RISK FACTORS ASSOCIATED WITH HYPERTENSION AMONG PEOPLE LIVING WITH HIV/AIDS AT PCEA KIKUYU HOSPITAL

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DECLARATION

I, the undersigned, declare that this dissertation is my own original work and has not been presented for a degree in any other university and that all information from other scholars has been referenced and acknowledged.

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APPROVAL

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DEDICATION

This dissertation is dedicated to my sponsor and beloved, Dr Nwosu.C, Urban, and David, my children. I also dedicate it to my father, Late Mr. Albert Ugo and my mum, Ezinne Augustina Ugo, and my entire family members, especially my sister Eziada (Bar) Nneka Amanze who was there for me during my studies.

Above all this work is dedicated to God Almighty.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
AMPATH	Academic Model Providing Access to Health Care
ART	Antiretroviral Therapy
BP	Blood Pressure
BMI	Body Mass Index
CA	Cancer
CCC	Comprehensive Care Center
CDs	Communicable Diseases
CRD	Chronic Respiratory Diseases
CVD	Cardiovascular Diseases
DALY	Disability Adjusted Life Years
DM	Diabetics Mellitus
GHO	Global Health Organization
HAART	Highly Active Antiretroviral Therapy
SHBP	High Blood Pressure
HDL	High Density Lipoprotein
HIV	Human Immunodeficiency Syndrome
HTN	Hypertension

JNC	Joint National Committee
LDL	Low Density Lipoprotein
MDGs	Millennium Development Goals
MmHg	Millimeters of mercury
MoH	Ministry of Health
NCDs	None Communicable Diseases
NNRTIs	Non-Nucleoside Reverse Transcriptase Inhibitors
NRTIs	Nucleoside Reverse Transcriptase Inhibitors
PCEA	Presbyterian Church of East Africa
PI	Protein Inhibitor
PLWHIV	People Living with HIV
SBP	Systolic Blood Pressure
UNAIDS	United National Joint Programme on HIV and AIDS
WHO	World Health Organization

Definition of Operational Terms

Attitude: This is predisposition or a tendency to respond positively or negatively towards a certain idea, person, object or situation. It influences an individual's choice of action, and response to challenges, incentives, and rewards.

BMI: Body mass index is a number that reflects body weight adjusted for height. Normal values are 18.5-24.9, 25-29.9 are considered overweight, while values of 30 or higher are considered obese.

Chronic diseases: These are diseases that require regular use of medication and continuous follow up by a health care giver.

Comorbidity: This is a condition whereby an individual has two or more other medical conditions in addition to a disease that was initially diagnosed.

Disability Adjusted Life Years (DALYs): This is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. It was developed in the 1990s as a way of comparing the overall health and life expectancy of different countries.

Hypertension: This is defined as a systolic BP of greater than or equal to 140mmHg and diastolic blood pressure greater than or equal to 90mmHg

Knowledge: This is a familiarity, awareness, or understanding of someone or something, such as facts, information, descriptions or skills, which is acquired through experiences or education by perceiving, discovering or learning.

Morbidity: This is a measure of occurrence of a particular disease or a health related event in a given area. It is the unhealthy state of an individual.

Mortality- This is the measure of the number of deaths in general or due to a specific cause in a particular population, scaled to the size of that population, per unit of time.

Non communicable diseases- These are diseases or health conditions which are not spread through infectious agents or their pathogenic products. They are caused mostly by lifestyles.

Practice- This is a way of doing something that is the usual or expected way in a particular situation.

ABSTRACT

Introduction: Hypertension is a non-infectious disease that has been shown to be the leading risk factor of cardiovascular disease and stroke. HIV on the other hand, is an infectious disease that is mainly sexually transmitted. Both conditions pose a big challenge to the public health sector due to their high morbidity and mortality. With the scale up of ART, the negative impacts of HIV/AIDS have been controlled, with little attention on hypertension in HIV. It has been observed that PLWHIV are at higher risk of the non-communicable disease comorbidities globally, especially the cardiovascular diseases. This may be due to the effects of ARVS, as well as the HIV in the body system. Hypertension as the leading cause of CVD recently has been found to have high incidence, as well as high prevalence among PLWHIV and AIDS with high morbidity and mortality.

Objectives: The purpose of this study was to assess the risk factors that are associated with hypertension among PLWHIV and AIDS patients at PCEA Kikuyu hospital.

Methodology: An analytical case control study was conducted in 90 hypertensive and 90 non-hypertensive PLWHIV/AIDS attending clinic at PCEA Kikuyu hospital during the month of November and December 2016.Those who participated in the study were randomly selected from the records and matched on categorical age. Hypertension was determined from participants who are already on care for HBP or with BP >140/90mmHg recorded in 2 to 3 times consecutively during the previous visits, and on anti-hypertensive medications which are documented in their files. Information was obtained by direct interview with questionnaires adopted from the WHO STEPS instrument for NCD risk factors surveillance. Knowledge, attitude and practices on hypertension were done by using 15 questions adopted from the international journal on KAP research work by Pregnesh et a, l 2014. Information was entered with the use of excel then exported to the Statistical Products and Service

Solution version 20.0 (SPSS) for analysis. The study strictly adhered to ethical standards as provided by the ethical research committee.

Results: It was found that the following were independently associated with hypertension and remained significant till the end of the study. Among the cases and controls, 74% and 53% were aged >40 years, hence, hypertensive patients had a significantly reduced odds of being aged ≤ 40 years (OR=0.3, C.I: 0.1-0.8, p=0.03). Those who are married were 87% cases and 73% controls respectively, and were 4.1 times likely to develop HBP than the unmarried, (OR=4.1, C.I: 1.2-14.4, p=0.02). Those who attended higher level of education (secondary and tertiary) were 41% cases and 67% controls respectively, hence those who attended tertiary level of education had a higher chances of developing hypertension than the secondary and the primary level of education (OR=0.09, C.I: 0.01-0.6, p=0.01). BMI was also found to be independently associated with hypertension with only 24% cases and 46% controls respectively having normal BMI, hence the obese were 4.8 times more likely to develop HPB than those who have normal BMI and the underweight. The knowledge that hypertensive take hypertensive drugs daily remained statistically significant (p=0.00) till the end of the study, with 36% and 69% among the cases and controls respectively, having the knowledge that hypertensive takes drugs daily. Generally, in terms of knowledge on hypertension, 61% and 67% of the cases and controls respectively demonstrated poor knowledge on hypertension, 72% and 67% of the cases and controls demonstrated positive attitude on hypertension, while only 49% and 35% of the cases and controls respectively demonstrated good practices on hypertension. However, sex, duration on HAART, viral load, lifestyle factors was not associated with hypertension.

Conclusion: Independent risk factors of hypertension were found to be age, level of education, BMI, marital status and knowledge on hypertensive daily drug intake. However, both the cases and controls were not knowledgeable with poor practices on hypertension.

Recommendation: In order to control the hypertension menace and avert the morbidity and mortality secondary to it and NCDs in general, a hypertension awareness programme should be incorporated into the HIV programme. The National government through the help of the development partners who are supporting the ongoing HIV programme should make available provision for free BP check to the members of the public for early detection, and control of high blood pressure, and NCD at large.

1.0 INTRODUCTION AND BACKGROUND INFORMATION

1.1 Introduction

Hypertension remains a major global public health challenge that has been identified as the leading risk factor for cardiovascular morbidity and mortality (WHO 2002, JNC7 2003, Kearney et al 2004); mainly in poor countries. On the other hand, HIV is mainly a sexually transmitted disease which is also of major concern globally in the public health sector. Both conditions have a number of important things in common, morbidity and mortality. Hypertension and HIV are both quite easily diagnosed through simple screening test, particularly so with hypertension. HIV is becoming a chronic health condition which can be managed through a combination of drug therapies, and life style changes, while hypertension on the other hand is a chronic illness that is managed through lifestyle modification, single drug or combination of drug therapies. Both illnesses share the need for life long treatment, regular monitoring, and a reliable drug supply. Also, they require a major reorientation for health that is generally geared towards good attitude in the management of chronic diseases (Galie, et al 2015).

Globally, in the past hypertension was seen as a disease of the affluent, of prosperity, and therefore of no relevance to poorer countries, but this condition has now become an epidemic in most African countries that are fast in adopting the Western life and culture, Ferries et al (2014). He suggested that the burden of death attributable to hypertension over the next 20 years may substantially exceed that due to HIV and AIDS in low and middle income countries. However, with high burden of hypertension among PLWHIV and AIDS like in PCEA Kikuyu hospital CCC unit; the burden of morbidity and mortality will as well rise. Studies done have attributed this to effects of ARVs, inflammation caused by the HIV in the body, age, and race (D.A.D'S, 2009). Therefore, determining the risk factors, educating them on high blood pressure, will help in the early intervention and subsequent control and reduction in the burden of hypertension among PLWHIV and AIDS.

1.2 Statement of Research Problem and Justification

Hypertension is the major risk factor for cardiovascular diseases, and its magnitude among PLWHIV and AIDS is growing as it is associated with high morbidity and premature mortality. Among PLWHIV, it has been documented that the causes of high blood pressure are multifactorial, and these include; immune activation, inflammations, disorders of coagulation, ART itself and persistent immunodeficiency (American Heart Association, 2002), as well as the four general behavioral risk factors for NCDs as listed by the WHO action plan for prevention and control of NCD 2013-2020 (tobacco use, unhealthy diet, physical inactivity, harmful use of alcohol).

UNAIDs (2015), documented over 80% of NCD related deaths are due to CVD 17.5m, CA 8.2m, CRD 4m, DM 1.5m. A preliminary report in 2011 in Kenya by the MoH documented that NCDs cause over 50% of all hospital admissions and hospital deaths and by 2030, will cause over 60% of the total national mortality.

WHO (2009) estimated raised blood pressure to cause 7.5 million deaths, about 12.8% of all deaths. A preliminary report in 2018 by the MoH in the Kenya Stepwise Survey for NCDs risk factor showed that 56 per cent of Kenyans have never been measured for raised blood pressure, 8 people out of every hundred suffered from severe hypertension, with 23.8 per cent found to have raised blood pressure. In Africa, there is paucity of data on prevalence and associated death among PLWHIV and AIDS due to hypertension, but AMPATH HIV/AIDS (2010) program reported 10% prevalence of hypertension among PLWHIV and AIDS in Kenya. However, reports from PCEA Kikuyu hospital CCC unit showed that one in every five persons living with HIV and AIDS is found to be hypertensive. In 2014, about 400 patients out of 1995 patients in the CCC unit were being managed for hypertension. It has also been shown that hypertension is one of the leading causes of both in-patient and

outpatient morbidities (stroke, CVD) and mortalities in both PLWHIV and AIDS, and the non HIV patients.

One of the objectives of the WHO global action plan for prevention and control of NCD 2013-2020 is to reduce modifiable risk factors and underlying social determinants. In order to reduce the risk factors, it is important to ascertain the risk factors, address them so as to attain optimal control. This study will help to identify the risk factors that are associated with hypertension, more so on the awareness on the preventive and control measures, hence tailored towards early identification and intervention in the upsurge and burden of hypertension, and at the end achieve the WHO 2030 action plan for NCDs.

1.3 Objectives of the study

1.3.1 Main objective

To assess the risk factors that are associated with hypertension among PLWHIV at PCEA Kikuyu hospital.

1.3.2 Specific Objectives

1) To compare the sociodemographic factors between the hypertensive and non-hypertensive PLWHIV and AIDS.

2) To compare the distribution of clinical factors between the hypertensive and the non-hypertensive PLWHIV and AIDS.

3) To compare the behavioral/lifestyle practices between hypertensive and non-hypertensive PLWHIV and AIDS.

4) To compare the awareness, attitude and practices between hypertensive and non-hypertensive PLWHIV and AIDS.

1.4 Null Hypotheses

- There is no sociodemographic factor between hypertensive and non-hypertensive PLWHIV and AIDS.
- There is no clinical factors between hypertensive and non-hypertensive PLWHIV
- There is no behavioral/lifestyle practices between hypertensive and non-hypertensive PLWHIV and AIDS.
- There is no awareness, attitude and practices on hypertension between hypertensive and non- hypertensive PLWHIV and AIDS.

2.0 LITERATURE REVIEW

2.1 Introduction

This section provides a review on the study topic specifically the risk factors that are associated with hypertension among patients living with HIV and AIDS. The section starts by giving a description of HIV and AIDS in relation to hypertension, the impact of HIV on hypertension, behavioural and lifestyle practices that are associated with hypertension among PLWHIV and AIDS.

2.2 HIV/AIDS and Hypertension

Several studies have been carried out on hypertension alone, and on hypertension in HIV/AIDS in general with contrasting results. While some authors documented normal blood pressure among PLWHIV, some other authors reported that ART has effect on blood pressure and as such prolonged use of ART causes high blood pressure (Seaborg et al, 2003). More so, many authors have found that majority of the hypertensive people still do not know the cause, and effect of hypertension and still believe that hypertension is caused by spiritual invocation (Iyalomhe, 2010), or as a result of a spelt from the ancestors, and as such have no knowledge on the risk factors, with poor attitude and practices to its management.

A study conducted by Glaziou, et al (2009) concluded that the incidence of pulmonary hypertension in HIV positive people is about 1 in 200, as compared to 2 cases per million yearly in the general population. According to Fisher et al (2014), there is a relationship between ART and other components of the metabolic syndrome, such as hyperlipidemia and elevated blood glucose. However, it is not clear whether HIV or specific ARVs are independent risk factors for hypertension.

2.2.1 Defining HIV/AIDS and Hypertension

The human immunodeficiency virus (HIV) is the viral causative agent of acquired immunodeficiency syndrome (AIDS). It is of two types, HIV1 and HIV2. HIV targets the immune system and weakens people's immunity and defense systems against infections, and some types of cancers. The most advanced stage of HIV is the acquired immunodeficiency syndrome (AIDS). This can take from 2 to 15 years to develop depending on the individual. The immune function is typically measured by the CD4 cell count, normal being > 1000cells/mm. Therefore, immunodeficiency results in increased susceptibility to a wide range of infections, and diseases that people with healthy immune systems can fight off.

