 24.4% in Nigeria the study was hospital based carried out in Uyo teaching hospital (Jackson et al., 2022). The similarity in the blood pressure control could be attributed to similarity in the study design. Similarly a study carried out in Uganda showed that blood pressure control was 24.3 percent among PLWH, The similarity could be attributed to similarity in geographical region (Muddu et al., 2019).

Poor BP control, both in HIV-infected and in the general uninfected population, can be due to a variety of causes including poor adherence on the part of the patient (which may be due to a myriad of reasons), costs of medication, clinical inertia, poor patient-provider communication, interactions of antihypertensive medications with food, herbs or other drugs, and even psychological factors. Nevertheless, efforts to manage hypertension adequately in people infected with HIV should be intensified to reduce the risk of cardiovascular disease, which is increasingly associated with mortality in this population (Jackson et al., 2022).

Hypertension seems to be common in PLWH probably due to traditional risk factors and HIV-related factors. However, its control in this population remains suboptimal. There is a need for collaborative healthcare professional team work to assess and address possible factors responsible for suboptimal hypertension control in hypertensive PLWH.

Studies on blood pressure control among PLWH note sub optimal blood pressure control which is similar to the blood pressure control among HIV negative participants. This could be because the adherence messages offered during clinical follow up visits for HIV care could also influence compliance to the hypertension medications. However, hypertension control remains sub optimal due to the various risk factors for hypertension. Hypertension frequently coexists with obesity, hyperlipidemia, or other metabolic

syndrome; the identification and management of these risk factors is an important part of the overall management of hypertensive patients.

5.4 Adherence to anti-hypertensive medication among the HIV positive and the HIV negative hypertensive patients on follow up

Among HIV negative patients 68.5% were adherent to their anti-hypertensive medications compared to 69.4% of the HIV positive patients who were adherent to their anti-hypertensive medications. Grigoryan et al, noted that adherence to anti-hypertensive medications was 77% among the American population. Adherence to anti-hypertensive medications in developed countries is higher than in the developing countries this could be due to the efficient and effective health care systems which enables universal health care to all the citizens (Grigoryan et al., 2013). In a cross-sectional study on prevalence and factors associated with adherence to anti-hypertensive medications among adults in an Asian community noted that 45% of the participants had poor adherence to anti-hypertensive medications (Kang et al., 2020) this was lower than the level of adherence levels observed in our study. The possible explanation for the difference in adherence levels could be due to difference in the geographical region and also difference in the method used for assessing adherence. The study by Kang et al, was carried out in a primary care clinic in Singapore and used indirect method of assessing adherence (medication adherence report scale MARS 5) which had a Cronbach's alpha score of 0.73 and 0.78 in two different studies which indicated good internal reliability the difference in the adherence levels would be explained by the difference in geographical location (Kang et al., 2020).

In sub-Saharan Africa, study in Ethiopia by Mekonnen et al, showed that adherence to anti-hypertensive medications was 67.2 % which was similar to the adherence levels we got in our study however assessment of adherence was by Morisky adherence scale whereby a score of ≥ 6 was adherent and ≤ 6 was non adherence (Mekonnen et al., 2017). In our study we used self-reports from the ministry of Health encounter forms on adherence. In addition, a study in Namibia by Nashilongo et al, on assessment of adherence to blood pressure medications in primary health care showed that the mean adherence level was $76.7 \pm 8.1\%$ this study compared well with our study which had almost similar levels of adherence. Nashilongos' study was a cross sectional study and used the Hill-Bone Compliance to high blood pressure therapy scale. The study also noted no association between adherence and any comorbidities such as HIV/AIDS which was an interesting finding, especially because concomitant HIV/AIDs appreciably increases pill burden, which is known to adversely affect adherence rates, on the contrary there is also enhanced adherence counselling during HIV management which may play a role also in the adherence to the anti-hypertensive medications (Nashilongo et al., 2017).

