RISK FACTORS ASSOCIATED WITH HYPERTENSION AND DIABETES AMONG PEOPLE LIVING WITH HIV/AIDS ATTENDING COMPREHENSIVE CARE CLINIC MURANG'A COUNTY REFERAL HOSPITAL

SILVIA WAIRIMU NGUGI

MASTER OF SCIENCE

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Risk Factors Associated with Hypertension and Diabetes among People Living with HIV/AIDS Attending Comprehensive Care Clinic Murang'a County Referral Hospital

Silvia Wairimu Ngugi

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

Signature……Date……

Silvia Wairimu Ngugi

This thesis has been submitted for examination with our approval as the University Supervisors

Signature……Date……

Prof. Kenneth Ngure

JKUAT, Kenya

Signature……Date……

Dr. John Gachohi

JKUAT, Kenya

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
AUDIT	Alcohol used disorders identification test.
BMI	Body Mass Index
CCC	Comprehensive Care Centre
CKD	Chronic Kidney Disease
DBS	Dried Blood Spot
HBP	High Blood Pressure
HCSB	Healthcare-Seeking Behaviour
HIV	Human Immunodeficiency Virus
KEMRI	Kenya Medical Research Institute
NCDs	Non-Communicable Diseases
PLWH	People Living with HIV
PLWHAs	People Living with HIV/AIDs
SES	Socioeconomic Status
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
STI	Sexually Transmitted Infections
UNAIDS	United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Body Mass Index	Defined as a statistical index reflecting body weight adjusted for height. Normal weight is considered between 18.5 and 24.9 kg/m^2, overweight is considered between 25 and 29.9 kg/m^2, while values of ≥30 kg/m^2 is considered obese (Weir & Jan, 2022).
Comprehensive Care Clinic	Care centres promoting universal access of HIV care and prevention services needed to reducing HIV related morbidity and mortality with services including voluntary HIV counselling and testing, HIV prevention and transmission, prophylaxis against opportunistic infections and opportunistic infections diagnosis and treatment as well as antiretroviral treatment (Kitahata et al., 2002)
Hypertension	Defined as is a systolic BP of greater than or equal to 140 mmHg and diastolic blood pressure greater or equal to 90 mmHg (Unger et al., 2020)
Diabetes	Defined as the random blood glucose levels of ≥11.1mmol/L (≥200 mg/dL) (Mathew & Tadi, 2021)
Non-communicable diseases (NCDs)	Defined as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental, and behaviours factors (Budreviciute et al., 2020)

ABSTRACT

Human immunodeficiency virus (HIV), Hypertension and Diabetes is still a major public health concern especially in Sub-Saharan Africa (SSA). In Kenya, HIV/AIDS and NCDs is among the leading causes for years of live lost (YLL) due to premature mortality. The burden of NCDs including diabetes and hypertension among people living with HIV (PLWH) increasingly high due to lifestyle changes coupled with a combination of genetic, physiological, environmental, behavioural factors. This study aimed to determine the risk factors associated with diabetes and hypertension (NCD of interest) among PLWH attending comprehensive care clinic (CCC) in Murang'a County Referral Hospital. The study primary outcome of the study was the proportion of PLWH diagnosed with the NCDs of interest. This study adopted a cross-sectional study design using a systematic sampling technique to enrol PLWH at the CCC clinic. Interviewer administered structured questionnaire were used to obtain characteristics of the PLHW. Subsequently, the PLWH were assessed for NCDs by taking their blood pressure measurements and blood sugar levels. 281 PLWH were randomly enrolled to the study, of whom 192 (68%) were female while 256 (91%) were aged above 35 years. 77 of the 281 PLWH had an NCD with hypertension being the most frequent NCD among PLWH at 27% (n=77) and none of the PLWH diagnosed with diabetes. In the logistic regression analyses at $p \leq 0.05$, a high BMI (Odds Ratio (OR) =1.15 95% CI 1.06, 1.24) and missing doctors 'appointment (OR=2.12 95% CI 1.23, 3.95) were independently associated with hypertension among PLWH. Understanding factors associated with missed or delayed appointments is essential in reducing the burdens of hypertension among PLWH by promoting an integrated patient-centred care and support. Chronic conditions, including hypertension and diabetes among people living with HIV/AIDs require long term adherence to treatment and regular follow-ups for symptom check-ups and management to prolong life and improve its quality.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Sub-Saharan Africa (SSA) accounts for 69% of the global total HIV burden affecting 23.5 million people (Moyo-Chilufya et al., 2023). According to UNAIDS 2021, 20.6 million people are living with HIV Eastern and southern Africa with about 16.2 million (UNAIDS, 2021). In these SSA countries, adult populations are burdened by HIV increasing their risk to non-communicable diseases (NCDs) including cardiovascular diseases, diabetes, hypertension, strokes, coronary artery disease, and cancers (Belaunzaran-Zamudio et al., 2020; Patel et al., 2018a; Smit et al., 2020). In Kenya, about 51% of Kenyan adults currently suffer from an NCD, however, 62% of people living with HIV suffer from NCD (Smit et al., 2020). NCDs complicate HIV treatment and care increasing related complications perhaps due to a likelihood of multi-drug interactions with recommended ARTs (Adeyemi et al., 2021a). Despite the World Health organization efforts to reduce mortality from NCDs by 25% by 2025, integration of NCD into existing HIV services systems promote efficient care and treatment for the increasing NCD morbidity among PLWH (Gausi et al., 2021).

In Kenya, Antiretroviral Treatment (ART) coverage is high, growing exponentially from 29% in 2007 to 61% in 2012 (Culhane et al., 2020). ART improves survival thus increasing longevity among PLWH increasing their risk to NCD conditions (Achwoka et al., 2019; Bijker et al., 2020). Efforts to expand HIV testing have resulted in a substantial increase in the percentage of Kenyan adults and adolescents tested, from 37% in 2007 to 70% in 2012 (Ng'ang'a et al., 2014). HIV when coupled with and NCDs are a significant problem of public health importance in the country contributing to years of live lost (YLL) due to premature mortality (Frings et al., 2018). Additionally, NCDs continue to contribute to growing numbers of hospitalizations straining the already weak health system. For instance, NCDs treatment are expensive and are prolonged requiring increasingly specialized healthcare services (Budreviciute et al., 2020). On the other hand, HIV services are well established in the country, however, PLWH not using ART are considered at higher risk of undiagnosed NCDs

compared to those on the treatment (Achwoka et al., 2019). This, therefore, warrants the need for integrating HIV and NCD services for improved care and coverage at the subnational levels (Adeyemi et al., 2021b).

While a few studies provide insight into HIV and comorbidities including NCDs and their associated risks among PLWH in the country including at the sub-national or county-levels (Wamai et al., 2018). This burden is yet to be determined in Murang'a county. To address this gap, this study aimed to estimate the prevalence of Hypertension and diabetes and their associated risk factors among PLWH attending CCC Murang'a County Referral Hospital as well as their determining health-seeking behaviour among PLWH.

1.2 Statement of the Problem

In Kenya, HIV/AIDS is among the leading causal factors for years of live lost (YLL) due to premature mortality constituting 18.9% of Kenya's total YLL (Frings et al., 2018). While Murang`a county is among the countries in the country with evidence of a growing hypertension and diabetes with HIV epidemic (Wekesa et al., 2022), the county's` disease burden inclusive of HIV and that of hypertension and diabetes ranges between (0.34-0.4YLL/person) within the national average of 0.4 YLL/person) (Frings et al., 2018). This disease burden is yet to be studied despite fewer county level extensive research showing similar HIV with hypertension and diabetes co-occurrence burden in other neighboring counties. Additionally, co-morbidity of HIV with hypertension and diabetes and their associated risk factors within the county is still not well determined, limiting the design of prevention and control interventions especially among PLWH.

Additionally, 80% of deaths of people living with HIV/AIDS are NCD-related (Mutagonda et al., 2022). Additionally, among PLWH, hypertension and diabetes are associated to over 50% of all hospital admissions and hospital deaths. PLWH with hypertension and diabetes are reported to miss opportunities for screening including checking for the blood pressure and blood sugar levels (Hopkins et al., 2021).

1.3 Justification of the Study

This study aims to determine the prevalence and associated risk factor for hypertension and diabetes (the NCD of interest) among PLWH attending CCC clinic. These findings on Hypertension, Diabetes and HIV comorbidity strengthen and improve existing policies to reduce the associated risks especially among PLWH. Awareness of HIV-NCD comorbidity is vital in mitigating associated burdens particularly among clinicians at the CCC. Additionally, understanding the prevalence of hypertension and diabetes among PLWH could contribute to improving the facility health information as well as providing key insights addressing health challenges by supporting decision making and public health intervention design (Uwanyirigira et al., 2023). Findings on occurrence of hypertension and diabetes with HIV could support improving the quality of life and delaying related complications following awareness and screening interventions (Badacho & Mahomed, 2024). Further, understanding healthcare-seeking behaviour among PLWH and those with NCDs could provide insights into designing and integrated public health intervention to offer an efficiency and cost-effective bundled care services. Findings from this study will be helpful in guiding policy and operational decisions improving and strengthening the care among PLWH. Understanding the knowledge on hypertension and diabetes among PLWH will guide in prioritizing resources toward bridging their knowledge gaps. Further, the prevalence of hypertension and diabetes among PLWH is essential especially for the county government in planning and designing an effective integrated bundled care for PLWH to reduce the burden of HIV comorbidities.

1.4 Research Questions

1. What is the prevalence of hypertension and diabetes among people living with HIV/AIDS attending CCC Murang'a County Referral Hospital?
2. What is the healthcare-seeking behaviour associated with hypertension and diabetes among people living with HIV/AIDS attending CCC Murang'a County Referral Hospital?
3. What are the health determinants associated with hypertension and diabetes among people living with HIV/AIDS attending CCC Murang'a County Referral Hospital?

1.5 Research Objectives

1.5.1 Main Objective

To determine risk factors associated with hypertension and diabetes among people living with HIV/AIDs attending CCC Murang'a County Referral Hospital.

1.5.2 Specific Objectives

1. To determine the prevalence of hypertension and diabetes among people living with HIV/AIDs attending CCC Murang'a County Referral Hospital.
2. To determine healthcare-seeking behaviours associated with hypertension and diabetes among people living with HIV/AIDs attending CCC Murang'a County Referral Hospital.
3. To identify health determinants associated with hypertension and diabetes among people living with HIV/AIDs attending CCC Murang'a County Referral Hospital.

1.6 Conceptual Framework

The study conceptual framework consisted of factors considered to be linked to the study outcome of presence of NCD among people living with HIV (Figure 1). These factors consisted of independent variables including socio-demographic, socio-economic and health care seeking behaviours. Additionally, other factors considered to influence the study outcome included behavioural and lifestyle characteristics and the risk perception linked to study outcome.

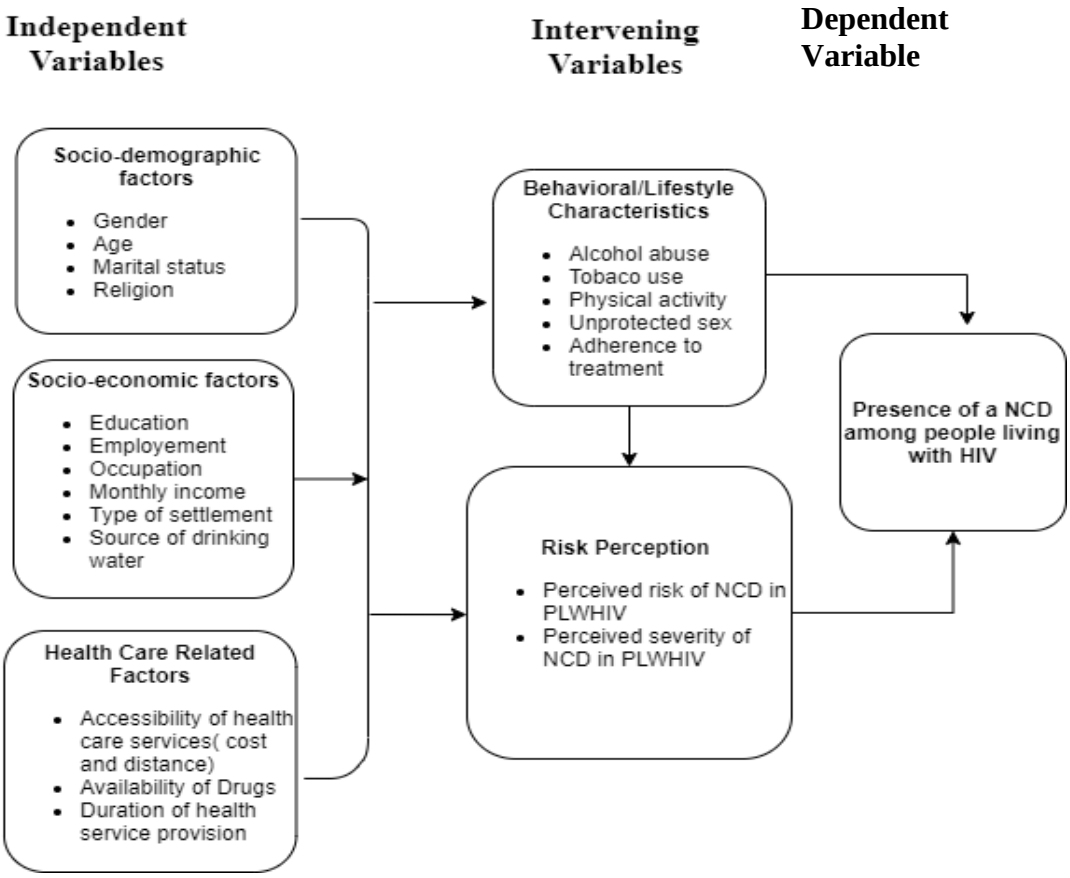

Figure 1.1: Conceptual Framework Showing Factors Linked to Prompting HIV, Hypertension and Diabetes (NCD)

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The section reviews the study topic on hypertension and diabetes (the non-communicable diseases of interest) risk factors among people living with HIV and AIDS (PLWH). The section describes HIV/AIDS comorbidity with hypertension and diabetes and their prevalence as well as the PLWH health-seeking care behaviour.