Hypertension on the other hand, is defined as a chronic condition characterized by a sustained increase in blood pressure which is measured by systolic and diastolic pressure of >140/90. It is the main driving cause of cardiovascular disease, and it is affected by cardiac output and peripheral resistant. The optimum blood pressure is defined as a systolic blood pressure of less than 120mmHg, and diastolic pressure of less than 80mmHg, and globally around 22% of adults aged 18 and over had raised blood pressure (WHO, 2014)**.**

2.2.2 WHO classification of hypertension

WHO CLASSIFICATION	SYSTOLE	DIASTOLE
Severe Hypertension	>180	>110
Moderate Hypertension	160-179	100-109
Mild Hypertension	140-159	90-99
High normal	130-139	85-89
Normal	120-129	80-84
Optimal	<120	<80
Isolated Systolic Hypertension in HIV	>140	<90

Table 2.2.2 showing the WHO classification of hypertension

2.2.3 Epidemiology of Hypertension and Hypertension in HIV

Hypertension is one of the most common non-communicable diseases in the world's population. Globally, the prevalence of hypertension in 2008 among adults aged 25 years and above was 40%, highest in Africa with prevalence of 46% for both men and women combined and lowest in America with 35% prevalence (GHO, 2014). WHO (2013) report estimated 1.1 billion adults to have raised BP, and less than 1 in 5 have it under control. This, on the other hand accounts for 5.7 million DALYs (Disability adjusted life years) or 3.7% of total DALYs. It is also estimated that hypertension is responsible for at least 45% of deaths due to stroke (Ferries et al, 2014). Projections based on available data (International

Journal of Epidemiology, 2014) indicated that the number of deaths attributed to hypertension in the next 20 years, may well exceed substantially the number of deaths attributed to HIV/AIDS. In Kenya, Joshi et al (2014), documented a paucity of data on hypertension prevalence, but according to their report, more than 20 million people are affected with hypertension, with prevalence of hypertension ranging from 25% to 35% in adults aged 25 to 64 years, with 58% prevalence aged 55 years who live in the urban area. In Kenya, a recent report by a national daily (May, 2018) reported on the incidence of hypertension by the MoH in the Kenya STEPWISE survey for NCD risk factor showed that 56% of Kenyans have never been measured for raised blood pressure. Among those who have been previously diagnosed with hypertension, only 22.3 percent were currently on medications prescribed by a health care worker.

Among PLWHIV/AIDS, the American Heart Association (2002), estimated the prevalence of hypertension in HIV disease to be between 20 to 25 percent before the introduction of HAART, and this elevated blood pressure may be related to metabolic disorders, especially with fasting triglycerides, with a prevalence of hypertension in up to 74% of patients with HAART related metabolic syndrome. The AMPATH HIV/AIDS (2010) program reported 10% prevalence of hypertension among PLWHIV in Kenya.

2.2.4 Cardiovascular Manifestation of Hypertension and HIV

From the American Heart Association journal, (2002), the effect of HIV lead to different types of cardiovascular diseases such as dilated cardiomyopathy, coronary heart diseases, systemic arterial hypertension, HIV associated pulmonary hypertension etc. The etiology of these have been attributed to HIV induced endothelial dysfunction, vasculitis in small, medium, and large vessels, in the form of atherosclerosis secondary to HAART, Proteins Inhibitor induced insulin resistance with increased sympathetic activity, sodium retention, aneurysm of the large vessels such as the carotid, femoral, and abdominal aorta with

impairment of flow to the renal arteries. Uncontrolled high blood pressure in both PLWHIV and the non HIV can lead to heart attack or stroke, heart failure, coronary heart diseases and cardiomyopathies. Although the epidemiology of CVD in HIV infection is poorly defined, available information by Mpiko and James (2005), on impact of HIV on CVD in Africa reported that there are unique features in the etiology, presentation and spectrum of HIV-associated cardiovascular disorders in people living in Africa. First, pericardial disease may be the initial manifestation of HIV infection in the early stages of the illness (Mpiko 2005). Second, the etiology of cardiac disease tends to reflect the prevalent infectious disease such as tuberculosis (Mpiko and James 2005). Third, the unique cardiovascular disorders such as aneurysm of large vessels have been reported in association with HIV infection in several parts of Africa (Mpiko and James 2005). However, evidence by the European AIDS Clinical guidelines (2012), documented an incidence of symptomatic heart failure in HIV positive patients to be ranging from 4 to 28%, among HIV infected children, 25% die with chronic cardiac disease, and 28% experience serious cardiac events after AIDS defining illness.

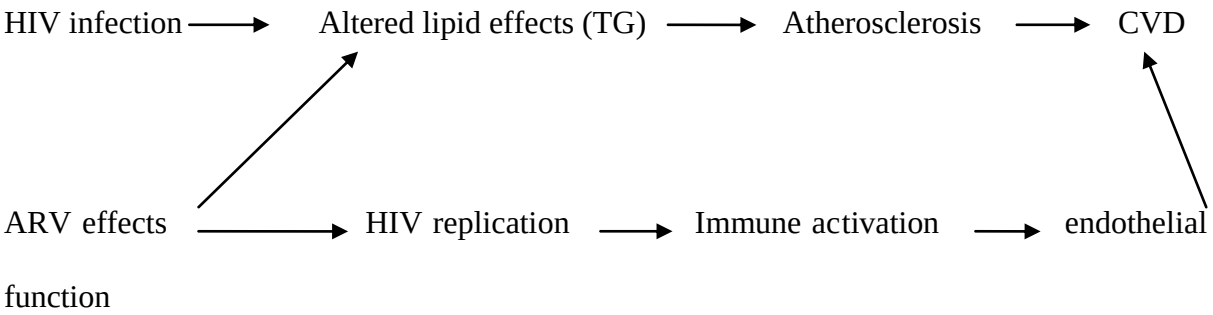


Figure 2.2.4 Interaction of Host, Virus and ART Effects on CVD

Adopted from an Update on CVD Complication in HIV Infection by the Journal of International AIDS Society USA 2009

CVD risk in HIV infection is a product of host, virus and antiretroviral therapy factors. The benefits of ART outweight cardiovascular disease risk. Delaying ART is not the answer to reducing these risks indeed, because HIV infection that is not suppressed may be accelerating

atherosclerosis, and earlier treatment may be of benefit in reducing risk of cardiovascular diseases.

It is of important to note that in Kenya, since the first case of HIV was found in 1984, the trend in the initiation of HAART has changed following a lot of changes in medications and gaps that were closed. In 1996, 10.5% Kenyans were living with HIV, but in 2015 the prevalence has almost halved to 5.9% (NASCOP, 2015). This progress is mainly due to the rapid scaling up of HIV treatment and care. Previously HAART was started in patients with CD4 of less than 200, then to 350 and 500 meters cube (Kenyan guideline, 2011-2016), until 2017 when the government introduce test and treat irrespective of the CD4 level. Antiretroviral drugs on the other hand have taken different forms due to some of the side effects associated with them, e.g. lipodystrophy, atherogenesis and CVD, which were found

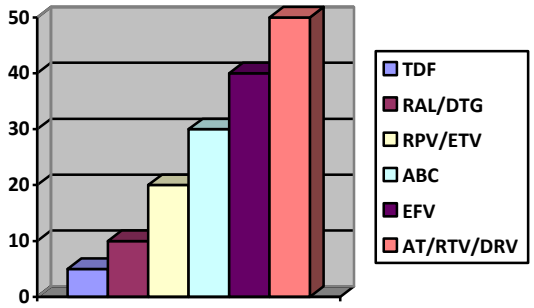


Figure 2.2.5 Showing the ART with the greatest effect on CVD, N/B that the numbers used are not the significant numbers.

to be caused by ddl e.g. Stavudine, and was scraped off. According to the 2018 ART Kenyan guideline, it some drugs are also faced out as first line drugs for instance, in adults and people who are ≥ 15 years or with 35kg body weight are now started on TDF/3TC/DTG or EFV, hence NVP is now being faced out. The above shows that the greatest ART that cause the greatest rise in total cholesterol are booster lopinavir and efavirenz, when used in

combination with NRTI. TDF has a marginally protective effect (Guidelines for ART in Kenya, 4th edition 2011).

2.3 Impact of HAART on blood pressure

A case series study that was done in the USA by Palacios et al (2002) on the impact of HAART on blood pressure found that, there is a high prevalence of high blood pressure among PLWHIV and AIDS after 48 weeks of administering of HAART. More so, it was found that associating factors to the rise in BP among PLWHIV and AIDS were, age, hypercholesterolemia and CD4 cell count, hence patients with lower CD4 cell count, hypercholesterolemia and increase in age, develop hypertension.

Seaborg et al (2003), analyzed blood pressure in the Multi Center AIDS cohort study in USA on the association between HAART and hypertension, and it was found that a longer duration on HAART of greater than 2 years carries a substantial increase risk of systolic hypertension of about 1.5 fold in comparison to HIV negative patients. But the risk of hypertension among PLWHIV and AIDS on HAART of less than 2 years is similar to the HIV negative patients.

In a case control study, Sattler et al (2001), on the elevated blood pressure in subjects with lipodystrophy due to HAART on PLWHIV and AIDS found that there is an increase in high blood pressure among HIV and AIDS patients with high level of fasting triglycerides, increase waist-to-hip ratio, and lipodystrophy following HAART. However, the authors proposed that intervention to control and management of hypertension should be instituted in PLWHIV and AIDS.

2.4. Sociodemographic factors that affect hypertension/ hypertension in HIV

In a case control study comparing the sociodemographic factors and hypertension knowledge in Angola (Abdesslam, 2009), it was found that the urban dwellers had better hypertension knowledge compared to rural dwellers. More so, socio-demographic and behavioral factors are some of the factors limiting prevention and care for hypertensive patients. Such factors may include hereditary factors, obesity; a diet high in salt, smoking, and lack of physical activity can all contribute to hypertension, (Calhoun et al 2008).

Wang, et al (2013), in a cross sectional study on patients related factors for optimal blood pressure control in hypertensive patients with HIV and AIDS found that optimal blood pressure control in hypertensive patients appear to be a long standing challenge around the world. This study went further to find that the reasons for suboptimal hypertension management was multi-factorial and potential barriers are, inadequate education from health professionals, limited access to specialist, and poor adherence to antihypertensive medication. Therefore, they suggested that new strategies or policies are required to improve the patient's accessibility to specialist services, and to reduce the financial burden associated with the management of hypertension. Earlier studies showed that less than 25% of patients who were treated for hypertension achieved the target blood pressure of less than 140/90mmHg (Manji et al, 2000).

In a cross sectional study conducted by Samal et al (2007), educational level was significantly associated with knowledge of risk factors, possible consequences, and medication treatment options.

A cross sectional study done by Mohmmedrifan et al (2012) on sociodemographic factors affecting prevalence of hypertension among bank employees in Surratt city, showed that the

prevalence of hypertension increased with seniority of the official position of bank employee with highest prevalence among managers (45.9%). However, the prevalence of hypertension was noted to be highest among the higher socioeconomic group.

2.5. Lifestyle/Behavioral factors that affect hypertension

According to the European AIDS Clinical Society guidelines (2012), smoking cessation, dietary, counseling, and exercise promotion are some of the lifestyle interventions recommended in PLWHIV for risk reduction of hypertension. Structured education on management of hypertension and lifestyle modification has been shown to facilitate body weight reduction and pharmacological control of blood pressures (WHO/ISOH, 2003).

Dickson et al (2006), in a randomized controlled trial study, documented that patients with elevated blood pressure should follow a weight-reducing diet, take regular exercise, and restrict alcohol and salt intake. He went further to document that relaxation therapies, calcium, magnesium potassium supplement to reduce blood pressure do not really work or reduces blood pressure. Numerous short term controlled trial studies have written that individuals can make lifestyle changes which lower blood pressure; this was according to the Seventh Report on JNC on prevention of high blood pressure (2003).

A clinical controlled trial by Elmer et al (2003), on the effect of comprehensive lifestyle modification on blood pressure control, documented that individuals can simultaneously make multiple lifestyle changes with issues on the extent to which individuals can sustain lifestyle changes over the long term.

Lifestyle measures are crucial steps in hypertension management, and dietary approaches to stop hypertension showed that a diet low in sodium and high in fruits, vegetables, and calcium is helpful in treating hypertension (Appel et al 1997). More so, exercise is critically important especially in children and young adults with hypertension.

2.6. Behaviour in context of hypertension management

Behavioural or conative component of attitude connotes the way the attitude we have influence how we act or behave. E.g. “I will avoid spiders and scream if I see one”. Hogg and Vaughan (2005), defined attitude as a relative belief, feelings and behavioral tendencies towards socially significant objects, groups, events or symbols. The strength with which an attitude is held is often a good predictor of behaviour, Katz Daniel (1960). The stronger the attitude, the more likely it should affect behaviour. One of the areas where attitude can serve for an individual is knowledge. The knowledge aspect of attitude strength covers how much a person knows about the object. People are generally more knowledgeable about topics that interest them and are likely to hold strong attitudes (positive or negative) as a consequence. Attitude based on direct experience are more strongly held and influence behaviour more than attitudes formed indirectly e.g. through hear and say (La Pierre, 1934). Hence attitude provides knowledge or meaning for life. The knowledge function of attitude refers to our need for a world which is consistent and relatively stable. This allows us to predict what is likely to happen and so gives us a sense of control. Attitude can help us organize and structure our experience. Knowing person’s attitude helps us predict their behaviour e.g. knowing that a person is religious, we can predict he will go to church. However, health care workers can utilize attitude and behavioural change to assess the patient’s knowledge on prevention and control of hypertension.

2.7 Knowledge on hypertension among PLWHIV/AIDS and non HIV patients

Knowledge refers to the state of being aware of a fact, phenomenon or an occurrence, either through experiences or training (Knorr-Cetina 2013). Hypertension knowledge includes the knowledge of what hypertension are all about, the predisposing factors and

control measures (Oliveria et al, 2005). A study conducted in Nigeria by Olando et al (2013), concluded that there is lack of public awareness and misconception about the nature, symptoms, risk factors and complications of hypertension.

Kagashe et al (2011), on the other hand, in their cross sectional study done in Dare Salam in Tanzania on the knowledge of hypertensive patients with or without HIV/AIDS noted that some of these patients are not knowledgeable on hypertension and their side effects, therefore, do not have adequate control of their blood pressure due to lack of knowledge. In his study, only about 19% of the pharmacists knew about drug interaction between the ARVs and antihypertensive drugs, hence there is need to improve on the patient's knowledge on hypertension, and pharmacists should also be up to date on the knowledge of hypertension HIV comorbidity. More so, there should be proper coordination between HIV, and hypertension clinics, with full integration of the pharmacist. This is the same with Iyalomhe (2010) who documented that knowledge of hypertension can result in controlled blood pressure. Some previous studies done have shown that patients who are aware that elevated blood pressure level leads to reduction in life expectancy had a greater compliance level with medication use and follow up visits, than patients without this awareness (Jokisalo et al, 2005).

A descriptive cross sectional study on hypertension related knowledge, attitude and lifestyle practices among hypertensive patients in Edo state of Nigeria conducted by S.Iyalomhe, and L.Iyalomhe (2012) found out that, even the hypertensive patients who have been on antihypertensive medications still have poor knowledge on hypertension, which was attributed to their negative attitude to treatment, together with non-adherent and poor life style adjustment. This was attributed to their poor educational background, as some still believe that hypertension could be caused by evil spirits, enemy remote attacks or food

poisoning. About 89% of the educated and the uneducated hypertensive were unaware of the symptomless nature of the disease. This observation is in contrast with the findings of other studies who reported that up to 90-96 percent and 89.6 percent respectively of the educated and the uneducated studied hypertensive patients demonstrated sufficient knowledge, valid perception, and positive attitude to treatment of hypertension, including implementation of adequate life-style practices (Yahiya et al, 2012). These were evidences to show that to determine the factors that are associated with hypertension among PLWHIV and AIDS is important to help curb hypertension menace and cardiovascular accidents.