In a study in Kenya by Kuria et al, on compliance to clinic visits and adherence to blood pressure medications showed that self-reported adherence to anti-hypertensive medications for those who complied with follow-up clinic visits as scheduled were 94%, this was higher than what was found in our study. The study by Kuria et al, was a retrospective study and was carried out in the community setting in Nairobi whereas our study was hospital based, this could explain the difference in the adherence levels that we observed (Kuria et al., 2018).

The method used in this study was self-report which was similar to what we used in our study. Our study found adherence levels to be 69.5% among PLWH and 68.5% among the HIV negative participants, whereas the study by Kimuyu et al, noted similar adherence levels to our study as 62.4 percent of the participants were adherent to their blood pressure medications, Morisky adherence scale was used to determine adherence in this study (Kimuyu et al., 2014). Perhaps the similarity might be due to similarity in the study design and also similarity in the geographical region.

According to Pender et al, in South Africa efforts to address non adherence should include robust doctor and patient relationship which respond to the patients' non-adherence to treatment on a case-by-case basis and should be sensitive to the non- verbal cues, motivate patient towards a desired outcome, be cognizant of the patients' cognitive capacity, assess individuals understanding of the issues raised and develop a reminder system (Pender et al., 2019). In our study reduced patient adherence to prescribed medications as well as adherence to lifestyle changes may be key in enhancing blood pressure control in our setting. Other factors highlighted by Pender et al., include medication related factors as a result of health care fragmentation which involve multiple complex medication regimens, poor communication among health care providers and the patients, patients' cognitive limitation, behavior and socio-economic status of patients which make patients take medications wrongly or forget to take medications altogether (Pender et al., 2019). Suboptimal adherence to antihypertensive treatment (defined as taking less than 80 percent of the prescribed medications, less than 80 percent of the time) is associated with poor control of blood pressure and increased risk for cardiovascular events. Therefore, frequent evaluation of compliance is essential in all hypertensive

patients. Simplifying treatment regimens, using fixed-dose combinations and long-acting agents improves adherence, facilitates achievement of treatment targets and reduces cardiovascular morbidity and healthcare expenditures. In addition, physicians should be educated to implement changes in hypertensive patients, particularly those who require multiple antihypertensive agents to achieve blood pressure control (Stelina et al., 2018).

Strength and weaknesses of the study.

Strength of the study:

The study being a quantitative study the findings can be generalized in the hospital setting (the sample is representative of the hospital setting).

Weakness of the study:

- It is difficult to understand the context of the phenomenon in that we could not ascertain the cause of the poorly controlled blood pressure.
- There could have been an absence of strong correlation between the adherence levels and blood pressure control this could be because blood pressure control can be found in both adherent and non-adherent patients for instance if there blood pressure is not adequately controlled.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The proportion of those with blood pressure control was slightly high (23%) among HIV positives compared to the HIV negatives patients (20 %) this difference was however not statistically significant.

Adherence to anti-hypertensive medications was almost similar between PLWH at 69.4% compared to 68.5% among the HIV negative participants.

6.2 Recommendation

Blood pressure control is key in averting morbidity and mortality associated with Hypertension.

- Follow up prospective study to assess the blood pressure control and adherence levels as well as factors associated with blood pressure control.

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APPENDICES

APPENDIX I: CONSENT FORM

COMPARING BLOOD PRESSURE CONTROL AMONG HIV POSITIVE AND HIV NEGATIVE HYPERTENSIVE PATIENTS ATTENDING WEBUYE COUNTY HOSPITAL.

You are being asked to take part in a research study to compare blood pressure control among HIV positive and HIV negative hypertensive patients on regular MOPC clinic attending Webuye county hospital. Please read this form carefully (or it may be read to you) and ask any questions you may have before agreeing to take part in the study among HIV positive and HIV negative hypertensive patients on regular MOPC clinic attending Webuye county hospital.

What we will ask you to do: If you agree to be in this study, we will conduct an interview with you. The interview will include questions about your age; level of education; the interview will take about 10 minutes to complete.