2.2 HIV/AIDs, Hypertension and Diabetes

Developing countries are significantly dual burdened by high HIV infection and NCD epidemics (Patel et al., 2018b). With the rapid expansion of HIV programs in Kenya, PLWH live longer increasing their risk to chronic conditions including NCDs (Achwoka et al., 2019). These HIV and NCD programs face challenges issues including inadequate funding and increased workload for program staff at the inception and implementation phases (Adeyemi et al., 2021b). Additionally, Evidence show PLWH are likely to have complications arising from NCD complications that present with few symptoms at the onset (Patel et al., 2018a). While active chronic care delivery models are rare in many low- and middle-income countries continuous services for these PLWH presenting minimal NCD-related symptoms requires different approaches including acute or episodic care package (van der Mannen et al., 2024). HIV-NCD comorbidities require consistent care comprising of doctors' appointments, tests and medication adherence, healthy living, and self-management practices including monitoring of treatment outcomes (Kasango et al., 2024). Addressing the burden of HIV and NCDs could leverage approaches including developing and using appropriate appointment and medication reminder systems, transport support, community follow-up for missed appointments and ART drug adherence, patient education, referrals, and counselling to support adherence and behaviours change (Duffy et al., 2017; Shayo et al., 2022; Vorkoper et al., 2018)

About 70% of the worldwide PLWH are Sub-Saharan African (SSA) countries (Kharsany & Karim, 2016). While several countries in SSA including Kenya continue to report rapid ART programs scale up, HIV-NCD comorbidity are on the rise worsening the disease burden (Achwoka et al., 2019). In Kenya, while NCDs account for over half of all hospital admissions and deaths, increased longevity of PLWH due to ART increase the likelihood of NCDs among PLWH (Achwoka et al., 2019). Earlier findings show the proportion of PLWH suffering from at least one key NCD will increase by a proportion of 26% by 2035 compared to the uninfected (6%) (Smit et al., 2018). This increase if contributed by the rapid urbanization, improved healthcare, and economic changes and increased HIV and NCD comorbidities including hypertension, diabetes, and kidney disease, in the populations demonstrating. This increase is partly linked to evidence of the HIV infection and ART as risk factors for NCDs in resource-limited settings (Achwoka et al., 2019). To address the burden of HIV-NCD comorbidity requires HIV and NCD care packages integrating to reduces related complications among PLWH in developing countries (Adeyemi et al., 2021b; Haregu et al., 2014).

2.3 HIV Co-Morbidity with Hypertension and Diabetes

Several studies show evidence of HIV comorbidity with NCDs including diabetes mellitus, hypertension, and hyperlipidaemia (Chhoun et al., 2017; Getahun et al., 2020). The HIV-NCD comorbidity are more frequently reported among women and older PLWH (Chhoun et al., 2017; Patel et al., 2018a). Additionally, in other studies male PLWH are reported to have higher blood pressures compared to women (Mbuthia et al., 2021). Common NCD risks among PLWH include being overweight, obese body mass index, poor diet, insulin deficiency and not taking part in physical activity (Ndirangu-Mugo et al., 2022; Saito et al., 2020). Diabetes mellitus, hypertension, and hyperlipidaemia are the most common NCDs among PLWH increasing their risk to cardiovascular events including acute myocardial infarction and all-cause mortality (Feinstein et al., 2019; Rücker et al., 2018). Most PLWH with NCD have are at risk of developing metabolic complications, including the development of insulin resistance and diabetes (Willig & Overton, 2016). Additionally, PLWH on ART are likely to develop a lipodystrophy syndrome such as peripheral lipoatrophy and visceral fat

redistribution associated with metabolic alterations, including dyslipidaemia and insulin resistance (Husain et al., 2017; Willig & Overton, 2016). In other studies, no formal education is linked to greater risk of diabetes (Seiglie et al., 2020). Additionally, level of education, BMI, marital status, alcohol consumption, and knowledge of hypertensive daily drug intake marriage status has been associated with hypertension among PLWH (Kimani et al., 2019).

Earlier studies provide evidence of NCDs progression for instance it is estimated that PLWH with prehypertension took 2–4-year before progressing to hypertension (Singh et al., 2021). Diabetes mellitus among PLWH increase the risks associated with foot, cardiovascular, eye, nerve, and renal complications (Gebrie et al., 2020). To reduce HIV-NCD comorbidities systematic screening and treatment for undiagnosed NCDs using standard guidelines should be integrated into HIV care and treatment programs especially among key populations (Adeyemi et al., 2021b).

2.4 Health Care-Seeking Behaviour among People Living with HIV/AIDS (PLWHAs)

Health seeking behaviour among PLWH are associated with age, gender, level of education, employment status, poverty, treatment facilities preference, health care services and costs (Abdulai et al., 2022; Anselmi et al., 2015; Kimani et al., 2019). Earlier studies link PLWH not visiting health facilities for treatment and management including STI services, ART treatment adherence (Ahmed et al., 2022; Akullian et al., 2016; Azia et al., 2016). These practices are linked to attitudes or subjective norms among PLWH including stigma and discrimination and gender differences (Azia et al., 2016). Other factors shown to influencing health seeking behaviours among PLWH include location, patients judge the quality of services and religion-cultural belief (Bhutto & Nisar, 2017; Churcher, 2013; Lazarus et al., 2021). Further, the need for medical care outside regular clinic hours and securing safe transportation at night are also among the significant barriers to seeking care. Studies show, PLWH seeking treatment services from traditional healers and chemists before seeking treatment at the facilities (Benzekri et al., 2021). Additionally, professional conduct positively impacts the health care professionalism. Professional parameters link to ethical

principles allowing for patients to treated with equality irrespective of their social class, race, or tribe (Olejarczyk & Young, 2022). To improve the healthcare-seeking behaviours of PLWH at the clinic and the health services offered need to addressing barriers impeding health access and behaviour change including addressing stigma, denial and awareness of early care HIV treatment/care clinics capacity for quality care (Sanga et al., 2019).

2.5 Health Determinants Associated with Hypertension and Diabetes among PLWHAs

The quality of life and its determinants among PLWH is associated with gender, age, education levels, socioeconomic status, relationship, anxiety and depression, psychoactive substances abuse or addiction, perceived social support, and missing antiretroviral medication as well as disease conditions including co-morbidities (Gruszczyńska & Rzeszutek, 2019; Peter et al., 2014; Reif et al., 2013; Suleiman et al., 2020; Wedajo et al., 2022). Other factors linked to quality of life among PLWH include alcohol use disorder, khat chewing, cigarette smoking, and household wealth increased the risks to NCD vulnerability in the general population and rural areas (Addis et al., 2022; Duko et al., 2019). The quality of life linked to socio- economic and cultural factors affect CD4 counts of PLWH thus increasing the risk of disease progression (Mutabazi-Mwesigire et al., 2015). Additionally, other factors including lack of HIV information, poverty, substance abuse, unsafe sexual practices, ignorance, and cultural beliefs are linked to increasing risks to HIV infection by promoting risky sexual behaviours (Mutabazi-Mwesigire et al., 2015). ART treatment in poor populations should considered and prioritize disease progression vulnerabilities, therefore, be prioritized during the HAART scale for treatment as prevention.

CHAPTER THREE

MATERIAL AND METHODS

3.1 Study Site

This study was conducted in Murang'a Referral Hospital Comprehensive Care Centre (CCC). Murang'a Referral Hospital is the largest public referral hospital in Murang'a County. Murang' a County has a population of 1,056,640 occupying a total area of 2,523Km$^{2.}$ Representing a population of 419 person per square kilometer (KNBS, 2019). The CCC serves as a primary care centre and public referral centre for HIV/AIDS patients for all seven wards in Murang' a County namely, Gatanga, Kandara, Kangema, Kigumo, Kiharu, Maragwa, Mathioya (Figure 2).

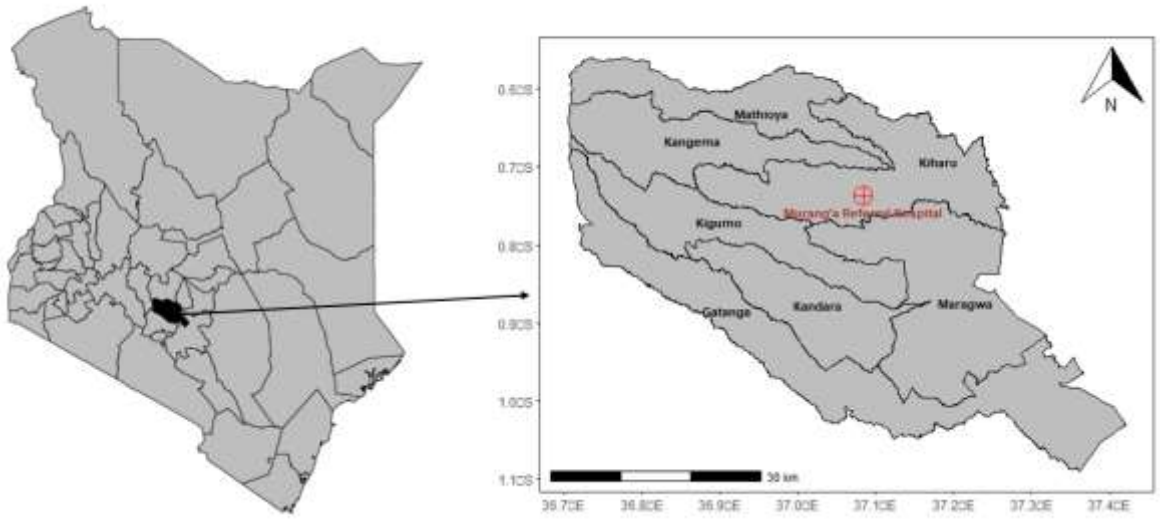

Figure 3.1: Map of the Study Site in Murang'a County (Right Panel), Showing Murang'a Referral Hospital that Serves all the Wards in the Murang`a. Murang`a County is One of the Counties in Kenya (Left Panel).

3.2 Study Design

This study was conducted between February to May 2021 adopting a cross-sectional study design. PLWH Patients visiting the CCC were systematically sampled to taking part in the study.

3.3 Study Population

The study population for this research was adults aged 18 and above who lived positively with HIV/AIDS and visited Murang'a Referral Hospital-CCC during the study.

3.3.1 Inclusion Criteria

- Consenting PLWH patients attending CCC clinic at Murang'a Referral Hospital.
- PLWH Patients with a confirmed HIV positive result.

3.3.2 Exclusion Criteria

- New patients with no confirmatory HIV-positive result
- Non-consenting PLWH patients attending CCC clinic.
- PLWH who were mentally incapacitated.

3.4 Sampling Procedure

PLWH attending CCC were systematically sampled. The sampling interval (skip interval) established and calculated as k = N/n, where N (1100) is the population size and n (281) is the sample size. This gave k as 3.9 and was rounded up to 4. The first participant was randomly selected using lottery method from the appointment list which was used as the sampling frame. The first respondent was identified as the 2^{nd} on the list. Given the sampling interval was 4, the second and third participants were 6^{th} and the 10^{th} clients. This continued until the determined sample size was achieved. Interviewer administered questionnaire were used to obtain PLWH characteristics.

3.5 Sample size Calculation

The sample size calculation was derived from the Cochran formula (1977). In a study on the burden of prehypertension among adults in Kenya (Jared et al., 2020), the prevalence of hypertension was 21%.

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where, n denoted the desired sample size (The target population is > 10,000). In the numerator, Z denoted the standard normal deviation at the required confidence level, p denoted the estimated prevalence of Hypertension at 21% and q denoting distributional of the prevalence (1-0.21). In the denominator, *d* denoting the level of marginal error and the level of statistical significance.

$$n = \frac{(1.96 \times 1.96) \times (0.21 \times 0.79)}{0.05 \times 0.05} = 255$$

$$= 255\ respondents.$$

The estimated minimum sample size was 255 patients. A 10 percent increase of the participant were included to address non-response bringing the total sample size to 281 respondents.

3.6 Data Collection

3.6.1 Variables

3.6.1.1 Dependent Variables

The proportion of PLWH patients diagnosed with diabetes mellitus and hypertension was the study outcome of interest.

3.6.1.2 Independent Variables

Independent variables obtained in this study includes the level of education, income, occupation, age, marital status, number of children, family support, present and past medical history, income, and behavioural risk factors. These behavioural risk factors included consumption of tobacco and alcohol, monitoring of blood glucose and pressure, physical activity, balanced diet including intake of vegetables and fruits, and taking of processed meals.

3.6.2 Data Collection Tools

PLWH characteristics were collected using interviewer administered questionnaire. The characteristics' included the level of education, income and occupation, age, marital status, family support, medical history, income. The questionnaires were pre-tested and translated prepared in Kiswahili languages to ensure consistency and reliability. The questionnaire pretesting included checking for participants' ability to comprehend the questions, the duration the questionnaire will take, language comprehension, and the structuring of the questions. After pretesting 30 respondents, the questionnaire was amended to fit the study and ensure reliable data is obtained. A trained research assistant assisted in data collection process.

3.6.3 Data Collection Procedures

Respondents were captured at the exit point after receiving the service sought in the facility. The PLWHAs were expected to produce hospital cards showing the CCC visits. The interviewer administered questionnaire was administered to patients who consented in the study. The sampled respondents were asked to join the interviewer in a room for purposes of confidentiality. In the room, the interviewer asked questions as per the attached interview schedule as they recorded the responses.

The blood pressure measurements and blood sugar levels were collected based on case definitions (*see* o*perational Definition of Terms for case definition*). All the collected

data were saved in a password safe database, and only the researcher was able to access the database.

3.7 Data Management and Analysis

Once the data was collected, it was cleaned and checked for accuracy, consistency, completeness, and exploratory data analyses conducted. Descriptively data was presented in the form of summary tables, texts and described in frequencies or counts, proportions, and rates. Inferential statistics was performed using logistic regression models to determine factors associated with hypertension and diabetes among PLWHAs.