2.8 Conceptual Framework

This section will discuss the factors that are associated with hypertension among HIV and AIDS patients. Hypertension is associated with high morbidity and mortality e.g. hemorrhagic stroke, cardiovascular diseases, and renal failure. There are several factors that are associated with hypertension from patients, health care and system factors. In this section, it will be based on patient's factors e.g. sociodemographic factors, HIV factors and lifestyle/behavioural factors.

PREDICTOR VARIABLES **OUTCOME VARIABLES**

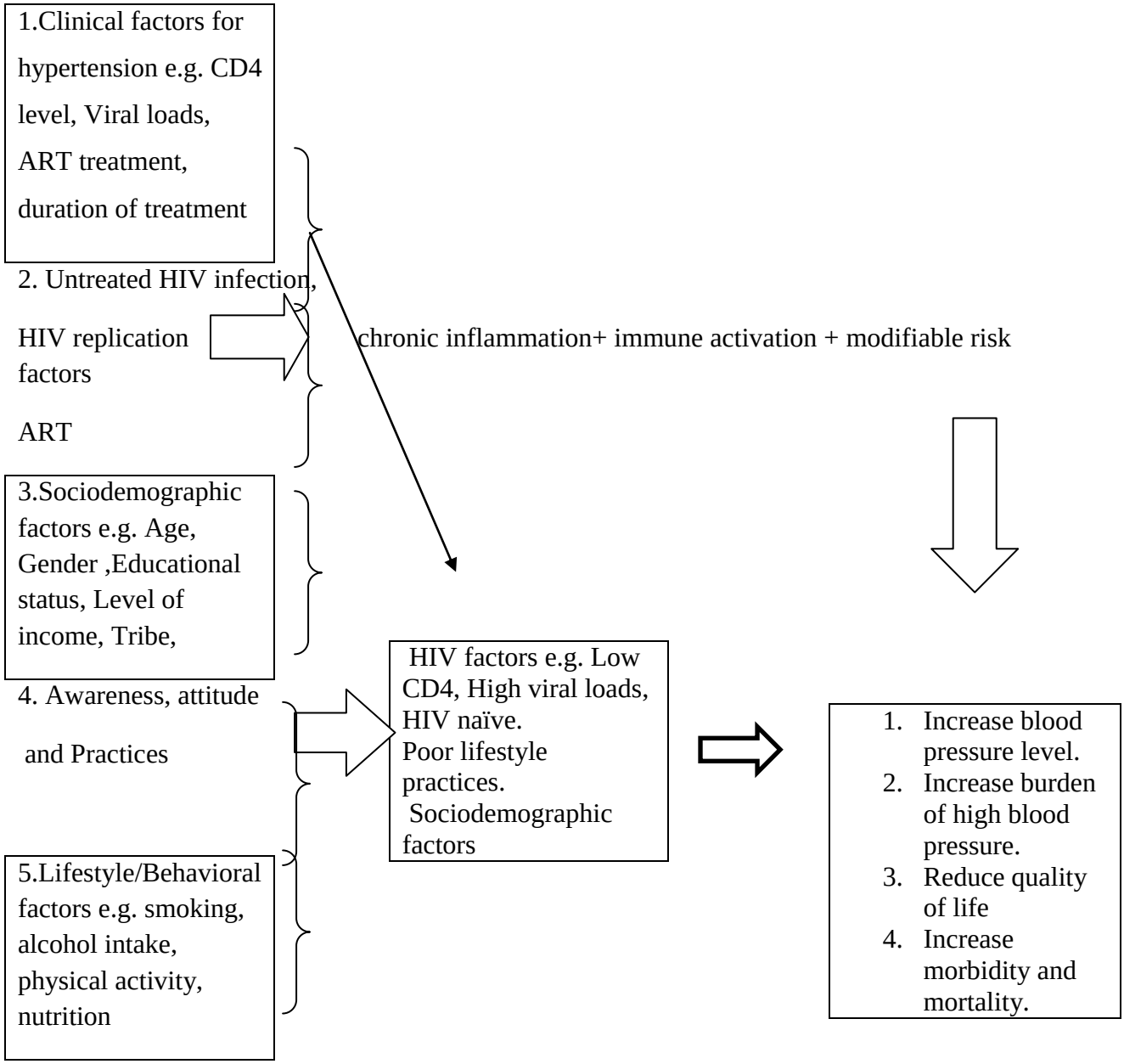


Figure 2.8: Conceptual Framework on the factors that is Associated with Hypertension among PLWHIV and AIDS

3.0 METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was used to carry out the study. It describes the study design, the study target population, study area, and method of collecting and analyzing the data. In addition, it indicates the ethical considerations as well as the anticipated limitations of the study.

3.2 Study Design

The study adopted a hospital based analytical case-control study design which assessed the factors that are associated with hypertension among PLWHIV and AIDS in PCEA Kikuyu hospital. The study employed only a quantitative method. The quantitative data collected from the hypertensive PLWHIV and AIDS, was matched on age with the non-hypertensive PLWHIV and AIDS which served as the comparative group present in the CCC clinic.

3.3 Study area

The study was conducted at PCEA Kikuyu hospital CCC unit. It is a faith based organization owned by the Presbyterian Church of East Africa with the mission to deliver quality health services to humanity. It is located in Kikuyu Sub County, in the central region of Kiambu County. The boundaries are; to the North is Limuru, to the East is Muguga and Kabete, to the South is Karai and to the West is Kinoo. The hospital is a level 4 health facility about 10 kilometers from Nairobi City. People from different parts of Kenya visit there for different medical purposes as it is the 10^{th} most busy ophthalmology center in the Sub Saharan region. The main economic activity in the county where this hospital is located is agriculture. The poverty level in the whole county is estimated at 25% with an age dependency ratio of 100:62. The hospital offers out-patient and inpatient, curative, preventive, and rehabilitative

health services with four major departments that are functional which includes Eye, Orthopedic, Dental and General Units. The General unit comprises of the Paediatric, Medicine, Surgery, Obstetrics and Gyneacology, Accident and Emergency, Comprehensive Care Center (CCC). The CCC unit has about 2000 active patients enrolled, with 500 patients being managed for hypertension. There are also some special clinics which includes the ENT and Neurosurgery clinic. There is one diabetes and hypertensive clinic which is accessible on Monday till Friday, except on weekends, where hypertensive and diabetic patients are followed up and two special medical out-patient clinics which are accessible in two days in every week. On average, 600 patients are managed for hypertension and diabetics at the DM clinic and 20 people are booked for every MOPC to be seen by the physician (Pceakikuyuhospital.org, 2015).

3.4. Study Population

The target population consisted of all patients living with HIV, and is on follow up in the hospital CCC unit.

3.5 Inclusion criterion

- All Patients living with HIV and AIDS on follow up at the hospital
- Those who had attained the age of 18 years and above at the time of study

3.6 Exclusion criterion

- Patients with mental illness
- Pregnant hypertensive patients
- Patients who were below 18 years of age
- Patients declining consent for participation

3.7 Sample Size calculation

At PCEA Kikuyu hospital, there were about 2000 active patients on care, with about 500 on management for high blood pressure and this gave us 500 cases, and 1500 controls.

	Cases	**Controls**	**TOTAL**
Patients with HTN	250	500	750
Patients without HTN	250	1000	1250
TOTAL	500	1500	2000

Table 3.7.1 showing case control design of PLWHIV in PCEA Kikuyu Hospital

The study adopted Charan and Biswas sampling as follows,

$$N = \frac{r+1}{r} \; Þ(1-Þ) \; \frac{(Z_\beta + Z\alpha/2)^2}{(Þ_1 - Þ_2)^2}$$

Where,

N= Sample size in the case group

$\frac{r+1}{r}$ = ratio of controls to case

Þ (1-Þ) = Measure of variability (similar to standard deviation)

Z_β = Desired level power (typically 90% power for .90)

Zα/2 = Desired level of statistical significance (typically 1.96)

$(P_1-P_{2)}^2$ = Effect size (difference in proportions)

Therefore, with the application of the above formulae;

Ratio of cases to controls: 500:1500 = 1:3

Odds Ratio: 250/250 × 1000/500 = 2

Proportion of control with HTN= 500/1500×100/1=33.3%

Proportion of cases with HTN=250/500×100/1=50%

Average proportion of exposed=.33+.50/2=.415

$$N=1.3\ \frac{(.415)(1-.415)(.90+1.96)^2}{(.50-.33)^2} \quad =89.4$$

Therefore, there were total 90 cases and 90 controls.

3.8 The case

The cases were the hypertensive patients who are living with HIV and AIDS.

3.9 The control

The control group were the non- hypertensive patients who are living with HIV and AIDS. This group also included patients with other diseases and is also living with HIV. A nurse stationed at the CCC clinic obtained the records of patients regarding their vital signs and HIV/AIDS status, and then the patient entered the room to see the resident clinician on duty, after which the participant was interviewed by the interviewer by administering the study questionnaire.

3.10 Sampling

3.10.1 Sampling Process

The sampling frame included all patients living with HIV and AIDS, and was on follow up at the hospital CCC unit. Patients aged 18 years and above were eligible to participate in the study. A table of random numbers was generated to guide in the sampling of both cases and controls and this was aided by computer software (Epi-Info).The numbers generated were matched with the patient file numbers.

3.10.1a Selection of Cases

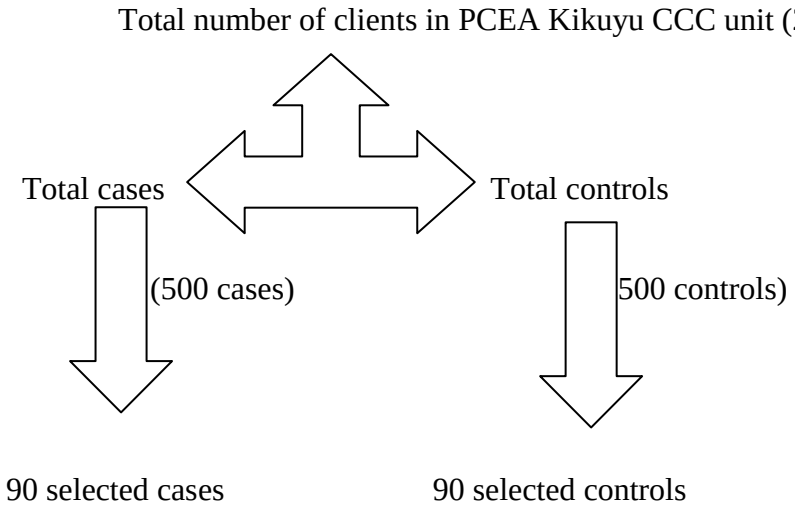
The case files of the hypertensive PLWHIV and AIDS were retrieved from the records, and then enrollment of study participants was carried out at the beginning of each clinic day. A simple random selection of 90 participants from 500 case files was used to recruit the number of participants. The selected cases were matched on categorical age with the controls. Participants were well informed on the need to participate only ones in the study so as to avoid bias. Sampled participants were interviewed by the interviewer after being reviewed by the resident clinician on duty. These were done after assessing their eligibility and obtaining informed consent to participate in the study. To avoid multiple enrollments, each patients file number was entered on the questionnaires and the interviewer kept the record of those numbers which were scrutinized during recruitment process. The diagnosis of hypertension was made based on systolic and diastolic measurement of BP of 140/90mmHg, which was recorded for more than two consecutive times during their clinic visits and are on anti-hypertensive but their adherence to antihypertensive was not assessed.

3.10.1b Selection of Controls

The population control files which were the non-hypertensive PLWHIV were retrieved from the records, and enrollment of study participants was carried out at the beginning of every

day of the CCC clinic. The blood pressures of the participants were taken to ensure that they are truly non-hypertensive. With a simple random sampling of 90 participants from 1500 controls, they were matched on categorical age with a difference of + or – 5 with the cases i.e. for each case, a control which was more or less of age by five was matched with the control (e.g. a case who was 30 years was matched with a control who was between 25 years and 35 years) was used to recruit the number of participants. They were interviewed after assessing for eligibility, seen by the resident clinician on duty, and with informed consent. The file numbers were also entered in the questionnaire to avoid multiple enrollments.

Figure 3.1 Recruitment Flow Chart



3.11. Variables

3.11.1 Outcome Variables

The outcome variable for this study was hypertension

3.11.2. Predictor Variables

The predictor variables were the distribution of Clinical factors on CD4 level, viral load, ART treatment, ART naïve, duration on treatment.

Sociodemographic factors: age, sex, gender, level of education, level of income, marital status, tribe.

Lifestyle/Behavioral: Tobacco, alcohol, diet, physical activities.

Other predictor variables were awareness, attitude, and practices on hypertension.

3.12. Data Collection

Two research assistants were recruited and trained on the objectives of the study as well as the data collection instruments. These research assistants were available for the entire period of data collection. The study involved only quantitative data collection method. Data collection involved the use of questionnaires which were pretested on hypertensive and non-hypertensive PLWHIV and AIDS who attend their clinic at PCEA Kikuyu hospital. Quantitative data were collected through a semi structured questionnaire (Appendix 2) adopted from the WHO STEPS Instrument for non-communicable disease risk factor surveillance. Another Quantitative data were also collected through a self-report on awareness and management on hypertension using a fifteen question tool adopted from the International Journal on KAP research work by Pregnesh et al 2014. The quantitative data questionnaire captured information on patients sociodemographic factors e.g. age, sex,

educational level, working status, clinical effect of HIV on hypertension e.g. CD4 level, viral load, ART treatment and duration; lifestyle/behavioral factors like; smoking, alcohol intake diet and physical activities.

3. 13 Data Processing and Analysis

The data collected was managed by the principal investigator who checked the questionnaires for completeness and consistency after each day data collection. This information was entered with the use of excel then exported using Statistical Products and Service Solution, version 20.0 (SPSS) for analysis. When entered in the computer, the out of range values were detected using frequency distribution tables. Inconsistencies within data were detected by using cross tabulations. Matched case-control analysis was done by conditional logistic regression. Continuous variables were summarized using the means and medians, and compared using a paired t test or Wilcoxon signed rank test. Multivariate analyses were used to compare the modifiable risk factors between the cases and the controls. The chi square was used to compare the outcome and predictor variables between the two groups, odds ratios being used to determine the association between the groups

3.14 Minimization of Errors and Biases

1. Prior to commencement of the study, a study pre-test was carried out at PCEA Kikuyu hospital. The pretest and its results were used to fine tune the study instruments and to make any necessary adjustments to address any shortcomings and challenges prior to conducting the actual study.

2. The questionnaires were standardized to ensure uniformity; questionnaires were written in English and translated to Kiswahili for those who do not understand English.

3. Study participants were sampled randomly to avoid selection bias and participants were advised to participant only once in this study to avoid multiple responses.

4. The research assistants were trained on the objectives of the study as well as the data collection tools. This ensured uniformity in the data collection process.

3.15 Ethical Considerations

With the approval by the PCEA Kikuyu hospital to carry out the research in their facility, a consent form was given to the participants, this was to ensure the participants of their safety and privacy, and those who were willing to participate were consented and were well informed. This study was a hospital based analytical case-control study and was conducted during the normal clinical routines and therefore did not interfere with the medical conditions of the patients. Confidentiality was maintained on information regarding the patient since names of clients were not sought and the information was not traceable to medical personnel or the patients themselves. The research proposal was submitted to the University of Nairobi and Kenyatta National Hospital Ethical Review for approval. The researcher also asked permission from the Kenya National Council for Science and Technology. Permission was also sought from the medical superintendent of PCEA Kikuyu Hospital. The results were shared with all concerned parties.