Risks and benefits: we hope to learn more about the factors associated with optimal blood pressure control among HIV infected and non- HIV infected patients at Webuye Hospital. This will inform the practice here so that the quality of services you get can be improved.

Compensation: There will be no compensation or cash benefits for participating in this study.

Your answers will be confidential. The records of this study will be kept private. In any sort of report we make public we will not include any information that will make it possible to identify you. Research records will be kept in a locked file; only the researchers will have access to the records.

Taking part is voluntary: Taking part in this study is completely voluntary. You may skip any questions that you do not want to answer. If you decide not to take part or to skip some of the questions, it will not affect your current or future relationship with Webuye Hospital. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researcher conducting this study is Dr Evelyn Kawira Majau. Please ask any questions you have now. If you have questions later, you may contact Dr. Evelyn Kawira at evelynkawir@yahoo.com or at 0710387027. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review and Ethics Committee (IREC) of Moi University at *IREC, Moi Teaching & Referral Hospital building, 2nd floor. Door No. 219, P.O. Box 3-30100, Eldoret, Kenya. Office line: 0787723677. Email: irec@mtrh.or.ke. Website: irec.or.ke*. You may also report your concerns or complaints anonymously through the above contacts for IREC. You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, or it has been read to me, and has received answers to any questions I asked. I consent voluntarily to participate as a participant in this research.

Your _____ Name _____ (printed)

Your Signature _____

Date _____

If illiterate

n.b: A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb-print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness _____ AND Thumb print of participant

Signature of witness _____

Date _____

Printed name of person obtaining consent _____

Date _____

This consent form will be kept by the researcher for at least three years beyond the end of the study.

APPENDIX II: INTERVIEW QUESTIONNAIRE

SECTION A :

Respondent's Questionnaire

Questionnaire ID No _____ Name of interviewer _____
 Participant's socio-demographic characteristics

What is your age in years?

 Gender Male ☐ Female ☐

Marital status

Married ☐ Single ☐ Widow ☐
 Separated/divorced ☐

Level of education

No formal education ☐ Primary education ☐ Secondary education ☐
 Tertiary education ☐

Patient's socio-economic factors:

Employment status

Formally employed ☐ Self-employed ☐ Not employed ☐

Estimated total monthly income (Ksh)?

Distance from your home to the hospital?

Less than 5 Km ☐ More than 5 Km ☐

Year of diagnosis of hypertension?

Family history of hypertension?

Yes ☐ No ☐

If yes, please specify who has hypertension?

Have you been hospitalized due to complications from hypertension in the last one year?

Yes ☐ No ☐

If yes, what were the complications?

.....

Side effects due to anti- hypertensive medications?

Yes ☐ No ☐

If yes, please state the side effects

Have you been tested for HIV?

No ☐ Yes ☐ Unknown / never tested ☐

If yes which year was the diagnosis made?

Do you have any other comorbid condition like diabetes, chronic kidney disease, thyroid disease?

Yes ☐ No ☐

If yes which comorbid disease/diseases

Have you ever smoked?

Yes ☐ No ☐

If yes, how many sticks per day?

.....

Have you ever taken alcohol?

Yes ☐ No ☐

If yes how much alcohol do you take?

Type of drink	Amount in mls	Duration in years
Sachets	No. of 25 ml sachet per week _____	
Beer bottles	Average no. of 500 mls bottles per week _____	
Local brew	Average no. of cups per week _____	

Do you have someone living with you to provide you with support?