3.8 Ethical Considerations

Scientific and ethical approval for the study was obtained from the AMREF Ethical Review Committee and Scientific Steering Committee. Permission was sought from National Commission for Science, Technology and Innovation (NACOSTI), the county Director of health services Murang'a County and the Murang'a County Referral Hospital Medical Superintendent, to undertake research in the facility. All participants were aged above 18 years and above were requested to consent before taking part in the study. All the obtained data were kept with utmost confidentiality and all participants were identified using unique IDs.

CHAPTER FOUR

RESULTS

4.1 Introduction

The research realized a total of 281 respondents as was expected. This formed a response rate of 100%. The researcher opted to work with the 281 as this further reduces the sampling bias which may have occurred.

4.2 PLWHAs Characteristics

Table 4.1 shows the PLWH participants' characteristics. Of the 281 PLWH, 68% were female while 91% of the participants were aged above 35 years, with an average age of 43 years. 60% of the PLWH attained primary and secondary education. While 64% of the PLWH were married, a majority (90%) were in monogamous marriages. 71% of the PLWH earned more than 10,000 Kenya shillings (KES) per month and more than 61% of them were in self-employed occupations.

Table 4.1: Characteristics of PLWHAs

Variable	Level	All PLWH (%) n=281	PLWH with hypertension (%) n=77	Prevalence of hypertension among PLWH (%)	95%CI
Gender	Female	192 (68)	52 (68)	18.5	16.2, 20.8
	Male	89 (32)	25 (32)	8.9	7.2, 10.6
Age	≤35 years	25 (9)	9 (12)	3.2	2.2, 4.3
	>35 years	256 (91)	68 (88)	24.2	21.6, 26.8
Marital status	Married	180 (64)	49 (64)	17.4	15.2, 19.7
	Separated divorced	52 (19)	13 (17)	4.6	3.4, 5.9
	Single, widow	49 (17)	15 (19)	5.3	4.0, 6.7
Marriage type	Monogamous	162 (90)	47 (96)	26.1	22.8, 29.4
	Polygamous	18 (10)	2 (4)	1.1	0.3, 1.9
Education level	Diploma, certificate, bachelor	110 (40)	22 (29)	7.9	6.3, 9.5
	Primary	18 (6)	7 (9)	2.5	21.6, 3.5
	Secondary	150 (54)	48 (62)	17.3	15.0, 19.5
Religion	Christian	238 (85)	64 (83)	22.8	20.3, 25.3
	Muslim, other	43 (15)	13 (17)	4.6	3.4, 5.96
Employment type	Formal casual self	70 (25)	21 (27)	7.5	5.9, 9.1
	self-employed	172 (61)	42 (55)	15.0	12.9, 17.1

Variable	Level	All PLWH (%) n=281	PLWH with hypertension (%) n=77	Prevalence of hypertension among PLWH (%)	95%CI
	Student, unemployed	38 (14)	14 (18)	5.0	3.7, 6.36
Income	<10000ksh	82 (29)	26 (34)	9.3	7.5, 11.0
	>10000ksh	199 (71)	51 (66)	18.1	15.9, 20.4

4.3 Prevalence of Hypertension and Diabetes among PLWHAs

In this study, 77 of the 281 PLWH had hypertension accounting to 27% with none of the PLWH having diabetes. Of the 77 hypertensive PLWH, 68 (88%) adults above 35 years of age .in addition, 71% of the PLWH with hypertension attained secondary or primary education. Hypertension was prevalent among PLWH with an income of less than 10,000 KES per month compared to those with higher incomes above 10,000 KES (Table 4.1). The systolic and diastolic blood pressures among the PLWH with hypertension were relatively higher for males compared to females varying slightly with age (Table 4.2). Similarly, among these PLWH the BMI and blood sugar were also relatively higher among males compared to their female counterparts (Table 4.2).

Table 4.2: Prevalence Hypertension and Diabetes among PLWHAs

Sex	Age in years	PLWH without Hypertension and diabetes (n=204)			PLWH with Hypertension (n=77)		
		Frequency	**Mean**	**SD**	**Frequency**	**Mean**	**SD**
Female							
	≤35	14	124.93	8.78	7	142.43	1.40
SBP	>35	126	123.90	8.45	45	144.67	3.28
	Total	140	124.01	8.45	52	144.37	3.18
	≤35	14	81.21	6.72	7	88.29	11.10
DBP	>35	126	82.02	8.11	45	93.4	4.81
	Total	140	81.94	7.97	52	92.71	6.13
	≤35	14	26.99	3.20	7	26.10	3.38
BMI	>35	126	29.68	3.89	45	31.31	3.21
	Total	140	29.41	3.90	52	30.61	3.67
Blood	≤35	14	7.09	1.29	7	6.97	0.96
glucose	>35	126	6.49	1.22	45	7.05	1.31
	Total	**140**	**6.55**	**1.24**	**52**	**7.04**	**1.26**
Male							
	≤35	2	125	8.50	2	147.5	9.19
SBP	>35	62	123.66	8.63	23	145	5.46
	Total	64	123.70	8.50	25	145.2	5.60
	≤35	2	81.5	7.22	2	90.5	2.12
DIA	>35	62	83.53	7.30	23	94.09	3.45
	Total	64	83.47	7.22	25	93.8	3.48
	≤35	2	28.94	4.76	2	34.89	0.31
BMI	>35	62	27.65	4.83	23	32.20	3.02
	Total	64	27.69	4.76	25	32.41	2.99
Blood	≤35	2	6.65	1.20	2	7.1	1.41
glucose	>35	62	6.81	1.21	23	7.2	1.01
	Total	**64**	**6.80**	**1.20**	**25**	**7.20**	**1.01**
				All			
SBP	≤35	16	124.94	8.19	9	143.56	4.13
	>35	188	123.82	8.49	68	144.78	4.11
	Total	204	123.91	8.45	77	144.64	4.10
DIA	≤35	16	81.25	6.38	9	88.78	9.69
	>35	188	82.52	7.87	68	93.63	4.38
	Total	204	82.42	7.76	77	93.06	5.41
BMI	≤35	16	27.24	3.08	9	28.05	4.86
	>35	188	29.01	4.31	68	31.61	3.15
	Total	204	28.87	4.25	77	31.19	3.55
Blood	≤35	16	7.03	1.22	9	7	0.97
glucose	>35	188	6.59	1.23	68	7.10	1.21
	Total	**204**	**6.63**	**1.23**	**77**	**7.10**	**1.18**

4.4 Healthcare-Seeking Behaviour among PLWHAs

Among the 77 PLWH with hypertension, only 13% of them had medical insurance coverage. A majority (88%) of these PLWH used public means to the health facility and utilized a maximum of 1,980 KES and an average of 234 KES in hospital costs (Table 3). 70% and 62% of these PLWH missed doctors' appointments and were in families with histories of diabetes. Only 20% of these PLWH were satisfied with the hypertension services provided at the health facility and 11% of the PLWH mentioned the health providers' exercised professionalism at the facility. In addition, 70% of the PLWH with hypertension were satisfied with their responded hypertension queries (Table 3). Only 5 of the 77 PLWH received familial support including having their transport costs covered when going to a clinical appointment (Table 4.3). 20% of the PLWH with hypertension use herbal treatment to manage hypertension.

Table 4.3: Healthcare-Seeking Behaviour among PLWHAs

Variable	Level	All PLWAs (n=281, %)	Hypertension (n=77, %)	Hypertension Prevalence among PLWHAs (%)	95%CI
Medical insurance cover	Yes	35 (13)	10 (13)	3.6	2.5,4.7
	No	245 (88)	67 (87)	23.9	21.4,26.5
Transport to PHC	Cycle, car, walk, other	34 (12)	9 (12)	3.2	2.2,4.3
	Public taxi	247 (88)	68 (88)	24.2	21.6, 26.8
Hypertension queries	Yes	73 (78)	7(70)	7.5	4.8,10.3
Responses	No	20 (22)	3 (30)	3.2	1.4,5.1
Satisfied with	Yes	24 (26)	2 (20)	2.2	0.6,3.7
services for hypertension	No	69 (74)	6 (80)	8.6	5.7,11.5
Health providers	Yes	84 (91)	9 (90)	9.8	6.7,12.9
professional	No	8 (9)	1 (10)	1.1	0.0,2.2
Family support for	Yes	35 (80)	5 (100)	11.4	0.0,16.1
hypertension	No	9 (20)	0 (0)	0.0	0.0
Herbal Treatment for	Yes	13(28)	1(20)	2.2	0.0,4.3
Hypertension	No	33(72)	4(80)	8.7	4.5,12.9
Miss doc	Yes	149 (53)	54 (70)	19.2	16.9,21.6
appointment	No	132 (47)	23 (30)	8.2	6.5,9.8
Family history of	Yes	162 (58)	48 (71)	17.1	14.8, 19.3
Diabetes	No	119 (42)	29 (29)	10.3	8.5,12.1

4.5 Behavioural-Risk Characteristics among PLWHAs

Of the 77 PLWH with hypertension, 14% of them were smoking tobacco products, with most (90%) of them smoking more than once a day. 20% of these PLWH consumed alcoholic drinks, with a majority (54%) consuming alcohol at least once weekly. Only 8 of the PLWH with hypertension checked their blood glucose. Only 14% of the participants engaged in moderate physical activities (Table 4.3). About 22% of the PLWHAs with hypertension took a balanced diet daily and a majority (99%) of these PLWHAs added table salt to their food servings and had fatty meals at least once a day.

4.6 Health Determinants among PLWHAs

Most (>90%) of these PLWHAs with hypertension had a daily fruit or vegetable serving and took processed foods such as bread at least once a week (Table 4.4). Upon further analysis, though non-significant, physical activity was associated with reduced systolic (p=0.617), diastolic (p=0.384) blood pressure, and blood sugar (p=0.539).

Table 4.4: Health Determinant Characteristics among PLWHAs

Variable	Level	All (%), n=281	Hypertension (%), n=77	Prevalence (%)	95%CI
Smoking tobacco	Yes	34(12)	11(14)	3.9	2.8, 5.1
	No	247(88)	66(86)	23.5	21.0, 26.0
Smoking frequency	Once	8(24)	1(9)	2.9	0.0, 5.8
	More than once	26(76)	10(91)	29.4	21.6, 37.2
Consume alcohol	Yes	59(21)	13(17)	4.6	3.4, 5.9
	No	221(79)	64(83)	22.9	20.3, 25.4
Alcohol consumption frequency	Once	34(58)	7(54)	11.9	7.7, 16.1
	2-5 times	25(42)	6(46)	10.2	6.2, 14.1
Often check blood glucose	Once	40(71)	5(63)	8.9	5.1,12.7
	2-5 times	16(29)	3(38)	5.4	2.3, 8.4
Physical activity	Yes	67(24)	14(18)	5.0	3.7, 6.3
	No	214 (76)	63(82)	22.4	19.9, 24.9
Vigorous exercise	None	67(96)	14(93)	20.9	15.9, 25.9
Moderate exercise	Cycling	3(4)	1(7)	1.5	0.0, 3.0
	None	64(96)	13(93)	19.4	14.6, 24.2
Balanced diet	Yes	53(19)	17(22)	6.0	4.6, 7.5
	No	228(81)	60(78)	21.4	18.9, 23.8
Add salt in servings	Never	2(1)	2(3)	0.7	0.2, 1.2
	Once	36(63)	13(56)	4.6	3.4, 5.9
	2 times	175(63)	43(56)	62.5	59.6, 65.4
	3 times	67(24)	19(25)	6.8	5.3, 8.3
Daily fatty meal serving	At least once	10(4)	0(0)	0.0	0.0, 0.0
	2 times	170(60)	41(53)	60.5	57.6, 63.4
	3 times	99(35)	34(44)	12.1	10.2,14.0
	≥4 times	2(60)	2(53)	0.7	0.2, 1.2
Daily fruit and vegetable serving	Never	6(2)	2(3)	0.7	0.2, 1.2
	At least once	216(77)	64(83)	22.8	20.3, 25.3
	2 times	55(20)	10(13)	3.6	2.5, 4.7
	3 times	3(1)	1(1)	0.4	0.0, 0.7
	≥4 times	1(0)	0(0)	0.0	0.0, 0.0
Weekly processed food servings	At least once	18(56)	6(47)	2.2	1.3, 3.0
	2 times	156(56)	35(47)	55.9	52.9, 58.9
	3 times	95(34)	30(40)	10.8	8.9, 12.6
	≥4 times	10(4)	4(5)	1.4	0.7, 2.1

Using univariable analysis, this study determined factors singly associated with Hypertension and Diabetes among PLWH. These factors included education level, physical activity, processed and fatty meals, adding salt to food servings, body mass index (BMI), and missing doctors' appointments at $p \leq 0.1$ (Table 4.5).