CHAPTER 4.0: FINDINGS

4.1 Introduction

The findings of the study are presented in this chapter. The specific objective of the study was to investigate the risk factors associated with hypertension among PLWHIV/AIDS at PCEA Kikuyu hospital. A total of 180 participants that comprised of 90 cases and 90 controls who met the inclusion criteria were recruited to take part in the study.

4.2 Demographic Information of the Participants

This section presents the demographic information of the participants which includes their age, sex, marital status, county of residence, tribe, work status and education level.

Table 4.2.1 Demographic Information of the Participants

	Frequency n (%)			**P value**
	Cases	**Controls**	**Odds ratio (95% CI)**	
Age				
≤40	23 (25.6)	42 (46.7)	0.4; C.I: 0.2-0.7	0.003
>40	67 (74.4)	48 (53.3)		
Total	90 (100.0)	90 (100.0)		
Sex				
Male	34 (37.8)	24 (26.7)	1.7; C.I: 0.1-3.1	0.111
Female	56 (62.2)	66 (73.3)		
Total	90 (100.0)	90 (100.0)		
Marital status				
Married	78 (86.7)	66 (73.3)	2.4; C.1:1.1-5.1	0.025
Never married	12 (13.3)	24 (26.6)		
Total	90 (100.0)	90 (100)		
County of residence				
Kiambu	73 (81.1)	72 (80.0)	1.1; C.I:0.5-2.3	0.851
Others	17 (18.9)	18 (20.0)		
Total	90 (100)	90 (100)		
Ethnicity				
Kikuyu	70 (77.8)	71 (78.9)	0.9; C.I: 0.5-1.9	0.856
Others	20 (22.2)	19 (21.1)		

Total	90(100)	90 (100)		
Work status				
Employed	70 (77.8)	74 (82.2)	0.8;C.I:0.4-1.6	0.456
Unemployed	20 (22.2)	16 (17.8)		
Total	90 (100)	90 (100)		
Level of Education				
No formal	5 (5.6)	7 (7.9)	2.5; C.I: 1.4-4.6	0.009
Primary level	54 (60.0)	31 (34.8)		
Secondary level	25 (27.8)	39 (43.8)		
Tertiary	6 (6.6)	12 (13.5)		
Total	90 (100)	90 (100)		

The results of the socio-demographic data as shown by Table 4.2.1 reveal that 115 (63.9%) participants were aged above 40 years, while 65 (36.2%) of them were less than 40 years. Amongst the cases, 67 (74.4%) participants were above 40 years while 23 (25.6%) were below 40 years of age. The controls had 48 (53.3%) participants who were above 40 years while 42 (46.7%) of them were below 40 years. The mean age of the cases was 47.62 (9.29) years while that of the controls was 40.68 (9.28) years. There was a statistically significant difference between the cases and controls with respect to their age and the hypertensive are less likely to be ≤40 years (OR 0.4, C.I:0.2-0.7, p=0.00).

Of the 180 participants, the females were 112 (67.8%) while the males were 58 (32.2%). The cases had 56 (62.2%) females and 34 (37.8%) males while the controls had 66 (73.3%) females and 24 (26.7%) males. There was no statistically significant difference between the cases and controls with respect to their sex, $\chi 2$ (1) = 2.544, p = 0.111.

The results also indicate that there was statistically significant difference between the cases and controls with respect to their marital status and the married are 2.4 more likely to develop hypertension(OR=2.4, C.I:1.1-5.1, p=0.03). Level of education is also found to be statistically significant ($\chi 2$ (3) = 11.614, p = 0.009). However, the county of residence ($\chi 2$ (1)

= 0.035, p = 0.851), tribe ($\chi 2$ (1) = 0.033, p = 0.856), and work status ($\chi 2$ (1) = 0.556, p = 0.456) were not statistically significant.

4.3 Clinical characteristics of the participants

This section describes the clinical characteristics of the participant which involve the viral loads, CD4 counts, participant's duration on HAART, type of ARVs participants are on and BMI of the participants.

Table 4.3.1 Distribution of the clinical characteristics of the participants

	Frequency n (%)			**P value**
	Cases n (%)	**Controls n (%)**	**Odds ratio95% C.I**	
Viral load				
Non detectable	60 (90.9)	50 (89.3)	1.2; C.I: 0.4-4.0	0.76
Detectable	6 (9.1)	6 (10.7)		
Total	66 (100)	56 (100)		
CD4 levels				
<500	43 (48.9)	53 (64.4)	0.6; C.I: 0.3-1.0	0.06
≥500	45 (51.1)	31 (35.6)		
Total	88 (100)	84 (100)		
Duration on HAART				
<2 years	8 (9.5)	13 (15.1)	0.6; C.I:0.2-1.5	0.268
≥2 years	76 (90.5)	73 (84.9)		
Total	84 (100)	86 (100)		
BMI				
Severe/mild/moderate	2 (2.2)	5 (5.5)	0.4; C.I:0.2-0.7	0.004
Normal	22 (24.7)	41 (45.6)		
Obesity	65 (73.0)	44 (48.9)		
Total	89 (100)	90 (100)		
ARVS				
NNRTI/NRTI	76 (91.5)	79 (92.2)	0.8; C.I: 0.2-2.6	0.739
PI	7 (8.4)	6 (7.8)		
Total	85 (100)	85 (100)		

N/B the above CD4 and viral load were based on the most recent CD4 and viral loads done before data collection based on the Kenya Guidelines, 2016.

Majority of the participants had good viral suppression [110 (90.2%)] with only 12 (9.8%) having poor viral suppression. In addition to this, the findings also reveal that there was no statistically significant differences between the cases and controls with respect to their viral load, $\chi 2$ (1) = 0.090, p = 0.764.

In terms of mean CD4 cell count amongst the cases and controls (518 ± 285 cells/µL Vs. 467 ± 294 cells/µL), the study found that there was no significant differences between the two groups, $\chi 2$ (1) = 3.529, p = 0.060. This was also the case for the duration on HAART [$\chi 2$ (1) = 1.228, p = 0.268] and type of antiretroviral therapy [$\chi 2$ (1) = 0.111, p = 0.739] where there were no statistical differences. However, there were statistical significant differences on BMI, and underweight have a reduce odds to develop hypertension (OR=0.4, C.I: 0.2-0.7, p=0.00).

4.4 Lifestyle/Behavioral Characteristics of the Participants

This section describes the lifestyle/ behavioural characteristics of the participants which include alcohol intake, smoking habit, salt consumption, fruits and vegetables consumption

Table 4.4.1 Lifestyle/behavioral characteristics of the participants

	Frequency n (%)			**P value**
	Cases n (%)	**Controls n (%)**	**Odds ratio, 95% C.I**	
Alcohol intake				
Yes	45 (50.0)	40 (45.0)	1.2; C.I: 0.7-2.2	0.498
No	45 (50.0)	49 (55.0)		
Total	90 (100)	90 (100)		
Smoking habit				
Yes	19 (21.1)	16 (17.8)	1.24; C.I: 0.6-2.6	0.572
No	71 (78.9)	74 (82.2)		
Total	90 (100)	90 (100)		
Exercise				
Never	51 (58.6)	40 (46.5)	1.6; C.I: 0.9-3.0	0.111
Yes	36 (41.4)	46 (53.5)		
Total	87 (100)	86 (100)		
Fruits				

consumption				
Yes	89 (100.0)	86 (100.0)	-	-
No	0 (0.0)	0 (0.0)		
Total	89 (100)	86 (100)		
Vegetables intake				
Yes	89 (100.0)	90 (100.0)	-	-
No	0 (0.0)	0 (0.0)		
Total	89 (100)	90 (100)		
Salt intake				
Never	24 (26.7)	21 (23.3)	0.2; C.I:0.6-2.4	0.606
Yes	66 (73.3)	69 (76.7)		
Total	90 (100)	90 (100)		

All of the lifestyle and behavioral factors which included alcohol intake [$\chi 2$ (1) = 0.459, p = 0.498], smoking habit [$\chi 2$ (1) = 0.319, p = 0.572], exercise [$\chi 2$ (1) = 2.543, p = 0.111], p = 0.308], and salt intake [$\chi 2$ (1) = 0.627, p = 0.606] were found not to be statistically different between the cases and controls in regards to hypertension.

4.5 Participant's Knowledge, attitude and practices on hypertension

This section describes the awareness, attitude and management practices of the participants, which include, BP check, weight, check, normal blood pressure level, attitude on salt consumption etc. among others.

Table 4.5.1 Participants Knowledge on Hypertension

Knowledge	**Frequency n (%)**			**P value**
	Cases n (%)	**Controls n (%)**	**Odds ratio; 95% C.I**	
Knows the term BP				
Yes	4 (4.5)	9 (10.2)	0.4; C.I: 0.12-1.4	0.138
No	86 (95.5)	79 (89.8)		
Total	90 (100)	88 (100)		
Knows that hypertensive takes drugs daily				
Yes	58 (64.5)	28 (31.5)	4.0; C.I: 2.1-7.4	0.000
No	32 (35.5)	61 (68.5)		

Total	90 (100)	99 (100)		
Knows the normal blood pressure level				
Yes	3 (3.3)	7 (8.6)	0.4; C.I: 0.1-1.5	0.195
No	87 (96.7)	74 (91.4)		
Total	90 (100)	81 (100)		
Knows factors that cause HBP				
Yes	58 (64.4)	62 (71.3)	0.7; C.I: 0.4-1.4	0.332
No	32 (35.6)	25 (28.7)		
Total	90 (100)	87 (100)		
Knows lifestyle changes that can prevent HBP				
Yes	54 (60.0)	37 (41.6)	2.1; C.I: 0.4-1.3	0.014
No	36 (40.0)	52 (58.4)		
Total	90 (100)	89 (100)		

There was a significant difference between the hypertensive and non-hypertensive groups with respect to the knowledge that hypertensive takes drugs daily [$\chi 2$ (1) = 19.503, $p < 0.001$] and the knowledge on lifestyle changes that prevent BP [$\chi 2$ (1) = 6.080, $p = 0.014$]. There was no significant difference between these two groups with respect to knowledge on the term blood pressure [$\chi 2$ (1) = 2.198, $p = 0.138$], knowledge on the normal blood pressure levels [$\chi 2$ (1) = 2.182, $p = 0.195$], and knowledge on the factors that cause high blood pressure [$\chi 2$ (1) = 0.548, $p = 0.459$].

Table 4.5.2 Participants attitudes on hypertension

Attitude	**Frequency n (%)**			**P value**
	Cases n (%)	**Controls n (%)**	**Odds ratio; 95% C.I**	
Attitude that healthy lifestyle can help reduce HBP				
Yes	61 (67.8)	60 (67.4)	1.0; C.I: 0.5-1.9	0.959
No	29 (32.2)	29 (32.6)		
Total	90 (100)	89 (100)		
Attitude that HBP is preventable				

Yes	40 (44.4)	40 (44.9)	1.0; C.I: 0.5-1.7	0.892
No	50 (55.6)	48 (55.1)		
Total	90 (100)	88 (100)		
Attitude that reduce salt intake prevents BP				
Yes	51 (56.7)	42 (47.2)	1.5; C.I: 0.8-2.6	0.500
No	39 (43.4)	47 (52.8)		
Total	90 (100)	89 (100)		
Would like to change lifestyle to prevent BP				
Yes	86 (97.7)	83 (93.3)	3.1; C.I: 0.6-15.8	0.278
No	2 (2.3)	6 (6.7)		
Total	89 (100)	29 (100)		
Attitude that regular BP check is important				
Yes	83 (94.3)	72 (81.8)	3.7; C.I: 1.3-10.6	0.011
No	5 (5.7)	16 (18.2)		
Total	88(100)	88(100)		

There was a significant difference between the hypertensive and non-hypertensive groups with respect to attitude that regular BP check is important [$\chi 2$ (1) = 6.543, p = 0.11]. There was no significant difference between these two groups with respect to attitude on healthy lifestyle can help reduce HBP [$\chi 2$ (1) = 0.003, p = 0.959], attitude on the HBP pressure is preventable [$\chi 2$ (1) = 0.018, p = 0.892], attitude that reduce salt intake can help prevent BP [$\chi 2$ (1) = 0.455, p = 0.500] and attitude on lifestyle changes can prevent BP [$\chi 2$ (1) = 2.048, p = 0.278].

Table 4.5.3 Participants practices on hypertension

Practices	Frequency n (%)			P value
	Cases n (%)	Controls n (%)	Odds ratio (95% C.I)	
Regular BP check				
Yes	17 (20.7)	0 (0.0)	-	0.000
No	65 (79.3)	76 (100.0)		
Total	80 (100)	76 (100)		
Regular weight check				
Yes	68 (87.2)	76 (100.0)	-	0.001
No	10 (12.8)	0 (0.0)		
Total	88 (100)	76 (100)		
Regularly takes BP drugs for 2 weeks				
Yes	63 (70.8)	0 (0.0)	-	-
No	26 (29.2)	0 (0.0)		
Total	89 (100)	0		
Regularly go for exercise				
Yes	36 (41.4)	46 (53.5)	0.6;C.I: 0.3-1.1	0.111
No	51 (58.6)	40 (46.5)		
Total	87 (100)	86 (100)		
Consumption of salt on table				
Yes	66 (73.3)	69 (76.7)	0.8; C.I: 0.4-1.7	0.606
No	24 (26.7)	21 (23.3)		
Total	90 (100)	90 (100)		

There was a significant difference between the cases and controls with respect to practices on regular BP check [$\chi 2$ (1) = 17.656, $p < 0.001$], regular weight check [$\chi 2$ (1) = 10.420, $p = 0.001$], and intake of BP drugs for 2 weeks [$\chi 2$ (1) = 93.801, $p < 0.000$]. There was no significant difference between these two groups with respect to practices on regular exercise [$\chi 2$ (1) = 2.543, $p = 0.111$], and consumption of salt intake [$\chi 2$ (1) = 0.267, $p = 0.606$].

4.6 Stratification of socio demographic factors with other variables

This section describes the stratification of the socio demographic characteristics with the clinical, lifestyle/behavioural, knowledge, attitude, and practices factors to check for cofounders.

4.6.1 Stratification of socio demographic factors with clinical variables

Table 4.6.1 Stratification of socio demographic factors with the level of CD4 (<500 and ≥500)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=59) >40 (n=113)	3.227 (1)	0.051; C.I.: 0.289 – 1.002	0.072
Sex Male (n=56) Female (n=116)	4.149 (1)	0.028; C.I.: 0.262 – 0.928	0.042
Marital Status Married (n=138) Never married (n=34)	2.796 (1)	0.067; C.I.: 0.302 – 1.042	0.095
Residence Kiambu (n=138) Others (n=34)	3.010 (1)	0.062; C.I.: 0.308 – 1.029	0.083
Tribe Kikuyu (n=133) Other (n=39)	2.945 (1)	0.062; C.I.: 0.306 – 1.030	0.086
Work Status Employed (n=138) Unemployed (n=34)	2.949 (1)	0.062; C.I.: 0.306 – 1.030	0.086
Education Primary level and below (n=95) Secondary level and above (n=77)	1.347 (1)	0.185; C.I.: 0.347 – 1.226	0.246

The stratification of the sociodemographic characteristics with the CD4 level among the cases and controls indicate that there was statistically significant difference between CD4 level of <500 and ≥500 with respect to sex (chi=4.149, p=0.042).