Yes ☐ No ☐

List of food eaten yesterday

- Morning
- Afternoon
- Evening

0. Mainly vegetable and starch
1. Mainly animal protein
2. Other specify

Table of food eaten last week

Food type	How many days eaten last week	If not eaten. Do you sometimes eat it.
------------------	--------------------------------------	---

Yes = y, No =N

Green vegetables

Root vegetables

Cereals

Eggs

Meat

Fish

Pulses

White bread

Brown bread

Milk

Other foods- specify

Code 0. = mainly vegetables and non-refined starches

1. =mainly animal protein and fat diet

2. = other --- specify

Level of activity (Standardized scale) (PAL guideline)

CODE	LIFESTYLE	EXAMPLE	PAL²	Tick
0.	Extremely inactive	Cerebral palsy, stroke	<1.40	
1.	Sedentary	Office worker getting little or no exercise	1.40 – 1.60	
2.	Moderately active	Construction worker or person running	1.70 – 1.99	

		one hour daily	
3.	Vigorously active	Agricultural worker (non-mechanized) or person swimming two hours daily	2.00 – 2.40
4.	Extremely active	Very active sports person, competitive cyclist	>2.40

Waist circumference: (adapted from the WHO cutoff)

0.	Normal	<94 cm in males and < 80 cm in women
1.	Increased	>94 cm <102 cm in males and >80 cm < 88 cm in women
2.	Substantially increased	>102 cm males and > 88 cm in women

Body mass index?

Code the following e.g BMI (adapted from WHO 2000)

0.	<18.50	Underweight
1.	18.5-24.99	Normal range
2.	25-29.9	Overweight (pre-obesity)
3.	30 -34.99	Obese class 1
4.	35.00- 39.99	Obese class 11
5.	≥ 40.00	Obese class 111

Waist hip ratio:

1.	Substantially increased	≥0.90 in males and ≥0.85 in women
----	-------------------------	-----------------------------------

SECTION B:**Data extracted from the patient's file:****Two previous blood pressure records?**

Current blood pressure recording?

Average blood pressure reading -----**Anti-hypertensive drugs**

Drug	Class	Please tick	Duration of the drugs taken
	Adalat		
	Enalapril		
	Hctz		
	Losartan		
	Amlodipine		
	Metoprolol		
	Carvedilol		
	Lisinopril		
	Felodipine		
	Any other please specify		

Last CD4 count?

Viral load?

Which anti-hypertensive medications are you currently on?

SECTION C:**Medication and adherence:** adapted from HTN return encounter form.MOHWere all medicines taken as prescribed in the last one month? ☐ Yes ☐ No, specify below:

Name of the drug	Dosage	Were all medicines taken as prescribed in the last week	Reason
Adalat		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Enalapril		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Hydrochlorothiazide		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Losartan		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Amlodipine		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Metoprolol		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Carvedilol		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Lisinopril		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Lisinopril/HCTZ		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other
Felodipine		☐ None ☐ Few ☐ Most ☐ All	☐ Ran out of medications ☐ Forgot ☐ Side effects ☐ Don't like ☐ Other

APPENDIX III: FOMU YA IDHINI

Kulinganisha udhibiti wa shinikizo la damu kati ya wasioambukizwa na walioambukizwa virusi vya ukimwi katika hospitali ya webuye.

Ninachukua wakati huu kukusihi kushiriki katika utafiti wa kulinganisha udhibiti bora wa shinikizo la damu kati ya wagonjwa wanaoishi na virusi vya Ukimwi na wasioishi na virusi vya Ukimwi. Tafadhali soma fomu hii kwa makini (ama utasomewa) na uulize maswali yoyote unaweza kuwa nayo kabla ya kukubali kushiriki katika hii utafiti.

Lengo la utafiti: Lengo la utafiti huu ni kulinganisha udhibiti wa shinikizo la damu kati ya wasioambukizwa na walioambukizwa virusi vya ukimwi katika hospitali ya webuye.

Chenye tutakuuliza ufanye: Nitakuhoji ukikubali kushiriki kwa utafiti huu. Katika mahojiano utauulizwa maswali kuhusu umri wako; kiwango cha elimu; Mahojiano itachukua muda wa dakika 10 kukamilisha.