Table 4.5: Univariable Analysis of risk Factors among PLWHAs

Variable	Levels	All PLWH (%)	OR	OR95%CI	P-value
Gender	Female	192 (68)	*Ref*	-	-
	Male	89 (32)	1.05	0.59, 1.83	0.86
Age	≤35 years	25 (9)	*Ref*	-	-
	>35 years	256 (91)	0.64	0.28, 1.58	0.316
Marital status	Married	180 (64)	*Ref*	-	-
	Separated, divorced	52 (19)	0.89	0.43, 1.77	0.750
	Single, widowed	49 (17)	1.18	0.58, 2.3	0.639
Education level	Primary	18 (7)	*Ref*	-	-
	Secondary	150 (54)	0.74	0.27, 2.12	0.557
	Diploma, certificate, bachelor	110(40)	0.39	0.14, 1.17	0.0831.
Religion	Christian	238 (85)	*Ref*	-	-
	Muslim, others	43 (15)	1.18	0.56, 2.36	0.651
Employment type	Student, unemployed	172 (61)	*Ref*	-	-
	Formal, casual	38 (14)	0.73	0.32, 1.71	0.469
	Self	70 (25)	0.55	0.27, 1.19	0.120
Income	<10000ksh	82 (29)	*Ref*	-	-
	>10000ksh	199 (71)	0.74	0.42, 1.31	0.299
Medical cover	Yes	245 (88)	1.06	0.47, 2.27	0.879
	No	35 (13)	*Ref*	-	-
Transport to PHC	Cycle, car, walk, other	34 (12)	*Ref*	-	-
	Public, taxi	247 (88)	1.06	0.48, 2.49	0.897
PHC transport cost	-		1.00	0.99, 1.00	0.734
BMI	-		1.17	1.09, 1.26	<0.001
satisfied with	Yes	24 (74)	0.69	0.09, 3.03	0.658
NCD services	No	69 (26)	*Ref*	-	-
Smoke tobacco	Yes	34 (12)	1.31	0.59, 2.78	0.491
	No	247 (88)	*Ref*	-	-
Consume	Yes	59 (21)	0.69	0.34, 1.34	0.292
alcoholic drink	No	221 (79)	*Ref*	-	-
Consume	2-5 times	25 (42)	*Ref*	-	-
alcohol	Once	34(58)	0.82	0.24, 2.92	0.755
Check blood	2-5 times	16 (29)	*Ref*	-	-
glucose	Once	40 (71)	0.62	0.13, 3.36	0.549
Take physical	Yes	67 (24)	0.63	0.32, 1.19	0.174
activity	No	214 (76)	*Ref*	-	-
Take physical	Daily	43 (64)	*Ref*	-	-
activity	Once week, month	24 (36)	0.23	0.03, 0.97	0.075.
Balanced diet	Yes	53 (19)	1.32	0.68, 2.49	0.398
	No	228 (81)	*Ref*	-	-
Add salt in	>2 times	175 (63)	*Ref*	-	-
food serving	never	106 (37)	1.89	0.91, 3.83	0.079
Fatty meal	<2 times	180 (64)	*Ref*	-	-

Variable	Levels	All PLWH (%)	OR	OR95%CI	P-value
	>2_times	101 (35)	1.88	1.10, 3.21	0.021
Fruit vegetable	<2 times	216 (77)	*Ref*	-	-
	>2 times	65 (23)	1.85	0.93, 3.94	0.093
Processed food	>2 times	261 (94)	*Ref*	-	-
	<2 times	18 (4)	1.39	0.47, 3.73	0.525
Missed	Yes	149 (53)	2.69	1.55, 4.79	0.0005
doctor's appointment	No	132 (47)	*Ref*	-	-
Family history	Yes	162 (58)	1.31	0.77, 2.25	0.329
of diabetes	No	119 (42)	*Ref*	-	-

In the multivariate analysis, increasing BMI and missing doctors' appointments were independently associated with NCDs at $p \leq 0.05$. Participants missing doctor appointments increased the risk of hypertension by two folds, holding all factors constant. In addition, the risk of having diabetes increased by 15% for one unit increase of the BMI (Table 4.6).

Table 4.6: Multivariate Analysis of Risk Factors among PLWHAs

Variable	Level	OR	CI	P-value
Missing doctor's appointment	Yes	2.12	1.23, 3.95	0.008
	No	*Ref*	-	-
BMI		1.15	1.06, 1.24	<0.000

CHAPTER FIVE

DISCUSSION

5.1 General Discussion

This determined the risk factors associated with Hypertension and diabetes among people living with HIV/AIDS (PLWH) in a referral health facility. Hypertension was the frequent NCD among the PLWH, with higher frequencies in women. On the other hand, none of the PLWHAs were diabetic, however, a majority (45%) had prediabetes blood sugar levels. Increasing BMI levels and missing doctor appointments among PLWHAs predicted an increased risk of Hypertension among PLWH. Despite the study focusing on PLWHAs, findings are similar to observational studies in Kenya, diabetes was frequent among obese individuals with higher BMI (Mohamed et al., 2018)**.** Regular medical appointments particularly among PLWH and those for chronic condition care for diabetes and hypertension increase patient engagement and are associated with the prevention and delay of related complications. Understanding factors associated with missed or delayed appointments is essential in reducing the burdens linked to NCDs among PLWH by promoting more careful patient-centred care and support (Syed et al., 2013; Rücker et al., 2018).

5.2 Prevalence of Hypertension and Diabetes among PLHWAs

In this study, 27% the respondents had Hypertension. This suggests a co-morbid occurrence among PLWHAs (McCombe et al., 2022). None of the respondents had Diabetes. The prevalence of hypertension in this study is within the range of a South African study in proportions (Rajagopaul & Naidoo, 2021). While none of the PLWH had diabetes, most (54%) of them were prediabetic and hypertensive with older age (>35 years) suggesting a likelihood of progression to diabetic conditions if unchecked. Consistent with other studies, hypertension can occur with diabetes increasing the risk of cardiovascular morbidity and mortalities, especially among PLWH (Rücker et al., 2018). This is also attributable to the prolonged life due to increasing age as a result of antiretroviral therapy (ART) treatment availability and treatment duration (Rodés et al., 2022). While hypertension and diabetes affect PLWH for instance by

exacerbating several health conditions (McCombe et al., 2022), resources could be effectively allocated to improve the health system's HIV-NCD service integration. This will leverage overlapping services between HIV and NCD care by reducing service duplication and fragmentation, reducing costs or inconveniences and improving multiple NCD morbidities care including diabetes and hypertension (Manne-Goehler et al., 2019; McCombe et al., 2022).

5.3 Health Seeking Behaviour among PLHWAs

80% of PLWH with Hypertension were not satisfied with services provided on hypertension. Availability of staffs, drug supplies and enough consultation time give patients services satisfaction when offered at the health facility (Maduka, 2019). Unexpectedly, 90% and 30% of these PLWH with Hypertension mentioned that healthcare workers in the facility were professional and their NCD queries on were responded to. Strengthening health education to imparting stronger communication skills and professionalism among health care workers improve health care service delivery (Leonard, 2017). Again, a good nurse-patient relationship promotes quality of care, health information dissemination, opportunity to make recommended treatment choices (Molina-mula & Gallo-estrada, 2020). While all the PLWH reported not paying for the services, drug and treatment costs are known to be major barrier to adherence of medicine and treatment (Azia et al., 2016). Additionally, free patient services improve healthcare seeking behaviour especially among the adults (Gabrani et al., 2021). Only 6% of the PLWH with hypertension received family support including providing transport cost to get to clinic appointment. Involvement of family members can help in supporting patients thereby reducing pressure on patients, which can also improve healthcare seeking behaviour (Jazieh et al., 2018). Further, 20% of these PLWH with hypertension were taking traditional herbal treatments such as muarobaine in their management of non-communicable diseases. Use of herbal treatment is linked to issue regarding safety and efficacy warranting more studies on their efficiency and persistent use (Pan et al., 2019).

Less than 21% of the PLWH with hypertension took part in physical activities with moderated exercises suggesting reduced sedentary behaviours. Indeed, though non-

significant ($p>0.05$), physical activity was associated with reduced systolic and/or diastolic blood pressure and blood sugar among our participants. This is consistent with findings in Sub-Saharan Africa, linking physical activity to reducing these risks for non-communicable diseases and improving quality of life by promoting physiological benefits including improving blood glucose and blood pressure (Cannata et al., 2020; Kitilya et al., 2022). In this study, while 29% of the PLWH with hypertension had not reported taking part in any physical activities indicating a sedentary lifestyle habit associated with NCDs risk. Further studies are needed to assess physical inactivity among PLWH on ART treatment duration in a similar setting (John et al., 2017). To promote physical activity, hospital-based training and a home-based exercise program interventions in populations could be integrated into existing HIV and hypertension care models in the healthcare facilities. In turn, this will improve fitness, strengths and body composition among PLWH reducing hypertension risks and related complications as well as improve quality of life among PLWH (Kitilya et al., 2022; Ndirangu-Mugo et al., 2022).

5.4 Health Determinants among PLWHAs

The risk of hypertension increased by two folds among PLWH missing doctor's appointments suggesting adherence to these appointments could hinder proper care and management. Doctor's appointments are associated with additional care costs, quality of services received, and psychosocial support that influence service access and uptake (Ertz & le Bouhart, 2022). Indeed, 70% of the PLWH missed doctor appointments due to associated costs and drug unavailability in the facility. In Africa, studies show that missed appointments are common among low-income earners and poor families, and in instances where individuals lack transportation costs (Becker et al., 2020; Bigna et al., 2014). Such hindrances further contribute to poorer health outcomes due to worsening chronic illnesses (Gutierrez & Bertozzi, 2020). Improving patient adherence to doctor's appointments promotes a workable strategy for chronic illnesses management improving treatment and adherence (Yfantopoulos et al., 2021). Elimination of transport costs, family support, and good doctor-patient relationship are among the most common approaches used to increase the uptake of health care among patients in developing countries (Kruk et al., 2018). Further, adopting the use of

technology as a reminder system and as telehealth to provide health care for patients including PLWH is an effective way to reduce missed doctor appointments, especially in vulnerable communities (Haleem et al., 2021).

More than 22% of PLWH with hypertension were weekly consuming alcohol, smoking Tobacco, eating an unbalanced diet, and being physically inactive suggesting increased risk exposure to Hypertension and HIV. Physically inactivity, tobacco, and alcohol use are considered major behavioral risks in increasing non-communicable diseases (Sharma et al., 2020). Additionally, In Uganda and Kenya earlier findings link alcohol consumption with reduced retention of patients in care and delayed ART initiation (Patsis et al., 2020). Indeed, 70% of the PLWH with hypertension, consumed alcohol, smoked, and were physically inactive missed doctor's appointments increasing risks promoting HIV, hypertension occurrences and interactions (Jespersen et al., 2021). Alcohol consumption impacts decision-making and adherence to antiretroviral medication while also resulting in riskier sexual behavior including engaging in condomless sex likely to increase HIV incidences and progression (Rehm et al., 2017). On the other hand, repeated alcohol and smoking increase hypertension and diabetic complications and risk among PLWH (Parry et al., 2011; Jha, 2020).

. In this study, alcohol consumption is a major public health concern that can be tackled using couple-level alcohol interventions to address the consequences of alcohol use on ART adherence and NCD care (Conroy et al., 2019). Smoking cessation improves health outcomes increasing life expectancy and risks to NCDs (Jha, 2020).

One unit increase of the BMI predicted the risk of hypertension by 15% suggesting that BMI contributed to the increased risk of possibility of a weight gain more than the normal. Indeed, upon further stratification, most (99%) of our PLWH with hypertension had higher BMI levels of >24. These findings are similar to a study in South Africa linking body mass index (BMI) with NCDs among PLWH with the increasing BMI resulting in a build-up of blood sugar that in turn increases the body weight (Ngin et al., 2018; Rajagopaul & Naidoo, 2021). While this study did not assess effects of ART among our participants, increasing body weight when coupled with highly antiretroviral therapy (HAART) treatment predisposes PLWH to hypertension

and diabetes, perhaps due to the metabolic changes resulting from the drug treatment affecting normal reversion of the body weight causing disproportional body fatty tissues distribution (Baraki et al., 2019; Kumar & Samaras, 2018; Lai et al., 2019). Behavioural interventions such as routine body weight screening, physical exercise, and caloric restrictions are effective in maintaining healthy body weight among PLWH (Duncan et al., 2018; Lai et al., 2019).

About 32% of the PLWH with hypertension took an unbalanced diet daily suggesting an increased risk of poor nutritional diversity. Studies implicate an unbalanced diet to compound the risks of hypertension. This is consistent with this study findings especially among our PLWH with low income indicating the likelihood of increased vulnerability and getting sicker (Hyle et al., 2021). In addition, 33% and 22% of the PLWH with hypertension never took fruity servings, vegetables, and took processed foods daily known to increase the likelihood of contributing risks of diabetes and hypertension including obesity (Duan et al., 2022). While this study did not assess knowledge of healthy nutrition among our participants, accessing diverse foods and reducing intake of salt, sugar and saturated fatty meals reduced risks to diabetes and hypertension and promoted better health outcomes among PLWH. Expanding national and community health education Interventions promoting healthy feeding behavior while addressing knowledge barriers on healthy diets will immensely benefit PWH especially in tackling weight gain and obesity among other associated risks (Hyle et al., 2021).

5.5 Limitation and Strengths

This study is limited to an institutional setting with a study population within one region. Given the findings, another limitation is that this study did not explore the effects of ARVs on the potential build-up of blood sugar, and its contribution to hypertension and diabetes cases including prediabetes among this study population. In addition, the adopted cross-sectional study design shows no temporal relationships so the observed associations might not necessarily be causal. However, this study assessed risk factors associated with hypertension and diabetes among people living

with HIV/AIDS, thus providing insights that can be used to improve HIV and hypertension integrated care models that can be used managing hypertension.

5.6 Conclusions

1. The prevalence of hypertension among PLWH was 27% PLWH (45%) had prediabetes blood sugar.
2. Missing doctor appointments predicted occurrence of hypertension by two folds.
3. One unit increase of the BMI predicted occurrence of hypertension among PLHW by 15%.

5.7 Recommendations

1. The study findings recommend. Routine screening of hypertension and diabetes:
2. There should be routine screening of hypertension and diabetes in the HIV clinics. This will enable early detection, control and treatment of these patients.
3. PLWH need to routine health education to understand health determinant including diet while improving their health seeking behaviors for hypertension and diabetes management.
4. Further research should assess effects of antiretroviral therapy (HAART) on body weight among PLWH.