Table 4.6.2 Stratification of socio demographic factor with the viral loads (detectable and non-detectable)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=44) >40 (n=78)	0.011 (1)	0.832; C.I.: 0.325 – 4.041	0.915
Sex Male (n=34) Female (n=88)	0.011 (1)	0.680; C.I.: 0.385 – 4.327	0.918
Marital Status Married (n=93) Never married (n=29)	0.083 (1)	0.981; C.I.: 0.289 – 3.562	0.773
Residence Kiambu (n=94) Others (n=28)	0.007 (1)	0.692; C.I.: 0.380 – 4.297	0.932
Tribe Kikuyu (n=94) Other (n=28)	0.000 (1)	0.747; C.I.: 0.365 – 4.070	0.988
Work Status Employed (n=96) Unemployed (n=26)	0.009 (1)	0.684; C.I.: 0.378 – 4.400	0.926
Education Primary level and below (n=67) Secondary level and above (n=55)	0.006 (1)	0.679; C.I.: 0.359 – 4.812	0.937

In the stratification of the distribution of the sociodemographic factors with the viral load, the result showed that there was no statistically significant difference observed among the cases and controls between the non- detectable and detectable viral loads.

Table 4.6.3 Stratification of socio demographic factors with the duration on HAART (<2 years and ≥ 2 years)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=58) >40 (n=112)	0.635 (1)	0.315; C.I.: 0.242 – 1.580	0.426
Sex Male (n=54) Female (n=116)	1.142 (1)	0.193; C.I.: 0.201 – 1.382	0.285
Marital Status Married (n=135)	1.400 (1)	0.168; C.I.: 0.204 – 1.319	0.237

Never married (n=35)			
Residence Kiambu (n=137) Others (n=33)	0.737 (1)	0.277; C.I.: 0.233 – 1.519	0.391
Tribe Kikuyu (n=133) Other (n=37)	0.765 (1)	0.272; C.I.: 0.234 – 1.506	0.382
Work Status Employed (n=135) Unemployed (n=35)	0.742 (1)	0.274; C.I.: 0.231 – 1.515	0.389
Education Primary level and below (n=91) Secondary level and above (n=78)	0.077 (1)	0.606; C.I.: 0.296 – 2.034	0.781

The results of the stratification of the sociodemographic characteristics with duration on HAART among the cases and controls indicate that there was no statistically significant differences between those who have been on HAART for <2 years and ≥2 years.

Table 4.6.4 Stratification of socio demographic factors with BMI (Normal and Abnormal)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=115)	7.719 (1)	0.377; C.I.: 0.196 – 0.726	0.005
Sex Male (n=58) Female (n=122)	7.260 (1)	0.398; C.I.: 0.210 – 0.753	0.007
Marital Status Married (n=144) Never married (n=36)	8.274 (1)	0.368; C.I.: 0.192 – 0.706	0.004
Residence Kiambu (n=145) Others (n=35)	7.876 (1)	0.394; C.I.: 0.210 – 0.739	0.005
Tribe Kikuyu (n=141) Other (n=39)	8.068 (1)	0.377; C.I.: 0.198 – 0.717	0.005
Work Status Employed (n=144) Unemployed (n=36)	8.346 (1)	0.377; C.I.: 0.199 – 0.713	0.004
Education Primary level and below (n=97) Secondary level and above	9.768 (1)	0.339; C.I.: 0.175 – 0.658	0.002

(n=82)			

The stratification of the sociodemographic characteristics with participants BMI among the cases and controls indicate that there were statistically significant differences observed between those who have normal and abnormal BMI with respect to; age (Chi=7.719, p=0.005), sex (Chi=7.260, p=0.007), marital status (Chi=8.274, p=0.004), residence (Chi=7.876, p=0.005), tribe (Chi=8.068, p=0.005), work status (Chi=8.346, p=0.004), level of education (Chi=9.768, p=0.002).

Table 4.6.5 Stratification of socio demographic factors with ARV (NNRTI/NRTI and PI)

Variable	**Mantel-Haenszel Chi-square (df)**	**Common Odds Ratio**	**Significance level**
Age ≤40 (n=58) >40 (n=110)	0.076 (1)	0.684; C.I.: 0.198 – 2.363	0.783
Sex Male (n=53) Female (n=115)	0.000 (1)	0.847; C.I.: 0.267 – 2.681	0.992
Marital Status Married (n=133) Never married (n=35)	0.092 (1)	0.698; C.I.: 0.216 – 2.254	0.761
Residence Kiambu (n=135) Others (n=33)	0.005 (1)	0.812; C.I.: 0.259 – 2.541	0.946
Tribe Kikuyu (n=131) Other (n=37)	0.003 (1)	0.818; C.I.: 0.263 – 2.548	0.955
Work Status Employed (n=134) Unemployed (n=34)	0.001 (1)	0.831; C.I.: 0.269 – 2.567	0.972
Education Primary level and below (n=89) Secondary level and above (n=78)	0.016 (1)	0.898; C.I.: 0.269 – 2.992	0.900

The stratification results of the socio demographic characteristics with the type of ARVs the patients take indicate that there no statistically significant differences between the cases and controls observed.

4.7 Stratification socio demographic factors on lifestyle/behavioural characteristics.

Table 4.7.1 Stratification of sociodemographic factors with Smoking

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=115)	0.004 (1)	1.093; C.I.: 0.534 – 2.235	0.949
Sex Male (n=58) Female (n=122)	0.003 (1)	0.885; C.I.: 0.373 – 2.103	0.956
Marital Status Married (n=144) Never married (n=36)	0.049 (1)	1.160; C.I.: 0.561 – 2.396	0.825
Residence Kiambu (n=145) Others (n=35)	0.141 (1)	1.238; C.I.: 0.591 – 2.595	0.707
Tribe Kikuyu (n=141) Other (n=39)	0.148 (1)	1.235; C.I.: 0.595 – 2.564	0.700
Work Status Employed (n=144) Unemployed (n=36)	0.122 (1)	1.226; C.I.: 0.584 – 2.574	0.727
Education Primary level and below (n=97) Secondary level and above (n=35)	0.375 (1)	1.365; C.I.: 0.638 – 2.919	0.540

The results of the stratification of the socio-demographic characteristics with smoking among cases and controls indicate that there were no statistically significant differences between those who smoke and those who do not smoke.

Table 4.7.2 Stratification of socio demographic factors with consumption of alcohol

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance Level
Age ≤40 (n=64) >40 (n=115)	0.057 (1)	1.123; C.I.: 0.623-2.023	0.811
Sex Male (n=57) Female (n=122)	0.009 (1)	1.022; C.I.: 0.543-1.925	0.926
Marital Status Married (n=144) Never married (n=35)	0.456 (1)	1.288; C.I.: 0.709-2.339	0.499
Residence Kiambu (n=144) Others (n=35)	0.293 (1)	1.231; C.1.: 0.684-2.218	0.589
Tribe Kikuyu (n=140) Others (n=39)	0.305 (1)	1.235; C.I.: 0.685-2.228	0.581
Work status Employed (n=143) Unemployed (n=36)	0.372 (1)	1.256; C.I.: 0.697-2.264	0.542
Education Primary level and below (n=97) Secondary level and above (n=81)	0.487 (1)	1.304; C.I.: 0.710-2.396	0.485

The results of the stratification of the socio demographic characteristics with alcohol intake among cases and controls indicate that there were no statistically significant differences observed.

Table 4.7.3 Stratification of socio-demographic factors with exercise

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=63) >40 (n=110)	2.324 (1)	1.684; C.I.: 0.913 – 3.104	0.127
Sex Male (n=55) Female (n=118)	3.803 (1)	1.746; C.I.: 0.952 – 3.202	0.094
Marital Status Married (n=140) Never married (n=33)	1.401 (1)	1.520; C.I.: 0.825 – 2.801	0.237
Residence Kiambu (n=139) Others (n=34)	2.055 (1)	1.628; C.I.: 0.893 – 2.971	0.152
Tribe Kikuyu (n=138) Other (n=35)	2.037 (1)	1.628; C.I.: 0.891 – 2.975	0.154
Work Status Employed (n=137) Unemployed (n=36)	1.952 (1)	1.581; C.I.: 0.876 – 2.854	0.162
Education Primary level and below (n=96) Secondary level and above (n=76)	2.248 (1)	1.695; C.I.: 0.909 – 3.160	0.134

In the stratification of the socio-demographic factors with exercise among the cases and controls indicate that there were no statistically significant differences observed.

Table 4.7.4 Stratification of the socio-demographic characteristics on salt intake

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=115)	0.029 (1)	1.126; C.I.: 0.570 – 2.225	0.865
Sex Male (n=58) Female (n=122)	0.169 (1)	1.226; C.I.: 0.620 – 2.422	0.681
Marital Status Married (n=144) Never married (n=36)	0.017 (1)	1.111; C.I.: 0.563 – 2.194	0.896
Residence Kiambu (n=145) Others (n=35)	0.123 (1)	1.195; C.I.: 0.611 – 2.338	0.726
Tribe Kikuyu (n=141) Other (n=39)	0.106 (1)	1.178; C.I.: 0.609 – 2.276	0.745
Work Status Employed (n=144) Unemployed (n=36)	0.195 (1)	1.241; C.I.: 0.626 – 2.459	0.659
Education Primary level and below (n=97) Secondary level and above (n=82)	0.115 (1)	1.191; C.I.: 0.604 – 2.348	0.735

The results of the stratification of the socio-demographic characteristics with salt intake among the cases and controls indicate that there were no statistically significant differences observed.

4.8 Stratification of the socio demographic factors on knowledge, attitude and practices

Table 4.8.1 Stratification of the Socio demographic factors on the knowledge of what BP means

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=64) >40 (n=114)	0.835 (1)	0.436; C.I.: 0.118 – 1.606	0.361
Sex Male (n=57) Female (n=121)	1.811 (1)	0.370; C.I.: 0.108 – 1.266	0.178
Marital Status Married (n=142) Never married (n=36)	0.850 (1)	0.451; C.I.: 0.127 – 1.601	0.357
Residence Kiambu (n=144) Others (n=34)	1.403 (1)	0.409; C.I.: 0.120 – 1.387	0.236
Tribe Kikuyu (n=139) Other (n=39)	1.412 (1)	0.404; C.I.: 0.118 – 1.380	0.235
Work Status Employed (n=142) Unemployed (n=36)	1.363 (1)	0.420; C.I.: 0.125 – 1.403	0.243
Education Primary level and below (n=96) Secondary level and above (n=81)	0.087 (1)	0.675; C.I.: 0.189 – 2.413	0.769

In the stratification of the socio-demographic characteristics with the knowledge on the term high blood pressure among the cases and controls, indicates that there were no statistically significant differences between those who know what blood pressure means and those who don't.

Table 4.8.2 Stratification of the socio-demographic factors with knowledge that hypertensive take drugs daily (Yes and No)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=114)	20.114 (1)	4.284; C.I.: 2.244 – 8.177	0.000
Sex Male (n=57) Female (n=122)	17.178 (1)	3.637; C.I.: 1.975 – 6.696	0.000
Marital Status Married (n=143) Never married (n=36)	18.940 (1)	4.216; C.I.: 2.225 – 7.988	0.000
Residence Kiambu (n=144) Others (n=35)	18.324 (1)	3.920; C.I.: 2.109 – 7.288	0.000
Tribe Kikuyu (n=140) Other (n=39)	17.996 (1)	3.939; C.I.: 2.115 – 7.337	0.000
Work Status Employed (n=143) Unemployed (n=36)	17.940 (1)	3.947; C.I.: 2.118 – 7.355	0.000
Education Primary level and below (n=97) Secondary level and above (n=81)	19.570 (1)	4.519; C.I.: 2.331 – 8.758	0.000

The results of the stratification of the socio-demographic characteristics with knowledge that hypertensive takes drugs daily among cases and controls indicate that there were statistically significant differences observed with respect to age (Chi=20.11, p=0.00), sex (Chi=17.178, p=0.00), marital status (Chi=18.940, p=0.00), residence (Chi=18.324, p=0.00), tribe (Chi=17.996, p=0.00), work status (Chi=17.940, p=0.00), and level of education (Chi=19.57, p=0.00).

Table 4.8.3 Stratification of the socio demographic characteristics on what is the normal blood pressure

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=114)	1.237 (1)	0.383; C.I.: 0.096 – 1.523	0.266
Sex Male (n=57) Female (n=122)	1.606 (1)	0.361; C.I.: 0.094 – 1.383	0.205
Marital Status Married (n=143) Never married (n=36)	1.011 (1)	0.383; C.I.: 0.092 – 1.591	0.315
Residence Kiambu (n=144) Others (n=35)	0.952 (1)	0.415; C.I.: 0.105 – 1.646	0.329
Tribe Kikuyu (n=140) Other (n=39)	0.976 (1)	0.404; C.I.: 0.101 – 1.617	0.323
Work Status Employed (n=143) Unemployed (n=36)	0.980 (1)	0.400; C.I.: 0.099 – 1.613	0.322
Education Primary level and below (n=97) Secondary level and above (n=81)	0.142 (1)	0.580; C.I.: 0.135 – 2.493	0.706

The results of the stratification of the socio demographic factors with the knowledge on what the normal BP is among cases and controls indicates that there was statistically significant differences observed.

Table 4.8.4 Stratification of the Socio demographic characteristics on the knowledge of the causes of HBP

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=64) >40 (n=113)	1.190 (1)	0.662; C.I.: 0.346 – 1.268	0.275
Sex Male (n=57) Female (n=120)	0.494 (1)	0.753; C.I.: 0.397 – 1.428	0.482
Marital Status Married (n=141) Never married (n=36)	1.311 (1)	0.646; C.I.: 0.335 – 1.243	0.252
Residence Kiambu (n=142) Others (n=35)	0.631 (1)	0.733; C.I.: 0.389 – 1.383	0.427
Tribe Kikuyu (n=149) Other (n=38)	0.621 (1)	0.734; C.I.: 0.389 – 1.387	0.431
Work Status Employed (n=141) Unemployed (n=36)	0.638 (1)	0.732; C.I.: 0.388 – 1.381	0.425
Education Primary level and below (n=97) Secondary level and above (n=79)	1.358 (1)	0.640; C.I.: 0.331 – 1.237	0.244

The results of the stratification of the socio demographic factors on the causes of HBP among cases and controls indicates that there was no statistically significant findings observed

Table 4.8.5 Stratification of the Socio demographic factors on lifestyle changes that can prevent HBP

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=114)	5.918 (1)	2.253; C.I.: 1.215 – 4.177	0.015
Sex Male (n=57) Female (n=122)	5.585 (1)	2.114; C.I.: 1.167 – 3.828	0.018
Marital Status Married (n=143) Never married (n=36)	5.088 (1)	2.100; C.I.: 1.147 – 3.846	0.024
Residence Kiambu (n=144) Others (n=35)	5.347 (1)	2.092; C.I.: 1.157 – 3.782	0.021
Tribe Kikuyu (n=140) Other (n=39)	5.302 (1)	2.090; C.I.: 1.155 – 3.780	0.021
Work Status Employed (n=143) Unemployed (n=36)	5.801 (1)	2.200; C.I.: 1.201 – 4.027	0.016
Education Primary level and below (n=97 Secondary level and above (n=81)	7.715 (1)	2.592; C.I.: 1.365 – 4.924	0.005

The stratification of the socio demographic factors on the knowledge of the lifestyle changes that can prevent HBP among cases and controls indicates that there were statistically significant findings observed with respect to age (p=0.015, Chi=5.918 (1)), sex (p=0.018, Chi=5.585 (1)), marital status (p=0.024, Chi=5.088 (1)), residence (p=0.021, Chi=5.347 (1)), tribe (p=0.021, Chi=5.302 (1)), work status (p=0,16, Chi= 5.801 (1)), and level of education (p=0.005, Chi= 7.715 (1)).