Hatari na faida: Tunatarajia kujifunza mengi kuhusu mambo yanayohusiana na udhibiti wa shinikizo la damu mojawapo miongoni mwa yasiyo na aliyeambukizwa virusi vya ukimwi kuambukizwa wagonjwa katika hospitali ya Webuye. Hii itasaidia kuboresha huduma ambayo itapatianwa katika hospitali hii.

Fidia: Hakutakuwa na aina yoyote ya fidia ukushiriki katika utafiti huu.

Majibu yako yatakuwa siri: Rekodi ya utafiti huu yatawekwa siri. Katika aina yoyote ya ripoti hii yenye itachapishwa ama kuwekwa wazi kwa umma, hakutakuwa na taarifa yoyote yenye itawezesha utambuliwe. Rekodi ya utafiti huu pia itawekwa katika faili iliyofungwa; watafiti peke yao ndio watakuwa na uwezo wa kupata ama kurejelea hizo kumbukumbu.

Kushiriki ni kwa hiari: Kushiriki katika utafiti huu ni kwa hiari kabisa. Unaweza ruka maswali yoyote ambayo hutaki kujibu. Ukiamua kushiriki ama kuruka baadhi ya maswali, haitaathiri uhusiano wako wa sasa au wa baadaye na hospitali ya Umma ya Webuye. Ukiamua kushiriki kwa hii utafiti uko huru kujiondoa wakati wowote.

Ukiwa na maswali: Mtafiti mwenye atasimamia utafiti huu ni Dr. Evelyn Kawira Majau. Unaweza uliza maswali yoyote unayo sasa. Kama una maswali yoyote baadaye, unaweza wasiliana na Dr. Evelyn Kawira Majau kwa anwani ya barua pepe ya 'evelynkawir@yahoo.com' au kwa nambari ya simu 0710387027. Ukiwa na maswali yoyote au wasiwasi kuhusu haki zako kama mshiriki katika utafiti huu, unaweza wasiliana na Kamati ya Tathmini na Maadili ya Taasisi (Institutional Review and Ethics Committee-IREC) ya Chuo Kikuu cha Moi katika: 'IREC, Jengo la Moi Teaching & Referral Hospital, sakafu ya pili, Mlango Namba 219, S.L.P 3-30100, Eldoret, Kenya. Nambari ya Ofisi: 0787723677. Email: ired@mtrh.or.ke. Website: ired.or.ke.' Unaweza pia ripoti matatizo au malalamiko yako kwa fiche au bila kujitambulisha kwa majina

ukitumia njia hizi za mawasiliano ya IREC. Utapewa nakala ya fomu hii kuweka kwa ajili ya kumbukumbu yako.

Maelezo ya Makubaliano: Nimesoma au nimesomewa habari iliyoko hapo juu, na nimepokea majibu ya maswali yoyote niliuliza. Nakiri ya kwamba ni kwa hiari yangu nashiriki katika utafiti huu.

Jina _____ lako
(kuchapishwa)_____

Signature yako_____

Tarehe _____

Kama mshiriki hajui kusoma na kuandika

Shahidi anayejua kusoma na kuandika lazima atie saini (kama inawezekana, mtu huyu anafaa kuchaguliwa na mshiriki na hapaswi kuwa na uhusiano na timu ya utafiti). Washiriki ambao hawajui kusoma na kuandika wanafaa watie alama ya kidole gumba pia.

Nimeshuhudia mshiriki akisomewa kwa uangalifu fomu ya idhini, na amekuwa na nafasi ya kuuliza maswali. Nathibitisha ya kwamba ametoa kibali kwa hiari.

Jina la Shahidi _____ NA _____ alama ya kidole gumba ya mshiriki

Saini ya shahidi _____

Tarehe _____

Jina la anayepata kibali _____

Tarehe _____

Fomu hii ya idhini/ ridhaa itawekwa na mtafiti kwa angalau miaka mitatu zaidi baada ya kukamilishwa kwa utafiti.