REFERENCES

Abdulai, M. A., Marable, J. K., Wadus, A., & Asante, K. P. (2022). A qualitative analysis of factors influencing health-seeking behavior of people living with HIV, hypertension and diabetes in an urban area of Ghana. *12*, 263355652210926. https://doi.org/10.1177/26335565221092664

Achwoka, D., Waruru, A., Chen, T. H., Masamaro, K., Ngugi, E., Kimani, M., Mukui, I., Oyugi, J. O., Mutave, R., Achia, T., Katana, A., Ng'Ang'A, L., & de Cock, K. M. (2019). Noncommunicable disease burden among HIV patients in care: A national retrospective longitudinal analysis of HIV-treatment outcomes in Kenya, 2003-2013. *BMC Public Health*, *19*(1), 1–10. https://doi.org/10.1186/S12889-019-6716-2/TABLES/3

Addis, A., Id, G., Getachew Desta, Y., Zenebe, E., & Id, B. (2022). Behavioral and psychosocial factors of quality of life among adult people living with HIV on Highly Active Antiretroviral Therapy, in public hospitals of Southwest Ethiopia. *PLOS Global Public Health*, *2*(8), e0000822. https://doi.org/10.1371/JOURNAL.PGPH.0000822

Adeyemi, O., Lyons, M., Njim, T., Okebe, J., Birungi, J., Nana, K., Claude Mbanya, J., Mfinanga, S., Ramaiya, K., Jaffar, S., & Garrib, A. (2021a). Integration of non-communicable disease and HIV/AIDS management: A review of healthcare policies and plans in East Africa. *BMJ Global Health*, *6*(5). https://doi.org/10.1136/BMJGH-2020-004669,

Adeyemi, O., Lyons, M., Njim, T., Okebe, J., Birungi, J., Nana, K., Claude Mbanya, J., Mfinanga, S., Ramaiya, K., Jaffar, S., & Garrib, A. (2021b). Integration of non-communicable disease and HIV/AIDS management: a review of healthcare policies and plans in East Africa. *BMJ Global Health*, *6*(5), 4669. https://doi.org/10.1136/BMJGH-2020-004669

Ahmed, A., Dujaili, J. A., Jabeen, M., Umair, M. M., Chuah, L. H., Hashmi, F. K., Awaisu, A., & Chaiyakunapruk, N. (2022). Barriers and Enablers for Adherence to

Antiretroviral Therapy Among People Living With HIV/AIDS in the Era of COVID-19: A Qualitative Study From Pakistan. *Frontiers in Pharmacology*, *12*, 3968. https://doi.org/10.3389/FPHAR.2021.807446/BIBTEX

Akullian, A. N., Mukose, A., Levine, G. A., & Babigumira, J. B. (2016). People living with HIV travel farther to access healthcare: a population-based geographic analysis from rural Uganda. *Journal of the International AIDS Society*, *19*(1). https://doi.org/10.7448/IAS.19.1.20171

Anselmi, L., Lagarde, M., & Hanson, K. (2015). Health service availability and health seeking behaviour in resource poor settings: evidence from Mozambique. *Health Economics Review*, *5*(1), 1–13. https://doi.org/10.1186/S13561-015-0062-6/TABLES/5

Azia, I. N., Mukumbang, F. C., & Wyk, B. van. (2016). Barriers to adherence to antiretroviral treatment in a regional hospital in Vredenburg, Western Cape, South Africa. *Southern African Journal of HIV Medicine*, *17*(1), 476. https://doi.org/.4102/SAJHIVMED.V17I1.476

Badacho, A. S., & Mahomed, O. H. (2024). Lived experiences of people living with HIV and hypertension or diabetes access to care in Ethiopia: a phenomenological study. *BMJ Open*, *14*(2), e078036. https://doi.org/10.1136/BMJOPEN-2023-078036

Baraki, A. G., Gezie, L. D., Zeleke, E. G., Awoke, T., & Tsegaye, A. T. (2019). Body mass index variation over time and associated factors among HIV-positive adults on second-line ART in north-west Ethiopia: a retrospective follow-up study. *BMJ Open*, *9*(9), e033393. https://doi.org/10.1136/BMJOPEN-2019-033393

Becker, N., Cordeiro, L. S., Poudel, K. C., Sibiya, T. E., Sayer, A. G., & Sibeko, L. N. (2020). Individual, household, and community level barriers to ART adherence among women in rural Eswatini. *PLOS ONE*, *15*(4), e0231952. https://doi.org/10.1371/JOURNAL.PONE.0231952

Belaunzaran-Zamudio, P. F., Caro-Vega, Y., Giganti, M. J., Castilho, J. L., Crabtree-Ramirez, B. E., Shepherd, B. E., Mejía, F., Cesar, C., Moreira, R. C., Wolff, M., Pape,

J. W., Padgett, D., McGowan, C. C., & Sierra-Madero, J. G. (2020). Frequency of non-communicable diseases in people 50 years of age and older receiving HIV care in Latin America. *PLOS ONE*, *15*(6), e0233965. https://doi.org/10.1371/JOURNAL.PONE.0233965

Benzekri, N. A., Sambou, J. F., Ndong, S., Diallo, M. B., Tamba, I. T., Faye, D., Sall, I., Diatta, J. P., Faye, K., Sall, F., Cisse, O., Ndour, C. T., Sow, P. S., Malomar, J. J., Hawes, S. E., Seydi, M., & Gottlieb, G. S. (2021). Impact of Traditional Healers on the HIV Care Cascade in Senegal, West Africa: A Longitudinal Study. *The American Journal of Tropical Medicine and Hygiene*, *105*(5), 1290. https://doi.org/10.4269/AJTMH.21-0280

Bhutto, A. Q., & Nisar, N. (2017). Health-seeking behaviour of people living with HIV/AIDS and their satisfaction with health services provided at a tertiary care hospital, Karachi, Pakistan. *Eastern Mediterranean Health Journal = La Revue de Sante de La Mediterranee Orientale = Al-Majallah al-Sihhiyah Li-Sharq al-Mutawassit*, *23*(1), 13–19. https://doi.org/10.26719/2017.23.1.13

Bigna, J. J. R., Noubiap, J. J. N., Plottel, C. S., Kouanfack, C., & Koulla-Shiro, S. (2014). Factors associated with non-adherence to scheduled medical follow-up appointments among Cameroonian children requiring HIV care: A case-control analysis of the usual-care group in the MORE CARE trial. *Infectious Diseases of Poverty*, *3*(1), 1–9. https://doi.org/10.1186/2049-9957-3-44/TABLES/2

Bijker, R., Kiertiburanakul, S., Kumarasamy, N., Pujari, S., Sun, L. P., Ng, O. T., Lee, M. P., Choi, J. Y., Nguyen, K. v., Chan, Y. J., Merati, T. P., Cuong, D. D., Ross, J., & Jiamsakul, A. (2020). Survival after long-term ART exposure: Findings from an Asian patient population retained in care beyond five years on ART. *Antiviral Therapy*, *25*(3), 131. https://doi.org/10.3851/IMP3358

Budreviciute, A., Damiati, S., Sabir, D. K., Onder, K., Schuller-Goetzburg, P., Plakys, G., Katileviciute, A., Khoja, S., & Kodzius, R. (2020). Management and Prevention Strategies for Non-communicable Diseases (NCDs) and Their Risk Factors. *Frontiers in Public Health*, *8*, 574111. https://doi.org/10.3389/FPUBH.2020.574111

Cannata, F., Vadalà, G., Russo, F., Papalia, R., Napoli, N., & Pozzilli, P. (2020). Beneficial Effects of Physical Activity in Diabetic Patients. *Journal of Functional Morphology and Kinesiology 2020*, *5*(3), 70. https://doi.org/10.3390/JFMK5030070

Chhoun, P., Ngin, C., Tuot, S., Pal, K., Steel, M., Dionisio, J., Pearson, H., Mburu, G., Brody, C., & Yi, S. (2017). Non-communicable diseases and related risk behaviors among men and women living with HIV in Cambodia: Findings from a cross-sectional study. *International Journal for Equity in Health*, *16*(1), 1–12. https://doi.org/10.1186/S12939-017-0622-Y/TABLES/8

Churcher, S. (2013). Stigma related to HIV and AIDS as a barrier to accessing health care in Thailand: a review of recent literature. *WHO South-East Asia Journal of Public Health*, *2*(1), 12. https://doi.org/10.4103/2224-3151.115829

Conroy, A. A., McKenna, S. A., & Ruark, A. (2019). Couple interdependence impacts alcohol use and adherence to antiretroviral therapy in Malawi. *AIDS and Behavior*, *23*(1), 201. https://doi.org/10.1007/S10461-018-2275-2

Culhane, J., Sharma, M., Wilson, K., Roberts, D. A., Mugo, C., Wamalwa, D., Inwani, I., Barnabas, R. V., & Kohler, P. K. (2020). Modeling the health impact and cost threshold of long-acting ART for adolescents and young adults in Kenya. *EClinicalMedicine*, *25*. https://doi.org/10.1016/j.eclinm.2020.100453

Duan, M. J., Vinke, P. C., Navis, G., Corpeleijn, E., & Dekker, L. H. (2022). Ultra-processed food and incident type 2 diabetes: studying the underlying consumption patterns to unravel the health effects of this heterogeneous food category in the prospective Lifelines cohort. *BMC Medicine*, *20*(1). https://doi.org/10.1186/S12916-021-02200-4

Duffy, M., Ojikutu, B., Andrian, S., Sohng, E., Minior, T., & Hirschhorn, L. R. (2017). Non-communicable diseases and HIV care and treatment: models of integrated service delivery. *Tropical Medicine & International Health : TM & IH*, *22*(8), 926–937. https://doi.org/10.1111/TMI.12901

Duko, B., Toma, A., & Abraham, Y. (2019). Alcohol use disorder and associated factors among individuals living with HIV in Hawassa City, Ethiopia: a facility based cross-sectional study. *Substance Abuse Treatment, Prevention, and Policy*, *14*(1). https://doi.org/10.1186/S13011-019-0212-7

Duncan, A. D., Goff, L. M., & Peters, B. S. (2018). Type 2 diabetes prevalence and its risk factors in HIV: A cross-sectional study. *PLoS ONE*, *13*(3). https://doi.org/10.1371/JOURNAL.PONE.0194199

Ertz, M., & le Bouhart, G. (2022). The Other Pandemic: A Conceptual Framework and Future Research Directions of Junk Food Marketing to Children and Childhood Obesity. *Journal of Macromarketing*, *42*(1), 30–50. https://doi.org/10.1177/02761467211054354/ASSET/IMAGES/LARGE/10.1177_02761467211054354-FIG1.JPEG

Feinstein, M. J., Hsue, P. Y., Benjamin, L. A., Bloomfield, G. S., Currier, J. S., Freiberg, M. S., Grinspoon, S. K., Levin, J., Longenecker, C. T., & Post, W. S. (2019). Characteristics, Prevention, and Management of Cardiovascular Disease in People Living With HIV: A Scientific Statement from the American Heart Association. *Circulation*, *140*(2), e98–e124. https://doi.org/10.1161/CIR.0000000000000695

Frings, M., Lakes, T., Müller, D., Khan, M. M. H., Epprecht, M., Kipruto, S., Galea, S., & Gruebner, O. (2018). Modeling and mapping the burden of disease in Kenya. *Scientific Reports*, *8*(1). https://doi.org/10.1038/s41598-018-28266-4

Gabrani, J., Schindler, C., & Wyss, K. (2021). Health Seeking Behavior Among Adults and Elderly With Chronic Health Condition(s) in Albania. *Frontiers in Public Health*, *9*, 192. https://doi.org/10.3389/FPUBH.2021.616014/BIBTEX

Gausi, B., Otiku, P., Jacob, N., & Oni, T. (2021). Patient outcomes in integrated HIV and non-communicable disease models of care: a scoping review. *Journal of Global Health Reports*, *5*, e2021084. https://doi.org/10.29392/001C.27094

Gebrie, A., Tesfaye, B., Gebru, T., Adane, F., Abie, W., & Sisay, M. (2020). Diabetes mellitus and its associated risk factors in patients with human immunodeficiency virus

on anti-retroviral therapy at referral hospitals of Northwest Ethiopia. *Diabetology & Metabolic Syndrome*, *12*(1), 20. https://doi.org/10.1186/S13098-020-00527-1

Getahun, Z., Azage, M., Abuhay, T., & Abebe, F. (2020). Comorbidity of HIV, hypertension, and diabetes and associated factors among people receiving antiretroviral therapy in Bahir Dar city, Ethiopia. *Journal of Comorbidity*, *10*, 2235042X1989931. https://doi.org/10.1177/2235042X19899319

Gruszczyńska, E., & Rzeszutek, M. (2019). Trajectories of health-related quality of life and perceived social support among people living with HIV undergoing antiretroviral treatment: Does gender matter? *Frontiers in Psychology*, *10*(JULY), 1664. https://doi.org/10.3389/FPSYG.2019.01664/BIBTEX

Gutierrez, J. P., & Bertozzi, S. M. (2020). Non-communicable diseases and inequalities increase risk of death among COVID-19 patients in Mexico. *PLOS ONE*, *15*(10), e0240394. https://doi.org/10.1371/JOURNAL.PONE.0240394

Haleem, A., Javaid, M., Singh, R. P., & Suman, R. (2021). Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sensors International*, *2*, 100117. https://doi.org/10.1016/J.SINTL.2021.100117

Haregu, T. N., Setswe, G., Elliott, J., & Oldenburg, B. (2014). National Responses to HIV/AIDS and Non-Communicable Diseases in Developing Countries: Analysis of Strategic Parallels and Differences. *Journal of Public Health Research*, *3*(1), jphr.2014.99. https://doi.org/10.4081/JPHR.2014.99

Hopkins, K. L., Hlongwane, K. E., Otwombe, K., Dietrich, J., Cheyip, M., Olivier, J., van Rooyen, H., Doherty, T., & Gray, G. E. (2021). The substantial burden of non-communicable diseases and HIV-comorbidity amongst adults: Screening results from an integrated HIV testing services clinic for adults in Soweto, South Africa. *EClinicalMedicine*, *38*, 101015. https://doi.org/10.1016/j.eclinm.2021.101015

Husain, N. E., Noor, S. K., Elmadhoun, W. M., Almobarak, A. O., Awadalla, H., Woodward, C. L., Mital, D., & Ahmed, M. H. (2017). Diabetes, metabolic syndrome and dyslipidemia in people living with HIV in Africa: re-emerging challenges not to

be forgotten. *HIV/AIDS (Auckland, N.Z.)*, *9*, 193–202. https://doi.org/10.2147/HIV.S137974