4.9 Stratification of the socio demographic factors on attitude of the participants

Table 4.9.1 Stratification of the of Socio demographic factors with the attitude that healthy lifestyle is important to reduce HBP.

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=114)	0.00007 (1)	0.944; C.I.: 0.495 – 1.803	0.993
Sex Male (n=57) Female (n=122)	0.0002 (1)	0.955; C.I.: 0.511 – 1.784	0.988
Marital Status Married (n=143) Never married (n=36)	0.00002 (1)	1.056; C.I.: 0.559 – 1.995	0.996
Residence Kiambu (n=144) Others (n=35)	0.014 (1)	1.013; C.I.: 0.542 – 1.893	0.906
Trisbe Kikuyu (n=140) Other (n=39)	0.010 (1)	1.019; C.I.: 0.544 – 1.906	0.919
Work Status Employed (n=143) Unemployed (n=36)	0.003 (1)	1.033; C.I.: 0.551 – 1.937	0.953
Education Primary level and below (n=97) Secondary level and above (n=81)	0.087 (1)	1.167; C.I.: 0.606 – 2.250	0.769

The stratification of the socio demographic factors with the attitude that healthy lifestyle can help reduce high blood pressure among cases and controls indicate that there was no statistically significant findings observed.

Table 4.9.2 Stratification of the Socio demographic factors with the attitude that high blood pressure is preventable (Yes and No)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=114)	0.078 (1)	0.873; C.I.: 0.474 – 1.608	0.780
Sex Male (n=57) Female (n=122)	0.00004 (1)	0.961; C.I.: 0.531 – 1.740	0.984
Marital Status Married (n=143) Never married (n=36)	0.0002 (1)	0959; C.I.: 0.527 – 1.744	0.989
Residence Kiambu (n=144) Others (n=35)	0.007 (1)	0.981; C.I.: 0.545 – 1.765	0.932
Tribe Kikuyu (n=140) Other (n=39)	0.009 (1)	0.984; C.I.: 0.545 – 1.777	0.923
Work Status Employed (n=143) Unemployed (n=36)	0.011 (1)	0.986; C.I.: 0.547 – 1.780	0.917
Education Primary level and below (n=97) Secondary level and above (n=81)	0.282 (1)	1.251; C.I.: 0.664 – 2.357	0.595

The stratification of the socio demographic characteristics with the attitude on those who think that HBP is preventable among cases and controls indicate that there was no statistically significant difference observed.

Table 4.9.3 Stratification of the Socio demographic factors with attitude that reduce salt intake can help prevent HBP.

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=114)	1.698 (1)	1.574; C.I.: 0.856 – 2.893	0.193
Sex Male (n=57) Female (n=122)	1.224 (1)	1.465; C.I.: 0.809 – 2.651	0.269
Marital Status Married (n=143) Never married (n=36)	2.202 (1)	1.667; C.I.: 0.905 – 3.068	0.138
Residence Kiambu (n=144) Others (n=35)	1.268 (1)	1.467; C.I.: 0.814 – 2.641	0.260
Tribe Kikuyu (n=140) Other (n=39)	1.262 (1)	1.468; C.I.: 0.814 – 2.648	0.261
Work Status Employed (n=143) Unemployed (n=36)	1.371 (1)	1.493; C.I.: 0.825 – 2.699	0.242
Education Primary level and below (n=97) Secondary level and above (n=81)	2.625 (1)	1.746; C.I.: 0.938 – 3.248	0.105

The stratification of the socio demographic factors with the attitude that reduce salt intake can help prevent HPB among the cases and controls indicate that there was no statistically significant difference observed.

Table 4.9.4 Stratification of the socio demographic factors with attitude on those who would like to change their lifestyle if need be to prevent HBP.

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=112)	0.841 (1)	2.749; C.I.: 0.539–14.016	0.359
Sex Male (n=57) Female (n=120)	0.824 (1)	2.718; C.I.: 0.541–13.665	0.364
Marital Status Married (n=141) Never married (n=36)	1.367 (1)	3.475; C.I.: 0.662–18.238	0.242
Residence Kiambu (n=142) Others (n=35)	1.106 (1)	3.107; C.I.: 0.604–15.977	0.293
Tribe Kikuyu (n=138) Other (n=39)	1.137 (1)	3.072; C.I.: 0.610–15.480	0.286
Work Status Employed (n=141) Unemployed (n=36)	1.177 (1)	3.230; C.I.: 0.620–16.827	0.278
Education Primary level and below (n=95) Secondary level and above (n=81)	2.398 (1)	4.718; C.I.: 0.875–25.427	0.122

The results of the stratification of the socio demographic factors with the attitude on those who would like to change their life style if need be to prevent HBP among the cases and controls indicates that there was no statistically significant differences observed.

Table 4.9.5 Stratification of the Socio demographic factors on the attitude that regular BP check is important (Yes and No)

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=64) >40 (n=112)	5.468 (1)	3.590; C.I.: 1.256–10.258	0.019
Sex Male (n=57) Female (n=119)	4.984 (1)	3.375; C.I.: 1.202–9.481	0.026
Marital Status Married (n=141) Never married (n=35)	5.152 (1)	3.609; C.I.: 1.253–10.389	0.023
Residence Kiambu (n=142) Others (n=35)	5.354 (1)	3.688; C.I.: 1.288–10.564	0.021
Tribe Kikuyu (n=138) Other (n=38)	5.383 (1)	3.691; C.I.: 1.290–10.561	0.020
Work Status Employed (n=140) Unemployed (n=36)	5.320 (1)	3.712; C.I.: 1.288–10.698	0.021
Education Primary level and below (n=96) Secondary level and above (n=79)	6.110 (1)	4.634; C.I.: 1.481–14.502	0.013

The results of the stratification of the socio demographic characteristics with the attitude that regular BP check is important among cases and controls indicate that there was statistically significant differences observed with regards to age (p=0.019, Chi= 5.468 (1)), sex (p=0.026, Chi=4.984 (1)), marital status (p=0.023, Chi=5.152 (1)), residence (p=0.021, Chi=5.354 (1)), tribe (p=0.020, Chi=5.383 (1)), work status (p=0.021, Chi=5.320 (1)), and level of education (p=0.013, Chi=6.110 (1)).

4.10 Stratification of the socio demographic factors with practices on hypertension.

Table 4.10.1 Stratification of the Socio demographic factors with practices on weight check.

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=56) >40 (n=98)	6.451 (1)	0.000	0.011
Sex Male (n=52) Female (n=102)	9.198 (1)	0.000	0.002
Marital Status Married (n=120) Never married (n=34)	7.638 (1)	0.000	0.006
Residence Kiambu (n=125) Others (n=29)	8.362 (1)	0.000	0.004
Tribe Kikuyu (n=120) Other (n=34)	8.305 (1)	0.000	0.004
Work Status Employed (n=122) Unemployed (n=32)	8.334 (1)	0.000	0.004
Education Primary level and below (n=80) Secondary level and above (n=74)	8.123 (1)	0.000	0.004

The results of the stratification of the socio demographic factor on how often participants check their weight among cases and controls indicates that there was statistically significant differences with respect to age (p=0.011, Chi=6.451 (1)), sex (p=0.002, Chi=9.198 (1)), marital status (p=0.006, Chi=7.638 (1)), residence (p=0.004, Chi=8.362 (1)), tribe (p=0.004, Chi=8.305 (1)), work status (p=0.004, Chi=8.334 (1)), and level of education (p=0.004, Chi=8.123 (1)).

Table 4.10.2 Stratification of the Socio demographic factors with exercise

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=63) >40 (n=110)	2.324 (1)	1.684; C.I.: 0.913–3.104	0.127
Sex Male (n=55) Female (n=118)	2.803 (1)	1.746; C.I.: 0.952–3.202	0.094
Marital Status Married (n=140) Never married (n=33)	1.401 (1)	1.520; C.I.: 0.825–2.801	0.237
Residence Kiambu (n=139) Others (n=34)	2.055 (1)	1.628; C.I.: 0.893–2.971	0.152
Tribe Kikuyu (n=138) Other (n=35)	2.037 (1)	1.628; C.I.: 0.891–2.975	0.154
Work Status Employed (n=137) Unemployed (n=36)	1.952 (1)	1.581; C.I.: 0.876–2.854	0.162
Education Primary level and below (n=96) Secondary level and above (n=76)	2.248 (1)	1.695; C.I.: 0.909–3.160	0.134

The results of the stratification of the socio demographic characteristics with the attitude on how often participants engage in exercise among the cases and controls indicates that there was no statistically significant findings observed.

Table 4.10.3 Stratification of the Socio demographic factors with the participant's consumption of salt on table

Variable	Mantel-Haenszel Chi-square (df)	Common Odds Ratio	Significance level
Age ≤40 (n=65) >40 (n=115)	0.029 (1)	1.126; C.I.: 0.570–2.225	0.865
Sex Male (n=58) Female (n=122)	0.169 (1)	1.226; C.I.: 0.620–2.422	0.681
Marital Status Married (n=144) Never married (n=36)	0.017 (1)	1.111; C.I.: 0.563–2.194	0.896
Residence Kiambu (n=145) Others (n=35)	0.123 (1)	1.195; C.I.: 0.611–2.338	0.726
Tribe Kikuyu (n=141) Other (n=39)	0.106 (1)	1.178; C.I.: 0.609–2.276	0.745
Work Status Employed (n=144) Unemployed (n=36)	0.195 (1)	1.241; C.I.: 0.626–2.459	0.659
Education Primary level and below (n=97) Secondary level and above (n=82)	0.115 (1)	1.191; C.I.: 0.604–2.348	0.735

The stratification of the socio demographic factors with how often participants add salt on food while on table among cases and controls indicate that there was no statistically significant differences observed.

4.11 Independent risk factors associated with hypertension

Table 4.11.1 Independent risk factors associated with hypertension

The following variables were entered into logistic regression model as shown on Table 4.11.1

	B	S.E.	Wald	df	Sig.	Odds ratio	95% CI Odds Lower	for Ratio Upper
Age	-1.162	0.524	4.906	1	0.027	0.313	0.112	0.875
Marital status	1.410	0.642	4.822	1	0.028	4.097	1.164	14.427
Education			23.048	3	0.000			
Primary	-3.262	1.261	6.696	1	0.010	0.038	0.003	0.453
Secondary	-4.692	1.122	17.477	1	0.000	0.009	0.001	0.083
Tertiary	-2.440	1.019	5.727	1	0.017	0.087	0.012	0.643
BMI			12.761	2	0.002			
Normal	1.134	1.175	0.931	1	0.335	3.108	0.310	31.114
Obese	2.073	0.583	12.656	1	0.000	7.950	2.537	24.913
Knowledge: on daily intake of htn drugs	2.583	0.612	17.846	1	0.00	13.243	3.994	43.909
Knowledge: on lifestyle prevention of BP	0.423	0.540	0.615	1	0.433	1.527	0.530	4.396
Attitude: regular bp check is important	1.534	0.951	2.605	1	0.107	4.638	0.720	29.886
Practices: regular bp check	19.965	8679.58	0.000	1	0.998	468346	0.000	
Practices: weight check	-19.252	9702.14	0.000	1	0.998	0.000	0.000	
Constant	-23.980	19886.48	0.000	1	0.999	0.000		

Logistic regression was performed to ascertain the effects of selected significant predictor variables on the likelihood that respondents would be hypertensive. The predictor variables were respondent's age, marital status, level of education, BMI, knowledge that hypertensive takes drugs daily, knowledge that lifestyle changes can prevent high blood pressure, attitude that regular BP check is important, practices on participants regular BP and weight check. The model explained 60% (Nagelkerke R2) of the variance in hypertension and correctly classified 82% of cases.

From the results on Table 4.11.1 it can be seen that age (p=0.027), marital status (p=0.028), overall level of education (0.000), overall BMI, (P=0.002), and the knowledge that hypertensive takes drugs daily (p=0.00) were all found to be statistically significant. Those who are obese are 4.8 times higher to develop hypertension than those who have normal BMI. Those who are married have 4.1 higher odds to develop HBP than those who are unmarried. The knowledge that a person with high blood pressure should take drug daily was also found to be statistically significant and are 1.5 times higher odds to develop high blood among those who are not aware of this.

4.12 Hypothesis Testing

1. Null Hypothesis: There is no association of sociodemographic factors on hypertension between hypertensive and non-hypertensive PLWHIV/AIDS. Using level of significance as 0.05 and chi-square tests, the findings were as follows age (p=0.027), marital status (0.028), level of education (p=0.00). Thus, the above null hypothesis is rejected based on the p-values that are less than 0.05.

2. Null Hypothesis: There is no association of clinical factors on hypertension between hypertensive and non- hypertensive PLWHIV/AIDS. Findings: BMI (P=0.002). This null hypothesis is rejected due to P values <0.05.

3. Null Hypothesis: There is no association of behavioral/lifestyle practices on hypertension between hypertensive and non-hypertensive PLWHIV/AIDS. Findings: None of the lifestyle practices was statistically significant. Therefore, the above null hypothesis was not rejected based on the p- values that are greater than 0.05.

4. Null Hypothesis: There is no association of awareness, attitude and practices on hypertension between the hypertensive and non-hypertensive PLWHIV/AIDS. Findings: this null hypothesis is rejected because the knowledge that hypertensive takes drugs daily was significant (p=0.00).