APPENDIX IV: DODOSO LA MAHOJIANO

SEHEMU A:

Nambari ya Kitambulisho cha Maswali

Jina la anayehoji

Hali ya mhojiwa kijamii na kidemografia

Una umri gani kwa miaka?

Hali yako ya ndoa ni gani?

Umeolewa ☐ Hujaolewa ☐ Mjane ☐

Talaka ☐

Uko na kiwango gani cha elimu?

Hakuna elimu rasmi ☐ Elimu ya msingi ☐

Elimu ya sekondari ☐ Elimu ya juu ☐

Hali ya mgonjwa kijamii na kiuchumi

Hali yako ya ajira ni gani?

Una ajira rasmi ☐ Umejiriwa ☐ Hauna kazi ☐

Pato lako la kila mwezi ni lipi (Ksh)?

Umbali wa hospitali kutoka kwa nyumba yako ni upi?

Chini ya 5 Km ☐ Zaidi ya 5 Km ☐

Ni mwaka gani ambao ulipatikana na ugonjwa wa shinikizo la damu?

.....

Je! Katika familia yako kuna historia ya ugonjwa wa shinikizo la damu?

☐

Ndio

☐

La

Ikiwa ndio, tafadhali taja?

.....

Je! Umelazwa hospitali kutokana na matatizo ya shinikizo la damu katika mwaka mmoja uliopita?

☐

Ndio

☐

La

Ikiwa ndio, ni matatizo gani?

.....

Je! Unapata madhara yoyote kwa kutumia madawa ya shinikizo la damu?

☐

Ndio

☐

La

Ikiwa ndio, tafadhali taja?

.....

Je! Umewahi pimwa virusi vya ukimwi?

☐

Ndio

☐

La

☐

Hujui

Ikiwa ndio, ugonjwa ulipatikana mwaka gani?

.....

Ikiwa ndio, je, uko kwenye HAART?

☐

Ndio

☐

La

Je, kando na ugonjwa wa shinikizo la damu ukona ugonjwa ingine kama vile ugonjwa wa figo, ugonjwa wa sukari au ugonjwa wa tezi?

☐ Ndio ☐ La

Ikiwa ndio ni ugonjwa gani?

Je, umewahi kuvuta sigara?

☐ Ndio ☐ La

Ikiwa ndio, ni vijiti ngapi kwa siku?

.....

Je, kwa wakati huu unakunywa pombe?

☐ Ndio ☐ La

Ikiwa ndio, ni chupa ngapi au vikombe ngapi vya pombe kwa wiki?

Aina ya pombe	Kiasi kwa mls	Muda wa kunywa pombe kwa miaka
Sacheti	Idadi ya sachet za 25 mls kwa wiki _____	
Chupa za pombe	Idadi ya chupa za pombe za 500mls _____	
Pombe ya kienyezi	Idadi ya vikombe vya pombe kwa wiki _____	

Je, unaishi na yeyote anayekusaidia na kazi zako?

☐ Ndio ☐ La

Matumizi ya mboga?

5 au zaidi kwa wiki ☐ Chini ya tano kwa wiki ☐

Matumizi ya Matunda?

5 au zaidi kwa wiki ☐ Chini ya tano kwa wiki ☐

Orodha ya vyakula ulivyokula jana

- **Asubuhi**
- **Saa sita**
- **Jioni**

0.	Mboga na starch	
1.	Protini	
2.	Zingine	

Orodha ya vyakula ulivyovikula wiki lililopita

Aina ya vyakula	Siku ngapi ambazo ulivikula	Kama hujavikula ni mara ngapi unavikula? Ndio= N, La =L	
Green vegetables			
Root vegetables			
Cereals			

Mayai			
Nyama			
Samaki			
Pulses			
White bread			
Brown bread			
Maziwa			
Zinginezo			

0. = Mboga na non-refined starches

1. = protini

2. = Zingine

Kiwango cha shughuli (Kiwango cha usawa)