Hyle, E. P., Martey, E. B., Bekker, L. G., Xu, A., Parker, R. A., Walensky, R. P., & Middelkoop, K. (2021). Diet, physical activity, and obesity among ART-experienced people with HIV in South Africa. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*. https://doi.org/10.1080/09540121.2021.2012556/SUPPL_FILE/CAIC_A_2012556_SM0264.DOC

Jazieh, A. R., Volker, S., & Taher, S. (2018). Involving the Family in Patient Care: A Culturally Tailored Communication Model. *Global Journal on Quality and Safety in Healthcare*, *1*(2), 33–37. https://doi.org/10.4103/JQSH.JQSH_3_18

Jespersen, N. A., Axelsen, F., Dollerup, J., Nørgaard, M., & Larsen, C. S. (2021). The burden of non-communicable diseases and mortality in people living with HIV (PLHIV) in the pre-, early- and late-HAART era. *HIV Medicine*, *22*(6), 478–490. https://doi.org/10.1111/HIV.13077

Jha, P. (2020). The hazards of smoking and the benefits of cessation: A critical summation of the epidemiological evidence in high-income countries. *ELife*, *9*. https://doi.org/10.7554/ELIFE.49979

John, B., Todd, J., Mboya, I., Mosha, M., Urassa, M., & Mtuy, T. (2017). Physical activity and associated factors from a cross-sectional survey among adults in northern Tanzania. *BMC Public Health*, *17*(1), 1–8. https://doi.org/10.1186/S12889-017-4512-4/TABLES/4

Kasango, A., Daama, A., & Negesa, L. (2024). Challenges in managing HIV and non-communicable diseases and health workers' perception regarding integrated management of non-communicable diseases during routine HIV care in South Central Uganda: A qualitative study. *PLOS ONE*, *19*(8), e0302290. https://doi.org/10.1371/JOURNAL.PONE.0302290

Kharsany, A. B. M., & Karim, Q. A. (2016). HIV Infection and AIDS in Sub-Saharan Africa: Current Status, Challenges and Opportunities. *The Open AIDS Journal*, *10*(1), 34. https://doi.org/10.2174/1874613601610010034

Kimani, S., Mirie, W., Chege, M., Okube, O. T., & Muniu, S. (2019). Association of lifestyle modification and pharmacological adherence on blood pressure control among patients with hypertension at Kenyatta National Hospital, Kenya: a cross-sectional study. *BMJ Open*, *9*(1), 23995. https://doi.org/10.1136/BMJOPEN-2018-023995

Kitahata, M. M., Tegger, M. K., Wagner, E. H., & Holmes, K. K. (2002). Comprehensive health care for people infected with HIV in developing countries. *BMJ : British Medical Journal*, *325*(7370), 954. https://doi.org/10.1136/BMJ.325.7370.954

Kitilya, B., PrayGod, G., Peck, R., Changalucha, J., Jeremiah, K., Kavishe, B. B., Friis, H., Filteau, S., Faurholt-Jepsen, D., Krogh-Madsen, R., Brage, S., & Olsen, M. F. (2022). Levels and correlates of physical activity and capacity among HIV-infected compared to HIV-uninfected individuals. *PLOS ONE*, *17*(1), e0262298. https://doi.org/10.1371/JOURNAL.PONE.0262298

KNBS. (2019). Distribution of Population by Administrative Units. In *2019 Kenya Population and Housing Census: Vol. II*. http://www.knbs.or.ke

Kruk, M. E., Gage, A. D., Arsenault, C., Jordan, K., Leslie, H. H., Roder-DeWan, S., Adeyi, O., Barker, P., Daelmans, B., Doubova, S. v., English, M., Elorrio, E. G., Guanais, F., Gureje, O., Hirschhorn, L. R., Jiang, L., Kelley, E., Lemango, E. T., Liljestrand, J., … Pate, M. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet. Global Health*, *6*(11), e1196. https://doi.org/10.1016/S2214-109X(18)30386-3

Kumar, S., & Samaras, K. (2018). The Impact of Weight Gain During HIV Treatment on Risk of Pre-diabetes, Diabetes Mellitus, Cardiovascular Disease, and Mortality. *Frontiers in Endocrinology*, *9*. https://doi.org/10.3389/FENDO.2018.00705

Lai, J. L., Chen, Y. H., Liu, Y. M., Yuan, J. J., Lin, J., Huang, A. Q., & Ye, H. H. (2019). Prevalence and risk factors of anaemia in hospitalised HIV-infected patients in southeast China: a retrospective study. *Epidemiology and Infection*, *147*. https://doi.org/10.1017/S0950268818003618

Lazarus, J. v., Safreed-Harmon, K., Kamarulzaman, A., Anderson, J., Leite, R. B., Behrens, G., Bekker, L. G., Bhagani, S., Brown, D., Brown, G., Buchbinder, S., Caceres, C., Cahn, P. E., Carrieri, P., Caswell, G., Cooke, G. S., Monforte, A. d'Arminio, Dedes, N., del Amo, J., … Waters, L. (2021). Consensus statement on the role of health systems in advancing the long-term well-being of people living with HIV. *Nature Communications 2021 12:1*, *12*(1), 1–14. https://doi.org/10.1038/s41467-021-24673-w

Leonard, P. (2017). Exploring ways to manage healthcare professional—patient communication issues. *Supportive Care in Cancer*, *25*(Suppl 1), 7. https://doi.org/10.1007/S00520-017-3635-6

Maduka, O. (2019). Investigating client satisfaction with antiretroviral treatment services in South-South Nigeria. *SAHARA J : Journal of Social Aspects of HIV/AIDS Research Alliance*, *16*(1), 70. https://doi.org/10.1080/17290376.2019.1636709

Manne-Goehler, J., Siedner, M. J., Montana, L., Harling, G., Geldsetzer, P., Rohr, J., Gómez-Olivé, F. X., Goehler, A., Wade, A., Gaziano, T., Kahn, K., Davies, J. I., Tollman, S., & Bärnighausen, T. W. (2019). Hypertension and diabetes control along the HIV care cascade in rural South Africa. *Journal of the International AIDS Society*, *22*(3). https://doi.org/10.1002/JIA2.25213

Mathew, T. K., & Tadi, P. (2021). Blood Glucose Monitoring. *Medical Devices and Systems*, 66-1-66–10. https://doi.org/10.5005/jp/books/12651_10

Mbuthia, G. W., Magutah, K., & McGarvey, S. T. (2021). The Prevalence and Associated Factors of Hypertension among HIV Patients. *International Journal of Hypertension*, *2021*. https://doi.org/10.1155/2021/5544916

McCombe, G., Lim, J., van Hout, M. C., Lazarus, J. v., Bachmann, M., Jaffar, S., Garrib, A., Ramaiya, K., Sewankambo, N. K., Mfinanga, S., & Cullen, W. (2022). Integrating Care for Diabetes and Hypertension with HIV Care in Sub-Saharan Africa: A Scoping Review. *International Journal of Integrated Care*, *22*(1). https://doi.org/10.5334/IJIC.5839

Molina-mula, J., & Gallo-estrada, J. (2020). Impact of Nurse-Patient Relationship on Quality of Care and Patient Autonomy in Decision-Making. *International Journal of Environmental Research and Public Health*, *17*(3). https://doi.org/10.3390/IJERPH17030835

Moyo-Chilufya, M., Maluleke, K., Kgarosi, K., Muyoyeta, M., Hongoro, C., & Musekiwa, A. (2023). The burden of non-communicable diseases among people living with HIV in Sub-Saharan Africa: a systematic review and meta-analysis. *EClinicalMedicine*, *65*. https://doi.org/10.1016/j.eclinm.2023.102255

Mutabazi-Mwesigire, D., Katamba, A., Martin, F., Seeley, J., & Wu, A. W. (2015). Factors That Affect Quality of Life among People Living with HIV Attending an Urban Clinic in Uganda: A Cohort Study. *PLoS ONE*, *10*(6). https://doi.org/10.1371/JOURNAL.PONE.0126810

Mutagonda, R. F., Siril, H., Kaaya, S., Amborose, T., Haruna, T., Mhalu, A., Urassa, D., Mtisi, E., Moshiro, C., Tarimo, E., Mahiti, G. R., Minja, A., Somba, M., August, F., & Mugusi, F. (2022). Prevalence and determinants of non-communicable diseases including depression among HIV patients on antiretroviral therapy in Dar es Salaam, Tanzania. *Tropical Medicine & International Health*, *27*(8), 742–751. https://doi.org/10.1111/TMI.13790

Ndirangu-Mugo, E., Shumba, C. S., Gatiti, P., Mutwiri, B. D., Abubakar, A., & Teitelman, A. (2022). Interventions for Prevention of Non-Communicable Diseases among Adolescents Living with HIV: A Systematic Review. *SN Comprehensive Clinical Medicine 2022 4:1*, *4*(1), 1–12. https://doi.org/10.1007/S42399-022-01186-1

Ng'ang'a, A., Waruiru, W., Ngare, C., Ssempijja, V., Gachuki, T., Njoroge, I., Oluoch, P., Kimanga, D. O., Maina, W. K., Mpazanje, R., & Kim, A. A. (2014). The Status of HIV Testing and Counseling in Kenya: Results From a Nationally Representative Population-Based Survey. *Journal of Acquired Immune Deficiency Syndromes (1999)*, *66*(Suppl 1), S27. https://doi.org/10.1097/QAI.0000000000000102

Ngin, C., Pal, K., Tuot, S., Chhoun, P., Yi, R., & Yi, S. (2018). Social and behavioural factors associated with depressive symptoms among university students in Cambodia: a cross-sectional study. *BMJ Open*, *8*(9), e019918. https://doi.org/10.1136/BMJOPEN-2017-019918

Olejarczyk, J. P., & Young, M. (2022). Patient Rights And Ethics. *The Journal of Law, Medicine & Ethics*, *8*(6), 2–2. https://doi.org/10.1111/j.1748-720X.1980.tb00615.x

Pan, X., Zhang, A., Henderson, G. E., Rennie, S., Liu, C., Cai, W., Wu, F., & Tucker, J. D. (2019). Traditional, complementary and alternative medical cures for HIV: rationale and implications for HIV cure research. *Global Public Health*, *14*(1), 152. https://doi.org/10.1080/17441692.2017.1413122

Parry, C. D., Patra, J., & Rehm, J. (2011). Alcohol consumption and non-communicable diseases: epidemiology and policy implications. *Addiction (Abingdon, England)*, *106*(10), 1718. https://doi.org/10.1111/J.1360-0443.2011.03605.X

Patel, P., Rose, C. E., Collins, P. Y., Nuche-Berenguer, B., Sahasrabuddhe, V. v., Peprah, E., Vorkoper, S., Pastakia, S. D., Rausch, D., & Levitt, N. S. (2018a). Noncommunicable diseases among HIV-infected persons in low-income and middle-income countries: a systematic review and meta-analysis. *AIDS (London, England)*, *32*(Suppl 1), S5. https://doi.org/10.1097/QAD.0000000000001888

Patel, P., Rose, C. E., Collins, P. Y., Nuche-Berenguer, B., Sahasrabuddhe, V. V., Peprah, E., Vorkoper, S., Pastakia, S. D., Rausch, D., & Levitt, N. S. (2018b). Noncommunicable diseases among HIV-infected persons in low-income and middle-income countries: A systematic review and meta-analysis. *AIDS*, *32*(Suppl 1), S5–S20. https://doi.org/10.1097/QAD.0000000000001888,

Patsis, I., Goodrich, S., Yiannoutsos, C. T., Brown, S. A., Musick, B. S., Diero, L., Kulzer, J. L., Bwana, M. B., Oyaro, P., & Wools-Kaloustian, K. K. (2020). Lower rates of ART initiation and decreased retention among ART-naïve patients who consume alcohol enrolling in HIV care and treatment programs in Kenya and Uganda. *PLOS ONE*, *15*(10), e0240654. https://doi.org/10.1371/JOURNAL.PONE.0240654

Peter, E., Kamath, R., Andrews, T., & Hegde, B. M. (2014). Psychosocial Determinants of Health-Related Quality of Life of People Living with HIV/AIDS on Antiretroviral Therapy at Udupi District, Southern India. *International Journal of Preventive Medicine*, *5*(2), 203. /pmc/articles/PMC3950744/

Rajagopaul, A., & Naidoo, M. (2021). Prevalence of diabetes mellitus and hypertension amongst the HIV-positive population at a district hospital in eThekwini, South Africa. *African Journal of Primary Health Care & Family Medicine*, *13*(1), 1–6. https://doi.org/10.4102/PHCFM.V13I1.2766

Rehm, J., Probst, C., Shield, K. D., & Shuper, P. A. (2017). Does alcohol use have a causal effect on HIV incidence and disease progression? A review of the literature and a modeling strategy for quantifying the effect. *Population Health Metrics*, *15*(1). https://doi.org/10.1186/S12963-017-0121-9

Reif, S., Proeschold-Bell, R. J., Yao, J., Legrand, S., Uehara, A., Asiimwe, E., & Quinlivan, E. B. (2013). Three types of self-efficacy associated with medication adherence in patients with co-occurring HIV and substance use disorders, but only when mood disorders are present. *Journal of Multidisciplinary Healthcare*, 6–229. https://doi.org/ 10.2147/JMDH.S44204

Rodés, B., Cadiñanos, J., Esteban-Cantos, A., Rodríguez-Centeno, J., & Arribas, J. R. (2022). Ageing with HIV: Challenges and biomarkers. *EBioMedicine*, *77*, 103896. https://doi.org/10.1016/J.EBIOM.2022.103896

Rücker, S. C. M., Tayea, A., Bitilinyu-Bangoh, J., Bermúdez-Aza, E. H., Salumu, L., Quiles, I. A., Szumilin, E., Chirwa, Z., Rick, F., & Maman, D. (2018). High rates of hypertension, diabetes, elevated low-density lipoprotein cholesterol, and

cardiovascular disease risk factors in HIV-infected patients in Malawi. *AIDS (London, England)*, *32*(2), 253. https://doi.org/10.1097/QAD.0000000000001700