CHAPTER FIVE

5.0 Discussion of Findings

5.1 Socio-Demographic Factors

The purpose of this study was to investigate the factors associated with hypertension amongst the PLWHIV/AIDS receiving care at the PCEA Kikuyu hospital CCC unit. The study comprised of 90 cases (hypertensive) and 90 controls (normotensives). The age of the participants ranged from 18 – 78 years with mean and standard deviation of 47.62 (9.29) years for the cases and 40.48 (9.28) for the controls. Majority of the participants were above 40 years [115 (63.9%)], and this confirms the report from the KAIS (2015), which states that the highest proportion of people currently infected with HIV are between the ages of 34 – 44 years. There was a statistical significance difference between the cases and controls in respect to age, $\chi 2$ (1) = 8.693, p = 0.03. This is in agreement with studies done by Palacios et al (2002), Evanzio et al (2010) and Seaborg et al (2003) who looked at the impact of HAART on blood pressure and discovered that increasing age was associated with an increase of BP. Majority of the participants were also females who were 112 (67.8%), though there was no statistically significant difference between the cases and controls with respect to sex (p = 0.11), but this is in congruent with what is observed at the national level where women in Kenya are more vulnerable to HIV infections compared to men with the national HIV prevalence at 7.0 per cent and 4.7 per cent for men (NASCOP, 2016). This study showed that level of education is independently associated with hypertension, and those in tertiary institution are 0.1 times likely to develop high blood pressure (p = 0.00). This finding concurs with Tedesco et al (2003), who wrote that those who are more educated have high social status, sedentary living, hence with increase in level of high blood pressure. Marital status is independently associated with hypertension, and hypertensive patients had significantly

reduced odds of being unmarried (p=0.02). This study concurs with Wang et al (2005) findings that when compared married and unmarried prevalence of hypertension among Chinese women, women entering married life have hypertension prevalence level of 19% than those remaining unmarried with a level of 18% with statistically significant differences (P<0.001).

5.2 Clinical Factors

Majority of the participants had good viral suppression 110 (90.2%), with only12 (9.8%) having poor viral suppression with detectable viral load. This indicates good knowledge and adherence to ART medication. In this study, viral load (p=0.8), CD4 level (p=7), and duration on HAART (p=0.3) were not associated with high blood pressure, even though >80% of the participants have been on ART for ≥2 years. This does not concur with a study done elsewhere by Seaborg et al (2005) who found that HAART may induce hypertension through the acceleration of atherogenesis and subsequent hardening of the walls of blood vessels. He also said that this increase of BP was after 48 weeks on HAART and a longer follow up of patients on HAART would reveal more information about the true role on HAART and its metabolic consequences for high BP. The participants in this study were on NNRTI/NRTI or PI, with 115 (92.2%) being on NNRTI and NRTI, while 12 (7.7%) of them were on PI and are not independently associated with hypertension (p = 0.739). This finding contradicts the study done elsewhere by Crane et al (2006), who found out that elevated blood pressure was linked with the patients on treatment with PI (ritonavir boosted lopinavir) and was 2.5 times more likely to cause high blood pressure than NNRTI and NRTI (EFV/TDF). They concluded that the increase in BP in the HIV infected patients was partly attributed to HAART which contributed to improvement in the general state of health of these patients, hence, explained why patients with advanced stage of HIV infection and with previous lower baseline systolic blood pressure had a sudden increase in systolic blood pressure.

BMI was found to be independently associated with high blood pressure and the obese are 7.9 times likely to develop high blood pressures (p = 0.00). This is in agreement with a study done by Evanizero et al (2010), who found that hypertension was associated with high BMI values. This was due to the weight gained during treatment on HAART. Amongst the infected patients, the loss of weight enhances the fantasy of appearing ill, and this may be seen as a "taboo". Nutritional intervention aimed at maintaining a healthy weight should be emphasized as it is likely to offer protection against the onset of hypertension. Sattler et al (2001) in a case – control study done in the USA demonstrated that elevated blood pressure in subjects with lipodystrophy revealed that increased systolic blood pressure was more likely to become elevated in the event of an increased waist-hip-ratio. The authors therefore proposed that intervention to manage hypertension should be instituted in patients with three or more elevated systolic blood pressure readings. This augurs well with this study as 63% of the cases had systolic blood pressure of 140 to≥ 180 mmHg which signifies poor control of blood pressure.

5.3 Lifestyle/Behavioral Factors

Lifestyle factors are critical determinants of blood pressure levels and subsequently in management of hypertension. Excess body fat is a predominant cause of hypertension with additive effects of dietary salt, alcohol, and physical inactivity. According to Appel et al (1997), Dietary Approach to Stop Hypertension (DASH), a diet low in sodium, high in fruits, vegetables, and calcium is helpful in management of hypertension. Also, exercise is equally critical, especially to children and young adults who have heightened sympathetic nervous system activity. The outcomes of this study demonstrated no association with hypertension in respect to alcohol intake (p = 0.498), smoking habit (p = 0.572), exercise (p = 0.111) and salt intake (p = 0.606) between the cases and controls. This finding could be as a result of the counseling classes the patients undergo before they are started on ART (Kenya 2016 edition,

HIV guideline). These sessions include education on drug-food, drug-drug, drug-alcohol, and drug-smoking interactions. The other great contributory factors to good lifestyle practices to high blood pressure among the participants in this study can be from the major occupation which is farming that allows them to cultivate and consume a lot of their produce which is mainly fruits and vegetables. The physical activity associated with farming also could be a contributory factor. Patients with elevated blood pressure should follow a weight-reducing diet, take regular exercise, and restrict alcohol and salt intake (Dickson et al, 2006).

5.4 Knowledge, Attitude and Practices of Hypertension of the Participants

Knowledge is referred to the state of being aware of a fact, phenomenon or occurrence, either through experiences or training. The knowledge, attitude and practices of the participants were assessed by the use of a structured self-report fifteen questionnaire on the awareness and management of hypertension. In a similar study done by Jokisalo et al (2005), it was found that poor knowledge on health had been associated with poor compliance. Their study also revealed that patients who were aware of how elevated blood pressure levels reduces life expectancy had a great compliance level with use of medication, follow up visits than patients lacking this awareness. Hence, blood pressure education therefore, seems to be the key in improving patient's adherence, and reduction in the risk of progression. It should be noted that in this study that the patients were well versed with the knowledge and good practices and hence had a great adherence to their ART, but were poor in awareness of hypertension, irrespective of the fact that they are more at risk of it. When asked on what the term blood pressure means, 93% of the total participants did not know what it is, 96% of the cases, and 90% of the controls respectively. Many of the participants, 40% of the cases and 58% of the controls with statistically significant($p=0.014$) did not know the lifestyle changes that can cause HBP like stress, alcohol, salt intake etc. but believed that it was caused by too much thinking, or excess blood in the body that is looking for a way out. All these

misconceptions and beliefs may be the reason for the poor practices with high non adherence to antihypertensive. The observation in this study agrees with Tecla M et al (2016) in their study in Kenya on lay belief and knowledge on hypertension among PLWHIV. Olivera et al (2005), and Babaei et al (2008), reported that about 90% of their studied hypertensive demonstrated sufficient knowledge with valid perception and positive attitude to the treatment of hypertension, including implementation of adequate lifestyle practices. This does not agree with this study as 61% and 67% of the cases and controls respectively demonstrated poor knowledge on hypertension.

In terms of the attitude of the participants, 68% and 67% of the cases and controls respectively were aware of the healthy lifestyle which can reduce hypertension with no statistically significant findings (p=0.96). This is also applicable to those who would like to change their lifestyle if need be to prevent hypertension, 97%% and 93% among the cases and controls respectively with no statistically significant findings observed (p=0.27). Generally in this study, 72% and 67% of the cases and controls respectively, demonstrated positive attitude on the lifestyle measures in the prevention and management of high blood pressure, hence agrees with Olivera et al (2005) who reported 90% positive attitude to hypertension in their study participants.

The participants demonstrated poor practices to hypertension, 79% of the cases and 100% of the controls with statistically significant differences (p=0.00) do not regularly check their blood pressure, while 87% of the cases and 100% of the controls with statistically significant differences (0.001) have good practices on weight check. This could be attributable to high number of places which are owned by individuals where weight checks are done. These demonstrate poor practices across board for the cases and the controls, unaware of the risks of hypertension as generally, only 49% and 35% of the cases and controls respectively demonstrated good practices on hypertension. This also contradicts other studies whose

participants demonstrated 90% good practices and implementation on hypertension (Olivera et al 2005). Hence, there should be an initiative by the medical professionals and the government to promote knowledge with correct perceptions on the dangers and good practices on management of hypertension.

5.5 CONCLUSION

This study looked at the risk factors associated with hypertension amongst the PLWHIV/AIDS at the PCEA Kikuyu Hospital. Factors such as increasing age and notably marital status were independently associated with hypertension with the never married seemingly demonstrating protection against hypertension. Other factors such as, level of education reveals that those who are more educated with high social status and high sedentary living have higher chances of developing hypertension. Similarly, it is important to note that the population of females living with HIV is on the increase and policies should be in place to address this and offer tailored solution to reduce transmission and achievement of the 90-90-90 HIV intervention by the MoH of Kenya (NASCOP, 2016). CD4 level was not associated with hypertension and also the risk of developing hypertension was not associated with the duration one was on HAART.

However, in the course of this study, some findings which were not part of the objectives were noted. It was noted that ignorance was high in regards to hypertension treatment, and some of the participants consume herbal medicines thereby reducing the efficacy of both the antihypertensive and the ART. This, they said is because of the pill burden and the belief that high blood pressure was caused by too much blood; hence, by taking the herbal medication, it will help to reduce the quantity of blood in the body through urination. Alcohol intake is on the increase and majority of the participants are not aware of the WHO recommendation in regards to smoking, alcohol and dieting in controlling high blood pressure. Policies should

therefore be put in place to educate people with an emphasis on good lifestyle modification in the control of hypertension such as low salt intake, physical activities, smoking, as well as alcohol consumption as these will also help to achieve the WHO 2030 strategic plan on NCD.

5.6 RECOMMENDATIONS

1. There should be inclusion of hypertension awareness programme into the ongoing HIV programme in the country
2. Awareness on lifestyle modification on hypertension should be disseminated to the general public via posters, TV, churches, schools, etc. as well as more research on lifestyle modification of HBP.
3. Information obtained here will be sent to the MoH through the national programme on HIV/AIDS to design an education sensitive programme to address hypertension prevention among PLWHIV/AIDS.
4. There should be an initiative by the government to offer free BP, weight, and BMI check for the general public. This will help to curb and control hypertension menace through early detection and intervention.
5. An initiative by the medical professionals and the government should be put in place to promote knowledge, with correct perceptions on the dangers and good practices on hypertension.

5.7 Study Limitation.

This study was limited to the patients seeking hypertension and HIV/AIDS care at PCEA Kikuyu hospital therefore,

- The study relied only on the information given by the respondents, hence generalization could not be guaranteed.
- Also, it was expected that misinformation may compromise the results of the study.
- Tests such as lipid profiles to ascertain lipodystrophy were not done due to financial issues.

5.8 Study Strength.

- The case control study design of this study was to study the multiple risk factors of hypertension which was done.
- The odds ratio which was calculated has helped to approximate the risk of hypertension among PLWHIV/AIDS.
- This is the first time this type of study has been done at PCEA Kikuyu hospital.

References

1. Abdesslam B, (2009). Social Determinants, Health Equity and Human Development. Bentham E- Book Science Publishers.

2. Anon,(2016).[online]Availableat:https://www.heart.org/HEARTORG/General/Heart-and-Stroke-Association-Statistics_UCM_319064_SubHomePage.jsp [Accessed 3 Aug. 2016].

3. Appel LJ, Champagne CM, Harsha DW, .et al (2003), Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. *JAMA: Journal of the American Medical Association*.

4. Appel LJ, Obarzanek E, Elmer PJ, et al (1997), Dietary Approach to Stop Hypertension (DASH), clinical trial of the effects of dietary patterns on blood pressure. DASH collaborative Research Group.

5. Arodinwe EB, Ike SO, Nwokedinko SC. (2009). Case fatality among hypertension-related admissions in Enugu, Nigeria. *Nigerian journal of clinical practice*, *12*(2)

6. Bendavid E, Ford N, Mills EJ. (2012). HIV and Africa's elderly: the problems and possibilities. Aids, 26, S85-S91.

7. Borzecki AM, Oliveria SA, Berlowitz DR. (2005). Barriers to hypertension control *American Heart Journal*, *149*(5), 785-794.

8. Calhoun DA, Jones D, Textor S, et al, (2008). Resistant hypertension: diagnosis, evaluation, and treatment a scientific statement from the American Heart Association Professional Education Committee of the Council for High Blood Pressure Research. *Hypertension*, *51*(6), 1403-1419.

9. Chobanian AV, Bakris GL, Black HR, et al, 2003. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension*, *42*(6), pp.1206-1252.

10. Clumeck N, Pozniak A, Raffi F, (2008). European AIDS Clinical Society (EACS) guidelines for the clinical management and treatment of HIV-infected adults. *HIV medicine*, *9*(2), 65-71.

11. Currier JS, (2009). Update on cardiovascular complications in HIV infection. *Topics in HIV medicine: a publication of the International AIDS Society, USA*, *17*(3), pp.98-103.

12. De Cock KM, Rutherford GW, Akhwale W, (2014) Kenya AIDS Indicator Survey 2012 *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *66*, S1-S2

13. Dickinson HO, Mason JM, Nicolson DJ, et al, (2006). Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials. *Journal of hypertension*, *24*(2), pp.215-233

14. Diez-Manglano J, Barquero-Romero J, Almagro P, et al, (2014), Spanish Society of Internal Medicine, 2014. COPD patients with and without metabolic syndrome: clinical and functional differences. *Internal and emergency medicine*, *9*(4), pp.419-425

15. Edwards JK, Bygrave H, Van den Bergh R, et al, (2015). HIV with non-communicable diseases in primary care in Kibera, Nairobi, Kenya: characteristics and outcomes 2010–2013.*Transactions of The Royal Society of Tropical Medicine and Hygiene*, trv038.

16. Familoni OB. (2002). Hypertension-how much do our patients know? *Africa Health*, *24*(3), 13-14.

17. Ferrie JE. (2014). Knowing is not enough; we must apply. Willing is not enough; we must do. *International Journal of Epidemiology*, *43*(6), 1671-1677.

18. Franklin SS, Wong ND (2013), Epidemiology of hypertension, 16-32 Global *Health Observatory :(GHO)*. World Health Organization, 2014.

19. Galiè N, Humbert M, Vachiery JL, Gibbs S, et al (2015). 2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension. *European heart journal*, p.ehv317.

20. Glaziou P, Floyd K, Raviglione M (2009), Global burden and epidemiology of tuberculosis. *Clinics in chest medicine*, *30*(4), pp.621-636.

21. Iyalomhe GB & Iyalomhe SI, (2010). Hypertension-related knowledge, attitudes and life-style practices among hypertensive patients in a sub-urban Nigerian community. *J Public Health Epidemiology*, *2*(4), 71-7.

22. Iyalomhe GB & Iyalomhe SI, (2012). Health-Seeking Behavior of Rural Dwellers in Southern Nigeria: Implications for Healthcare Professionals.

23. Jokisalo E. (2005). *Compliance and patient-perceived problems in the treatment of hypertension*. University of Kuopio.

24. Joshi MD, Aya R, Njeru EK, et al 2014. Prevalence of hypertension and associated cardiovascular risk factors in an urban slum in Nairobi, Kenya: a population-based survey. *BMC Public Health*, *14*(1), p.1.