CODE	LIFESTYLE	EXAMPLE	PAL²	Tick
0.	Asiyefanya kazi	Upoovu wa ubongo	<1.40	
1.	Kufanya kazi kidogo	Anayefanya kazi kidogo ama asiyefanya kazi	1.40 – 1.60	
2.	Kufanya kazi	Kufanya kazi kwa mjengo au	1.70 – 1.99	

	kiasi	kukimbia saa moja kwa siku		
3.	Kufanya kazi mingi	Kufanya kazi kwa shamba	2.00 – 2.40	
4.	Kufanya kazi mingi sana	Kufanya kazi kwa michezo sana	>2.40	

Mzunguko wa kiuno: (iliyochukuliwa kutoka WHO)

0.	Kawaida	<94 cm kwa wanaume < 80 cm kwa wanawake	
1.	Ilongezeka	>94 cm<102 cm kwa wanaume and >80 cm < 88 cm kwa wanawake	
2.	Ilongezeka kwa kiasi kikubwa	>102 cm kwa wanaume and > 88 cm kwa wanawake	

42. Body mass index? (Iliyochukuliwa kutoka WHO 2000)

0.	<18.50	Underweight	
1.	18.5-24.99	Normal range	
2.	25-29.9	Overweight (pre- obesity)	

3.	30 -34.99	Obese class 1	
4.	35.00- 39.99	Obese class 11	
5.	≥ 40.00	Obese class 111	

43. Uwiano wa kiuno:

1.	Iliongezeka kwa kiasi kikubwa	≥ 0.90 kwa wanaume and ≥ 0.85 kwa wanawake	
----	----------------------------------	--	--

SEHEMU YA B:

Data iliyopatikana kwa faili ya mgonjwa:

Kipimo chako cha shinikizo ya damu mara mbili iliyotangulia ni gani?

.....

Je! Kipimo chako cha shinikizo ya damu kwa wakati huu ni gani?

.....

Wastani wa kipimo cha shinikizo ya damu

.....

Je! Kwa wakati huu unatumia matibabu gani ya ugonjwa washinikizo la damu?

Dawa	Aina	Tafadhali taja	Umetumia dawa muda gani
	Adalat		
	Enalapril		
	Hctz		
	Losartan		
	Amlodipine		
	Metoprolol		
	Carvedilol		
	Lisinopril		
	Felodipine		
	Lisinopril/HCTZ		
	Nyingine yoyote, tafadhali taja		

Je, Idadi ya CD4 ni gani?

Je, Idadi ya virusi vya ukimwi ni gani?

SEHEMU C:

Dawa na uzingatiaji:

Imenakiliwa kutoka HTN return encounter form. MOH

Kwa mwezi uliopita umekunywa dawa ulizopatiwa za shinikizo la damu?

☐Ndio ☐La

Jina la dawa	Kipimo	Je! Dawa zote zilimezwa kama ilivyoagizwa katika wiki iliyopita	Sababu
Adalat		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Enalapril		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Hydrochlorothiazide		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Losartan		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Amlodipine		☐ Hakuna ☐ Chache	☐ Dawa ziliisha ☐ Nilisahau

		☐ Nyingi ☐ Zote	☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Metoprolol		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Carvedilol		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Lisinopril		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Lisinopril/HCTZ		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
Felodipine		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine
HAART		☐ Hakuna ☐ Chache ☐ Nyingi ☐ Zote	☐ Dawa ziliisha ☐ Nilisahau ☐ Madhara ☐ Sipendi ☐ Sababu Nyingine

Appendix V: IREC APPROVAL



MU/MTRH-INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)
 MOI TEACHING AND REFERRAL HOSPITAL
 P.O. BOX 3
 ELDORET
 Tel: 334711/2/3
 Reference: IREC/2018/65
Approval Number: 0003075



MOI UNIVERSITY
 COLLEGE OF HEALTH SCIENCES
 P.O. BOX 4606
 ELDORET
 30th August, 2018



Dr. Evelyn Kawira Majau,
 Moi University,
 School of Medicine,
 P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Dr. Majau & Team,

RE: FORMAL APPROVAL

The MU/MTRH- Institutional Research and Ethics Committee has reviewed your research proposal titled: -

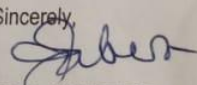
"Comparing Blood Pressure Control among HIV Positive and HIV Negative Hypertensive Patients attending Webuye County Hospital".