Saito, A., Karama, M., & Kamiya, Y. (2020). HIV infection, and overweight and hypertension: a cross-sectional study of HIV-infected adults in Western Kenya. *Tropical Medicine and Health*, *48*(1). https://doi.org/10.1186/S41182-020-00215-W

Sanga, E. S., Mukumbang, F. C., Mushi, A. K., Lerebo, W., & Zarowsky, C. (2019). Understanding factors influencing linkage to HIV care in a rural setting, Mbeya, Tanzania: qualitative findings of a mixed methods study. *BMC Public Health*, *19*(1), 1–15. https://doi.org/10.1186/S12889-019-6691-7/FIGURES/1

Seiglie, J. A., Marcus, M. E., Ebert, C., Prodromidis, N., Geldsetzer, P., Theilmann, M., Agoudavi, K., Andall-Brereton, G., Aryal, K. K., Bicaba, B. W., Bovet, P., Brian, G., Dorobantu, M., Gathecha, G., Gurung, M. S., Guwatudde, D., Msaidié, M., Houehanou, C., Houinato, D., … Manne-Goehler, J. (2020). Diabetes prevalence and its relationship with education, wealth, and BMI in 29 low- And middle-income countries. *Diabetes Care*, *43*(4), 767–775. https://doi.org/10.2337/DC19-1782/-/DC1

Sharma, S. R., Matheson, A., Lambrick, D., Faulkner, J., Lounsbury, D. W., Vaidya, A., & Page, R. (2020). The role of tobacco and alcohol use in the interaction of social determinants of non-communicable diseases in Nepal: A systems perspective. *BMC Public Health*, *20*(1), 1–13. https://doi.org/10.1186/S12889-020-09446-2/FIGURES/5

Shayo, E. H., Kivuyo, S., Seeley, J., Bukenya, D., Karoli, P., Mfinanga, S. G., Jaffar, S., & van Hout, M. C. (2022). The acceptability of integrated healthcare services for HIV and non-communicable diseases: experiences from patients and healthcare workers in Tanzania. *BMC Health Services Research*, *22*(1), 1–12. https://doi.org/10.1186/S12913-022-08065-4/TABLES/2

Singh, S., Kirk, O., Jaffar, S., Karakezi, C., Ramaiya, K., Kallestrup, P., & Kraef, C. (2021). Patient perspectives on integrated healthcare for HIV, hypertension and type 2 diabetes: a scoping review. *BMJ Open*, *11*(11). https://doi.org/10.1136/BMJOPEN-2021-054629,

Smit, M., Olney, J., Ford, N. P., Vitoria, M., Gregson, S., Vassall, A., & Hallett, T. B. (2018). The growing burden of noncommunicable disease among persons living with HIV in Zimbabwe. *AIDS (London, England)*, *32*(6), 773. https://doi.org/10.1097/QAD. 0000000000001754

Smit, M., Perez-Guzman, P. N., Mutai, K. K., Cassidy, R., Kibachio, J., Kilonzo, N., & Hallett, T. B. (2020). Mapping the Current and Future Noncommunicable Disease Burden in Kenya by Human Immunodeficiency Virus Status: A Modeling Study. *Clinical Infectious Diseases*, *71*(8), 1864–1873. https://doi.org/10.1093/CID/CIZ1103

Suleiman, B. A., Yahaya, M., Olaniyan, F. A., Sule, A. G., & Sufiyan, M. B. (2020). Determinants of health-related quality of life among human immunodeficiency virus positive (HIV-positive) patients at Ahmadu Bello University teaching hospital, Zaria, Nigeria- 2015. *BMC Public Health*, *20*(1). https://doi.org/10.1186/S12889-020-08659-9

Syed, S. T., Gerber, B. S., & Sharp, L. K. (2013). Traveling Towards Disease: Transportation Barriers to Health Care Access. *Journal of Community Health*, *38*(5), 976. https://doi.org/10.1007/S10900-013-9681-1

UNAIDS. (2021). *F A C T S H E E T 2 0 2 2*. https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf

Unger, T., Borghi, C., Charchar, F., Khan, N. A., Poulter, N. R., Prabhakaran, D., Ramirez, A., Schlaich, M., Stergiou, G. S., Tomaszewski, M., Wainford, R. D., Williams, B., & Schutte, A. E. (2020). 2020 International Society of Hypertension Global Hypertension Practice Guidelines. *Hypertension*, *75*(6), 1334–1357. https://doi.org/10.1161/HYPERTENSIONAHA.120.15026

Uwanyirigira, D., Biracyaza, E., Uzabakiriho, I., Omolo, J., Hakizayezu, F., & Nzayirambaho, M. (2023). Prevalence and Factors Associated with Hypertension Among HIV Positive Patients on Antiretroviral Therapy: A Hospital-Based Cross-Sectional Study in Rwanda. *Vascular Health and Risk Management*, *19*, 857–870. https://doi.org/10.2147/VHRM.S442108,

van der Mannen, J. S., Heine, M., Lalla-Edward, S. T., Ojji, D. B., Mocumbi, A. O., & Klipstein-Grobusch, K. (2024). Lessons Learnt from HIV and Noncommunicable Disease Healthcare Integration in Sub-Saharan Africa. *Global Heart*, *19*(1), 85. https://doi.org/10.5334/GH.1370

Vorkoper, S., Kupfer, L. E., Anand, N., Patel, P., Beecroft, B., Tierney, W. M., Ferris, R., El-Sadr, W. M., Bacon, M., Berman, J., Berzon, R., Bongomin, P., Bremer, A., Castor, D., Collins, P., Dirks, R., Dominguez, G., Ejigu, A. A., Engelgau, M., … Yonga, G. (2018). Building on the HIV chronic care platform to address noncommunicable diseases in sub-Saharan Africa: a research agenda. *AIDS (London, England)*, *32*(Suppl 1), S107. https://doi.org/10.1097/QAD.0000000000001898

Wamai, R. G., Kengne, A. P., & Levitt, N. (2018). Non-communicable diseases surveillance: Overview of magnitude and determinants in Kenya from STEPwise approach survey of 2015. *BMC Public Health*, *18*(3), 1–8. https://doi.org/10.1186/S12889-018-6051-Z/METRICS

Wedajo, S., Degu, G., Deribew, A., & Ambaw, F. (2022). Social support, perceived stigma, and depression among PLHIV on second-line antiretroviral therapy using structural equation modeling in a multicenter study in Northeast Ethiopia. *International Journal of Mental Health Systems*, *16*(1), 1–10. https://doi.org/10.1186/S13033-022-00536-9/TABLES/4

Weir, C. B., & Jan, A. (2022). BMI Classification Percentile And Cut Off Points. *StatPearls*. https://www.ncbi.nlm.nih.gov/books/NBK541070/

Wekesa, P., McLigeyo, A., Owuor, K., Mwangi, J., & Ngugi, E. (2022). Survival probability and factors associated with time to loss to follow-up and mortality among patients on antiretroviral treatment in central Kenya. *BMC Infectious Diseases*, *22*(1), 1–10. https://doi.org/10.1186/S12879-022-07505-0/FIGURES/2

Willig, A. L., & Overton, E. T. (2016). Metabolic Complications and Glucose Metabolism in HIV Infection: A Review of the Evidence. *Current HIV/AIDS Reports*, *13*(5), 289. https://doi.org/10.1007/S11904-016-0330-Z

Yfantopoulos, J., Protopapa, M., Chantzaras, A., & Yfantopoulos, P. (2021). Doctors' views and strategies to improve patients' adherence to medication. *Hormones*, *20*(3), 603–611. https://doi.org/10.1007/S42000-021-00294-2/FIGURES/4

APPENDICES

Appendix I: Introduction Letter

Letter to Introduction

TO……..

NAME……...

ADDRESS…….

DATE……

Dear Sir/Madam,

RE: REQUEST FOR RESEARCH PARTICIPATION.

I am a postgraduate student undertaking a Master of Science in Epidemiology; carrying out research on risk factors associated with selected non-communicable diseases among people living with HIV/AIDS attending CCC Murang'a County Referral Hospital. This study is being carried out as a part of the requirement of obtaining the degree. To conduct the research effectively, you have been selected to be a respondent for the study, which is entirely for academic purposes only. I am kindly requesting you to participate by responding to the questions as truthfully and honestly as you can. The information obtained will be treated with utmost privacy. Your co-operation and assistance in this research is highly appreciated.

Yours Sincerely,

Silvia Wairimu Ngugi

Appendix II: Questionnaire

Section A: Demographic variables

1. Gender
    a. Male [ ]
    b. Female [ ]
    c. Both sexes [ ]
2. How old are you? [ ]
3. What is your marital status?
    a. Single [ ]
    b. Married [ ]
    c. Separated/Divorced [ ]
    d. Widowed [ ]
4. Type of marriage

		Yes	No
Monogamous			
Polygamous			

5. What is your highest level of education?
    a. Postgraduate [ ]
    b. Bachelors [ ]
    c. Diploma [ ]
    d. Certificate [ ]
    e. Secondary [ ]
    f. Primary [ ]
    g. None [ ]
6. Respondent's religion
    a. Catholic [ ]
    b. Protestants [ ]
    c. Muslim [ ]
    d. Other [ ]

Section B: non-communicable diseases

7. Do you have any of the following Non-communicable Diseases?

	Hypertensions	**YES**	**NO**
1.	Diabetes mellitus		
2.	High blood pressure		

8. Are you on any treatment of the following?

	Hypertensions	**YES**	**NO**
3.	Diabetes mellitus		
4.	High blood pressure		

Section C: Healthcare seeking behaviours among people living with HIV/AIDs

9. Are hypertension drugs available in this health facility?
    a. No [ ]
    b. Yes [ ]

i. If yes, are they free in this health facility?
    a. Yes [ ] No [ ]

10. Have you considered going elsewhere for hypertension treatment?
    a. Yes [ ]
    b. No [ ]
11. Do health care providers give you sufficient time to respond to your queries?
    a. Yes [ ]
    b. No [ ]
12. Are you satisfied with services offered by the healthcare providers in this facility?
    a. Yes [ ]
    b. No [ ]
13. Are the healthcare providers professional?
    a. Yes [ ]
    b. No [ ]
14. Have you told anyone in your family that you are coming to the hospital for treatment?
    a. Yes [ ]
    b. No [ ]
15. Do you think people should consult a healthcare professional if they have hypertension?
    a. Yes [ ]
    b. No [ ]
16. Do you think health care providers where you seek treatment are professional?
    a. Yes [ ]
    b. No [ ]
17. How often do you check your blood pressure?
    a. Always [ ]
    b. Often [ ]
    c. Sometimes [ ]
    d. Rarely [ ]
18. How often do you check your weight?
    a. Always [ ]
    b. Often [ ]
    c. Sometimes [ ]
    d. Rarely [ ]
19. Do you visit health facility to seek health services when unwell?
    a. Yes [ ]
    b. No [ ]
20. Have you ever sought services of a traditional healer for hypertension and diabetes
    a. Yes [ ]
    b. No [ ]
21. Are currently taking any herbal medicine?
    a. Yes [ ]
    b. No [ ]

Section D: Socioeconomic Factors

22. What is your occupation?
    a. Formally employed [ ]
    b. casually employed [ ]
    c. Self-employed [ ]
    d. A student [ ]
    e. Unemployed [ ]
23. What is your average monthly income?
    a. 0-5000 [ ]
    b. 5000-10000 [ ]
    c. 10000-20000 [ ]
    d. 20000 and above [ ]
24. Kindly indicate your residence
    a. Low income settlement [ ]
    b. Middle income settlement [ ]
    c. High income settlement [ ]
25. What means of transport do you use to get to this health facility and how much do spend on transport?
    a. Walking [ ]
    b. Public transport [ ]
    c. Cycling [ ]
    d. Driving [ ]
26. Have you ever failed to get to health facility because of lack of money for transportation?
    a. Yes [ ]
    b. No [ ]

Section E: Behavioural factors

27. Have you ever smoked any tobacco products, such as pipes, cigarettes, cigars etc.?
    a. Yes [ ]
    b. No [ ]
28. Have you ever consumed any alcohol such as beer, wine and spirits?
    a. Yes [ ]
    b. No [ ]
29. Kindly indicate whether the following measurements were taken today
    a. Weight_____
        i. Yes [ ] No [ ]
    b. Height_____
        i. Yes [ ] No [ ]
    c. Blood Pressure _____
        i. Yes [ ] No [ ]
30. Did the healthcare provider inform you about BMI calculation?
    a. Yes [ ]
    b. No [ ]
31. Have you tested for blood glucose levels for the last six months?

a. Yes [ ]
b. No [ ]

32. Did the health care provider test your blood glucose today?
    a. Yes [ ]
    b. No [ ]
33. Do you perform physical exercises?
    a. No [ ]
    b. Yes [ ]
        i. If yes, how often do you exercise?
            a. Sometimes [ ]
            b. Rarely [ ]
34. Do you know the meaning of a balanced diet meal?
    a. No [ ]
    b. Yes [ ]
        i. If yes, do you observe balanced diet in your meal?
            a. Yes [ ]
            b. No [ ]
35. Do you add table salt in your food?
    a. Yes [ ]
    b. No [ ]
36. Do you prefer a high fatty diet?
    a. Yes [ ]
    b. No [ ]
37. Do you eat a serving of fruits/vegetables at least two servings every day?
    a. Yes [ ]
    b. No [ ]
38. How often do you take processed food in a week? (E.g. carbonated drinks, biscuits, cakes etc.)
    a. Everyday [ ]
    b. Twice a week [ ]
    c. More than twice a week [ ]

Appendix III: Questionnaire in Swahili

Kiambatisho: Maswali

Sehemu A: Vigezo vya idadi ya watu

1. Jinsia

Mwanaume [ ]

Mwanamke [ ]

Jinsia zote [ ]

2. Una miaka mingapi?

[ ]

3. Je! Ndoa yako ikoje?

Mseja [ ]

Umeoa [ ]

Wametengwa / Wameachana [ ]

Mjane [ ]

4. Aina ya kuoa

	Ndio	La
Mke mmoja		
Wake wengi		

5. Je! Ni kiwango gani cha juu cha elimu yako?

Uzamili [ ]

Shahada [ ]

Stashahada [ ]

Cheti [ ]

Sekondari [ ]

Msingi [ ]

Hakuna [ ]

6. Dini ya mhojiwa

Katoliki [ ]

Waprotestanti [ ]

Mwislamu [ ]

Nyingine [ ]

Sehemu ya B: magonjwa yasiyoambukiza

7. Je! Unayo yoyote ya Magonjwa Yasiyoambukiza yafuatayo?

	NCDs	NDIYO	HAPANA
I	Ugonjwa wa kisukari		
2	Shinikizo la damu		

8. Je! Uko kwenye matibabu yoyote ya yafuatayo?

	NCDs	NDIYO	HAPANA
1	Ugonjwa wa kisukari		
2	Shinikizo la damu		

Sehemu ya C: Tabia ya utaftaji afya kati ya watu wanaoishi na HIV / UKIMWI

9. Je! Dawa za NCD zinapatikana katika kituo hiki cha afya?

Ndio [ ] la [ ]

b) Ikiwa ndio, wako huru katika kituo hiki cha afya?