25. Joshi RK, Carbone P, Wang FC, et al (2014). Precise and ultrafast molecular sieving through grapheme oxide membranes. *Science*, *343*(6172), 752-754.

26. Jung O, Bickel M, Ditting T, et al (2004). Hypertension in HIV-1-infected patients and its impact on renal and cardiovascular integrity *Nephrology Dialysis Transplantation*, *19*(9), 2250-2258

27. Kagashe GA & Fazal SA. (2011). Knowledge of Hypertensive Patients With or Without HIV on Hypertension and Their Experience in Using Their Medicines in Dar es Salaam, Tanzania: The Role of the Pharmacist. *Tropical Journal of Pharmaceutical Research*, *10*(6), 825-831

28. Kenya National Bureau of Statistics 2009, Kenya Demographic and Health Survey 2008-2009, Preliminary Report

29. Knorr-Cetina KD (2013). *The manufacture of knowledge: An essay on the constructivist and contextual nature of science*. Elsevier.

30. Malaza A, Mossong J, Bärnighausen T et al (2012). Hypertension and obesity in adults living in a high HIV prevalence rural area in South Africa. *Plops one*, *7*(10), p.e47761.

31. Manji HK, Moore GJ, Chen G et al (2000) Clinical and preclinical evidence for the neurotropic effects of mood stabilizers: implications for the pathophysiology and treatment of manic–depressive illness. *Biological Psychiatry*, *48*(8), 740-754.

32. Momin MH, Desai VK, Kavishwar AB (2012). Study of socio-demographic factors affecting prevalence of hypertension among bank employees of Surat City. *Indian journal of public health*, *56*(1), p.44.

33. Ntsekhe M, Hakim J, (2005). Impact of human immunodeficiency virus infection on cardiovascular disease in Africa. *Circulation*, *112*(23), pp.3602-3607.

34. Odusola AO, Hendriks M, Schultsz C, et al (2014). Perceptions of inhibitors and facilitators for adhering to hypertension treatment among insured patients in rural Nigeria: a qualitative study. *BMC health services research*, *14*(1), p.1.

35. Oladapo OO, Salako L, Falase AO, et al (2013). Knowledge of hypertension and other risk factors for heart disease among Yoruba rural southwestern Nigerian population. *British Journal of Medicine and Medical Research*, *3*(4), p.993.

36. Oliveria SA, Chen RS, McCarthy BD, et al (2005). Hypertension knowledge, awareness, and attitudes in a hypertensive population. *Journal of general internal medicine*, *20*(3), pp.219-225.

37. Odedosu T, Vieira D L, Ogedegbe G.et al (2012). Overcoming barriers to hypertension control in African Americans. *Cleveland Clinic journal of medicine*, *79*(1), 46-56.

38. Ogunmola OJ, Oladosu OY, Olamoyegun AM. (2014). association of hypertension and obesity with HIV and antiretroviral therapy in a rural tertiary health center in Nigeria: a cross-sectional cohort study. *Vascular health and risk management*, *10*, 129.

39. Palacios R, Santos J, García A, et al (2006). Impact of highly active antiretroviral therapy on blood pressure in HIV-infected patient a prospective study in a cohort of naive patients *HIV medicine*, *7*(1), 10-15.

40. Patel RP & Taylor SD (2002) Factors affecting medication adherence in hypertensive patients *Annals of Pharmacotherapy 36*(1), 40-45.

41. Pceakikuyuhospital.org (2015). *PCEA Kikuyu Hospital* Retrieved 8 October 2015, from http://www.pceakikuyuhospital.org/

42. Samal D, Greisenegger S, Auff E, et al (2007). The relation between knowledge about hypertension and education in hospitalized patients with stroke in Vienna. *Stroke*, *38*(4), pp.1304-1308.

43. Sattler FR, Qian D, Louie S, et al (2001). Elevated blood pressure in subjects with lipodystrophy.*Aids*, *15*(15).

44. Seaberg EC, Munoz A, Lu M, et al (2005). Association between highly active antiretroviral therapy and hypertension in a large cohort of men followed from 1984 to 2003.*Aids*, *19*(9), 953-960.

45. Vaughan G and Hogg MA, (2005). *Introduction to social psychology*. Pearson Education Australia.

46. Vogel T and Wanke M (2016). *Attitudes and attitude change*. Psychology Press.

47. Wang YB, Kong DG, Ma LL et al (2013). Patient related factors for optimal blood pressure control in patients with hypertension. *African health sciences*, *13*(3), 579-583

48. WHO international Society of hypertension writing group 2003 WHO international society of hypertension (ISH) Statement on management of hypertension. J Hypertension 2003; 21: 1982-92.

49. World Health Organization (WHO), & UNAIDS, U. (2015). Global HIV/AIDS response: epidemic update and health sector progress towards universal access: progress report 2015 [Internet]. Geneva: WHO; 2011. [Cited 2012 Oct 29]. 233 p.

50. World Health Organization (2000) Second generation surveillance for HIV: the next decade.

51. World Health Organization (2013) Global action plan for the prevention and control of non-communicable diseases 2013-2020.

52. Yahya R, Muhamad R & Yusoff HM. (2012) Association between knowledge, attitude and practice on cardiovascular disease among women in Kelantan, Malaysia *Int J Collaborative Res Intern Med Public Health*, *4*, 1507-23.

Appendix 1: INFORMED CONSENT

Study Topic: Risk factors associated with hypertension among PLWHIV and AIDS at PCEA Kikuyu hospital.

Principal Investigator:

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Good morning/afternoon;

My name is Ugo – Okereke Ijeoma Delphine and I am a master's student from the University of Nairobi taking a master's degree in Public Health. I wish to carry out a study on the risk factors that are associated with hypertension among PLWHIV and AIDS referring to PCEA kikuyu hospital. I would like to inform you about this study.

Purpose of the Study: This study aims to investigate on the factors that are associated with hypertension among PLWHIV and AIDS in PCEA kikuyu hospital. The findings of this study will establish the causes of hypertension among PLWHIV and AIDS patients to propose ways to ameliorate them and for optimal blood pressure control to prevent morbidity and mortality that is associated with high blood pressure. This study is also a part of fulfillment for the award of my master's degree at University of Nairobi.

Procedure: The study is expected to be carried out within one to two months. Those clients who agree to participate in this study will be required to give some information about them and also answer several questions which will be used to estimate the risks that are associated

with hypertension, and their awareness on hypertension. Blood pressures will also be measured during the interviews. You will be required to participate only once during the entire period of this study.

Risks: There is no physical harm expected from this study as participants will only be interviewed and their blood pressure taken.

Benefits: Participants in this study will not benefit directly in terms of monetary or material gain. However, findings from this study will help to give good strategies on how to intervene on the high prevalence of blood pressure to reduce morbidity and mortality.

Confidentiality: The answers to the questions in this study will be kept confidential. No names will be used in the final write up. The questionnaires will be coded and original destroyed after one year. Neighbors' may know that you have participated in the study but they will not know the answers that you gave to our questions.

Compensation: There will be no risks expected from participating in this study; hence, no compensation is expected. Participants will also not expect any form of payment for participating in this study.

Voluntaries: Participation in this study is purely optional. If one feels uncomfortable during the interview process, you are allowed to withdraw your participation without any consequences.

I……having been explained about the purpose and procedures of this study and all other aspects regarding this study, I give /fail to give my informed consent to participate.

Participants signature……..Date…….

Investigators Signature……..Date……..

NOTE; Any issues regarding this study can be raised to me through open discussion, or through my mobile number 0726683527 or email delphineijeoma@yahoo.com, as well as through Kenyatta National Hospital/ University of Nairobi Ethics and Review Committee using contacts below.

(1) Kenyatta National Hospital
P.O. BOX 20723-00202,
Tel. (254)020726300 Ext 4410244355

(2) University of Nairobi
College of Health Sciences
P. O. BOX19676-00202
Tel (254) 0202726300.

Appendix 2: Questionnaire

PART 1. DEMOGRAPHY

Question	Response and Code	Remarks
Age in Years, 18 years and above		
Sex	Male 1 Female 2	
Marital status	Never married 1 Currently married 2 Separated 3 Divorced 4 Widowed 5 Cohabiting 6 Don't know 77	
Highest level of education	No formal education 1 Less than primary school 2 Primary school completed 3 Secondary school completed 4 College/University completed 5 Post graduate degree 6	
Work status over the past 12 months	Government employee 1 Private sector employee 2	

	Self-employed 3 Volunteer 4 Homemaker 5 Retired 6 Unemployed able to work 7 Unemployed unable to work 8 Don't know 77	
What is the average earning of the family in the past one year	Per month Refused	
County residence	Kiambu 1 Nairobi 2 Others 77	
Tribe	Kikuyu 1 Luhya 2 Luo 3 Kalenji 4 Others 77	
PART 2 **Lifestyle/Behavioral**		
ALCOHOL USE		
Have you ever consumed any alcohol such as beer, wine, and spirits? If Yes, indicate which type of alcohol, quantity in liters or	Yes, currently 1 Yes, but stopped 2 Never 3 Don't know 77	

bottles per day, and for how long in days, weeks, months and years. If Yes but stopped, state after how long of alcohol consumption, quantity daily. Also, state when he stopped in weeks, months and years.		
Do you have a clear understanding of the published WHO recommendation on alcohol use?	Yes 1 No 2	
TOBACCO USE		
Have you ever smoked any tobacco products, such as pipes, cigarettes, cigars etc.?	Yes, currently 1 Yes, but stopped 2 Never 3	
If Yes, indicate which type of tobacco, number of sticks and for how long in months, years. If Yes but stopped, state how long he smoked, number of sticks and for how long in months, years, and when he stopped smoking.		
During the past one month, did someone smoke in your home, workplace or surrounding e.g. matatu?	Yes 1 No 2 Don't work in a closed area 3	

Do you have a clear understanding of the WHO recommendations on tobacco use?	Yes 1 No 2	T12
DIET		
In a typical week, on how many days do you eat fruits? Indicate with number of days.	Don't know 77	
How many servings of fruit do you eat on one of those days? Indicate with numbers.	Don't know 77	
In a typical week, on how many days do you eat vegetables? Indicate with number of days.	Don't know 77	
How many servings of vegetables do you eat on one of those days? Indicate with numbers.	Don't know 77	
What type of oil or fat is most often used for meal preparation in your home?	Vegetable oil 1 Fat 2 Others 3 Don't know 77	
How often do you add salt or salt sauce before or while eating?	Always 1 Often 2 Sometimes 3 Rarely 4	

	Never 5 Don't know 77	
How many times are salt or salty seasoning e.g. Maggi, Knorr etc. added to your food while cooking?	Always 1 Often 2 Sometimes 3 Rarely 4 Never 5 Don't know 77	
Do you have a clear understanding of the published WHO recommendation on healthy diet?	Yes 1 No 2	
PHYSICAL ACTIVITY		
Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like (carrying or lifting heavy loads, digging or construction work) for at least 10 minutes continuously?	Yes 1 No 2	
In a typical week, on how many days and how much time do you spend in doing vigorous-intensity activities as part of your work, recreational activities, sports, cycling, running or football.	Number of days Hours: Minutes	

Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking (or carrying light loads) for at least 10 minutes continually?		
In a typical week, on how many days do you do moderate-intensity activities as part of your work, recreational activities, sports, fitness, cycling, swimming and volleyball?	Number of days Hours: Minutes	
How much time do you spend sitting or reclining on a typical day?	Hours: minutes	
Do you have a clear understanding of the published WHO recommendations on physical activity for adults	Yes 1 No 2	
HIV /PHYSICAL MEASUREMENTS		
CD4 Viral load What year was HIV diagnosis made? Are you taking anti-retroviral drugs? NAMES How long have you		

been on ARVS? What year was hypertension diagnosed. BP(mmHg) Weight(kg) Height(cm) BMI(kg/m)		
HISTORY OF RAISED BLOOD PRESSURE		
Have you ever been told by a doctor or health worker that you have raised blood pressure or hypertension.	Yes 1 No 2	
Have you ever had your blood pressure measured by a doctor or other health worker?	Yes 1 No 2	
Have you been told in the past 12 months that you have hypertension?	Yes 1 No 2	
In the past two weeks, have you taken any drugs (medication) for raised blood pressure prescribed by a doctor or other health worker? How often do you take them?	Yes 1 No 2	
Have you ever seen a traditional healer for raised blood pressure or	Yes 1 No 2	

hypertension?		
Are you currently taking any herbal or traditional remedy for you raised blood pressure?	Yes 1 No 2	

Health Knowledge, Attitude, & Practice Survey

The following questions assess your attitudes about several health-related issues. Your answers will help us to better organize and evaluate health education activities in your community. Thanks in advance.

For each statement given, please indicate whether you think it is true or false.

QUESTIONS ON KNOWLEDGE

(1) What does the term blood pressure mean?

1. High level of stress, tension or over thinking [ ]
2. Rapid pulse or rising blood looking for a way out. [ ]
3. Force of blood pushing against blood vessel walls. [ ]
4. I Don't know [ ]

(2) Do you know that person with high blood pressure should take drugs every day?

1. Yes [ ]
2. No [ ]
3. Don't know [ ]
4. Any other response [ ]

(3) Do you know the factors that can cause high blood pressure?

1. High salt intake
2. Alcohol/Smoking
3. Lack of exercise [ ]
4. Don't know [ ]

(4) What should normal blood pressure be?

1. Less than or equals 120/80 [ ]
2. Less than or equals 139/89 [ ]
3. Less than or equals 160/100 [ ]
4. I Don't know [ ]

(5) Can you prevent high blood pressure through lifestyle changes?

Yes [ ] **No** [ ]

State _____ State _____

HOW: _____ **WHY:** _____

QUESTION ON ATTITUDE

(1) Is healthy lifestyle important to reduce HBP?

Yes [ ] **No** [ ]

State

WHY:

(2) Do you think that high blood pressure is preventable?

Yes [ ] **No** [ ]

State _____

HOW: _____

(3) Can reduce salt intake help to prevent high blood pressure?

Yes [ ] **No** [ ]

State _____ State

WHY:

HOW: _____

(4) Would you like to change your lifestyle if need be to prevent hypertension?

Yes [ ] **No** [ ]

State

WHY

6. Do you know that regular blood pressure check is important?

Yes……No……..

QUESTIONS ON PRACTICES

(1) How often do you check your blood pressure?

(2) How often do you check your weight?

(3) How many times have you taken your prescribed drugs for the last one week?

(4) How often do you exercise?

(5) How often do you add salt on table in your food?

Appendix 3: Research Project Plan

4.1 Time Frame

Duration in Weeks / Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Problem Identification																
Proposal Writing																
Seeking consent from Ethical committees																
Recruitment and training of research assistants																
Pre-testing of study tools																
Administration of tools																
Data cleaning and entry																
Data analysis																
Report writing and presentation																
Compilation of final report and dissemination																

Appendix 4: Research Budget Plan

S/NO	Subject	Amount in ksh
1.	2 Research assistants allowances at Ksh 2000 per day for 30 days	120,00
2.	Stationery and purchase of equipment	20,000
3.	Data management and analysis	50,000
4.	Contingency	20,000
Total:		**210,000ksh**