Your proposal has been granted a Formal Approval Number: **FAN: IREC 3075** on 30th August, 2018. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; hence will expire on 29th August, 2019. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date. You will be required to submit progress report(s) on application for continuation, at the end of the study and any other times as may be recommended by the Committee.

Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. You will also be required to seek further clearance from any other regulatory body/authority that may be appropriate and applicable to the conduct of this study.

Sincerely,



DR. S. NYABERA
DEPUTY-CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc	CEO	-	MTRH	Dean	-	SOP	Dean	-	SOM
	Principal	-	CHS	Dean	-	SON	Dean	-	SOD

APPENDIX VI: HOSPITAL APPROVAL

 REPUBLIC OF KENYA COUNTY GOVERNMENT OF BUNGOMA MINISTRY OF HEALTH OFFICE OF THE MEDICAL SUPERINTENDENT WEBUYE COUNTY HOSPITAL Telephone: 0732333682/0759932327 Email: webuyedistricthospital@yahoo.com	 Medical Superintendent Webuye County Hospital P.O. Box 25 – 50205 WEBUYE
RE: WBY/DH/GA/95/VOL. I/ 89	Date: 13TH SEPTEMBER, 2018

Dr. Evelyn Kawira Majau
 Moi University
 School of Medicine
 P.O. Box 4606 - 30100
 ELDORET - KENYA

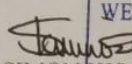
Dear Madam,

RE: APPROVAL TO CARRY OUT RESEARCH AT WEBUYE COUNTY HOSPITAL

Following your letter dated 11th September, 2018 requesting to carry out research at Webuye County Hospital refers.'

I am pleased to inform you that you can carry out your research; *'Comparing Blood Pressure Control among HIV Positive and HIV Negative Hypertensive Patients attending Webuye County Hospital.'*

Yours faithfully,



MEDICAL SUPERINTENDENT
WEBUYE COUNTY HOSPITAL
 P. O. Box 25 - 50205

DR. SIMON KISAKA WEBUYE
 FOR: MEDICAL SUPERINTENDENT
WEBUYE COUNTY HOSPITAL

APPENDIX VII: BUDGET

No	ITEMS	QUANTITY	COST per UNIT Kshs	TOTAL(Kshs)
	STATIONARY and EQUIPMENT			
1	Foolscap	2 reams	300	600
2	Printing papers	5 reams	450	2250
3	Ball points	2 packet	20	800
4	Pencils	5	20	100
5	Erasers	5 pieces	5	25
6	Note books	5	50	250
8	Pocket files	5	50	250
9	Staples	1 packet	200	200
	RESEARCH PROPOSAL DEVELOPMENT			
10	Printing of draft proposal	10 copies	500/copy	5000
11	Printing final proposal	7 copies	500/copy	3,500
12	Binding Research proposal	7 copies	200/copy	1,400
	THESIS DEVELOPMENT			
13	Printing of draft thesis	10 copies	1000/copy	10,000
14	Binding thesis (hard cover)	7 copies	500/ copy	3,500
15	Photocopy schedule & consent	300pages	3/page	900
	FIELDWORK			
18	Research assistants	4 people	Each 25,000	100,000
	COMMUNICATION			
19	Phone, E-mail, and Internet searches	-	-	40,000
20	Consultancy (statistician)	-	-	40,000
21	Dissemination costs	-	-	20,000
	GRAND TOTAL			228,775

Table 1 :Budget