Ndio [ ] la [ ]

10. Je! Umefikiria kwenda mahali pengine kwa matibabu ya NCD?

Ndio [ ] la [ ]

11. Je! Watoa huduma ya afya wanakupa muda wa kutosha kujibu maswali yako?

Ndio[ ] la [ ]

12. Je! Umeridhika na huduma zinazotolewa na watoa huduma za afya katika kituo hiki?

Ndio la [ ]

13. Je! Watoa huduma ya afya ni wataalamu?

Ndio la [ ]

14. Je! Umemwambia mtu yeyote katika familia yako kuwa unakuja hospitalini kwa matibabu?

Ndio la [ ]

15. Je! Unafikiri watu wanapaswa kushauriana na mtaalamu wa huduma ya afya ikiwa wana NCDs?

Ndio [ ] la [ ]

Je! Unafikiri watoa huduma za afya ambapo unatafuta matibabu ni wataalamu?

Ndio[ ] la [ ]

17. Unaangalia shinikizo la damu mara ngapi?

Daima [ ] Mara nyingi [ ]

Wakati mwingine [ ] Mara chache [ ]

18. Unaangalia uzito wako mara ngapi?

Daima [ ] Mara nyingi [ ]

Wakati mwingine [ ] Mara chache [ ]

19. Je! Unatembelea kituo cha afya kutafuta huduma za afya wakati haujambo?

Ndio [ ] la [ ]

20. Je! Umewahi kutafuta huduma ya mganga wa kienyeji wa magonjwa yasiyo ya kuambukiza?

Ndio [ ] la [ ]

21. Je! Unachukua dawa yoyote ya asili?

Ndio [ ] la [ ]

Sehemu ya D: Sababu za Uchumi

22. Kazi yako ni nini?

Kuajiriwa rasmi [ ] kuajiriwa kawaida [ ]

Kujiajiri [ ] Mwanafunzi [ ]

Kutokuwa na ajira [ ]

23. Je! Wastani wa mapato yako ya kila mwezi ni nini?

0-5000 [ ] 5000-10000 [ ]

10000-20000 [ ] 20000 na zaidi [ ]

24. Tafadhali onyesha makazi yako

Makazi ya mapato ya chini [ ]

Makazi ya kipato cha kati [ ]

Makazi ya mapato ya juu [ ]

25. Unatumia usafiri gani kufika katika kituo hiki cha afya na unatumia kiasi gani kwa usafiri?

Kutembea [ ] Usafiri wa umma [ ]

Baiskeli [ ] Kuendesha gari [ ]

26. Je! Umewahi kushindwa kufika kwenye kituo cha afya kwa sababu ya ukosefu wa pesa za usafiri?

Ndio [ ] la [ ]

Sehemu ya E: Sababu za tabia

27. Je! Umewahi kuvuta bidhaa yoyote ya tumbaku, kama vile mabomba, sigara, sigara nk?

Ndio [ ] la [ ]

28. Je! Umewahi kunywa pombe kama vile bia, divai na pombe?

Ndio [ ] la [ ]

29. Tafadhali onyesha ikiwa vipimo vifuatavyo vilichukuliwa leo

Uzito_____ Ndio [] Hapana []

Urefu_____Ndio [] Hapana []

Shinikizo la damu _____Ndio [ ] Hapana [ ]

30. Je! Mtoa huduma ya afya alikufahamisha juu ya hesabu ya BMI?

Ndio [ ] la [ ]

31. Je! Umepima viwango vya sukari ya damu kwa miezi sita iliyopita?

Ndio [ ] la [ ]

32. Je! Mtoa huduma ya afya alijaribu sukari yako ya damu leo?

Ndio [ ] la [ ]

33. Je! Unafanya mazoezi ya mwili?

Ndio [ ] la [ ]

Ikiwa ndio, unafanya mazoezi mara ngapi?

Mara nyingine [ ]

Nadra [ ]

34. Je! Unajua maana ya lishe bora ya lishe?

Ndio [ ] la [ ]

(b) Ikiwa ndio, je! unazingatia lishe bora katika mlo wako?

Ndio [ ] la [ ]

35. Je! Unaongeza chumvi ya mezani kwenye chakula chako?

Ndio [ ] la [ ]

36. Je! Unapendelea lishe yenye mafuta mengi?

Ndio [ ] la [ ]

37. Je! Unakula kutumikia matunda / mboga angalau migao miwili kila siku?

Ndio [ ] la [ ]

38. Ni mara ngapi unachukua chakula kilichosindikwa kwa wiki? (Mfano vinywaji vya kaboni, biskuti, keki nk.)

Kila siku [ ]

Mara mbili kwa wiki [ ]

Zaidi ya mara mbili kwa wiki [ ]

Appendix IV: Consent Form

Information about the Study

Hello, I am asking for your participation in my Master of Science degree research thesis research. I am Master's Degree in Epidemiology student at Jomo Kenyatta University of Agriculture and Technology. My research topic is "**risk factors associated with hypertension and diabetes among people living with HIV/AIDS attending Comprehensive Care Clinic, Murang'a County Referral Hospital".**

You can choose to be in the study or not. By answering the questions honestly and completely you will be contributing to the knowledge base about risk factors associated with non-communicable diseases among people living with HIV/AIDS.

You have been selected to represent People living with HIV/AIDS in this county (Murang'a County)

Informed Consent

Participation in this study is voluntary. If you decide not to participate, there will not be any negative consequences. The questionnaire will not have your name on it, and will be coded only by a number, and not by name.

Please be aware that if you decide to participate, you may stop participating at any time and you may decide not to answer any specific question. All of the information that you provide for the study will be kept completely confidential.

If you have questions or concerns now or afterwards, you may contact (Provide phone number).

There are no anticipated risks to your participation in this study. If you feel some discomfort at responding to certain questions please feel free to skip them. The questions will only take 20 minutes.

Do you have any questions about the Study? Are you willing to participate in this study?

Consent Form

I have a form that must be read to you before we begin, in order to confirm that we have explained the study to you and that you have agreed to participate.

We ask you to sign the form, but we do not keep the form attached to the questionnaire, so your name will not be linked to the information we write about you, and no one except the people responsible for the study will have access to this information.

I understand that I have been asked by (Name) to participate in a research project designed to establish the risk factors associated with non-communicable diseases among people living HIV/AIDS. I understand that during this study I will answer questions risk factors associated with hypertension and HIV/AIDS by filling in a questionnaire form. My participation in the study will be kept confidential, and my identity will be available only to those performing or supervising the research. I understand that I would never be identified by name in any publications resulting from this study.

I am aware that there may be some questions in the questionnaire, which may make me uncomfortable. I realize that I do not have to answer any question that I do not want to answer. I understand that I am free to withdraw my consent and to discontinue participation in this research project at any time, without affecting my future image and health care services provided at Murang'a Level Five CCC.

I realize that I will not receive any direct compensation from this project. However, with my participation, I hope to help investigators, healthcare providers other patients and the entire public to improve their understanding of the risk factors associated with hypertension among people living with HIV/AIDS.

Certificate

I have read and understood this consent form or I have had it explained to me to my satisfaction the information relating to this study. I understand what my participation will involve and agree to take part in filling the questionnaire under the terms of this

agreement. I have had the opportunity to ask questions about it, and my questions have been answered to my satisfaction.

I consent voluntarily to participate in this study and I understand that I have the right to withdraw at any time, without it in any way affecting my image and health care services provided at Murang'a Level Five CCC..

Participant signature……..

Researcher /Assistant Signature……

Date……

Appendix V: Consent Form (Pretesting of the Tool)

Information about the Study

Hello, I am asking for your participation in my Master of Science degree research thesis research. I am Master's Degree in Epidemiology student at Jomo Kenyatta University of Agriculture and Technology. My research topic is: "**risk factors associated with hypertension and Diabetes among people living with HIV/AIDS attending Comprehensive Care Clinic, Murang'a County Referral Hospital".**

You can choose to be in the study or not. By answering the questions honestly and completely you will be contributing to the knowledge base about risk factors associated with hypertension and diabetes among people living with HIV/AIDS.

You have been selected to represent People living with HIV/AIDS in this county

Informed Consent

Participation in this study is voluntary. If you decide not to participate, there will not be any negative consequences. The questionnaire will not have your name on it, and will be coded only by a number, and not by name.

Please be aware that if you decide to participate, you may stop participating at any time and you may decide not to answer any specific question. All of the information that you provide for the study will be kept completely confidential.

If you have questions or concerns now or afterwards, you may contact (Provide phone number).

There are no anticipated risks to your participation in this study. If you feel some discomfort at responding to certain questions please feel free to skip them. The questions will only take 20 minutes.

Do you have any questions about the Study? Are you willing to participate in this study?

Consent Form

I have a form that must be read to you before we begin, in order to confirm that we have explained the study to you and that you have agreed to participate.

We ask you to sign the form, but we do not keep the form attached to the questionnaire, so your name will not be linked to the information we write about you, and no one except the people responsible for the study will have access to this information.

I understand that I have been asked by (Name) to participate in a research project designed to establish the risk factors associated with non-communicable diseases among people living HIV/AIDS. I understand that during this study I will answer questions risk factors associated with hypertension, diabetes and HIV/AIDS by filling in a questionnaire form. My participation in the study will be kept confidential, and my identity will be available only to those performing or supervising the research. I understand that I would never be identified by name in any publications resulting from this study.

I am aware that there may be some questions in the questionnaire, which may make me uncomfortable. I realize that I do not have to answer any question that I do not want to answer. I understand that I am free to withdraw my consent and to discontinue participation in this research project at any time, without affecting my future image and health care services provided at Thika Level Five CCC..

I realize that I will not receive any direct compensation from this project. However, with my participation, I hope to help investigators, healthcare providers other patients and the entire public to improve their understanding of the risk factors associated with hypertension and diabetes among people living with HIV/AIDS.

Certificate

I have read and understood this consent form or I have had it explained to me to my satisfaction the information relating to this study. I understand what my participation will involve and agree to take part in filling the questionnaire under the terms of this

agreement. I have had the opportunity to ask questions about it, and my questions have been answered to my satisfaction.

I consent voluntarily to participate in this study and I understand that I have the right to withdraw at any time, without it in any way affecting my image and health care services provided at Thika Level Five CCC..

Participant signature……..

Researcher /Assistant Signature……

Date……

Appendix VI: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **997918**

Date of Issue: **25/May/2020**

RESEARCH LICENSE

This is to Certify that Ms.. silvia wairimu ngugi of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research in Muranga on the topic: RISK FACTORS ASSOCIATED WITH SELECTED NON-COMMUNICABLE DISEASES AMONG PEOPLE LIVING WITH HIV/AIDS ATTENDING CCC MURANG'A COUNTY REFERALL HOSPITAL for the period ending : 25/May/2021.

License No: **NACOSTI/P/20/5047**

997918

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

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Appendix VII: Research Publication

Missed HIV care appointments and high body mass index predict hypertension risks at diagnosis: a risk identifying opportunity among people living with HIV for global health

Authors

Silvia Ngugi
School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Kenya
Cyrus Mutie
School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Kenya
Victoria Wanjiku
School of Medicine, Jomo Kenyatta University of Agriculture and Technology, Kenya
Reagan Chweya
School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Kenya
John Gachohi
School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Kenya; Global Health Program, Washington State University, Washington, US; Paul G. Allen School of Global Health, Washington State University, Washington, US
Kenneth Ngure
School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Kenya; Department of Global Health, University of Washington, Washington, US
DOI: https://doi.org/10.18203/2394-6040.ijcmph20240610

Keywords: : NCD, Diabetes, Hypertension

Abstract

Background: Chronic conditions, including diabetes and hypertension among people living with HIV/AIDS (PLWHIV), require long-term adherence to treatment and regular follow-ups for symptom checkups and management to prolong life and improve its quality. To inform the design

of patient-centered HIV-NCD interventions, this study determined predictors of hypertension and diabetes (non-communicable diseases-NCD) among PLWHIV.

Methods: This study adopted a cross-sectional study design. Attendance registers of PLWHIV attending the comprehensive care clinic at Murang'a referral hospital served as a sampling frame. The first study participant was randomly selected using a lottery method, while other participants were systematically sampled and enrolled. PLWHIV were clinically examined for NCD (hypertension and/or diabetes) screening and body mass index (BMI). Logistic regression models predicted associations with risk factors linked to the selected NCD among PLWHIV.

Results: A total of 281 PLWHIV were recruited, of these 192 (68%) were female, while 91% were aged above 35 years. We identified 77 (27%) PLWHIV with hypertension, and none had diabetes. About 70% of the PLWHIV with NCD missed HIV care appointments. About 89% of the PLWHIV were obese and overweight. Higher BMI (Odds ratio (OR)=1.15 95%CI 1.06, 1.24) and missing HIV care appointments (OR=2.12 95%, CI 1.23, 3.95) increased the risk of hypertension among PLWHIV.

Conclusions: We establish increased risks to NCD associated with higher BMI and missed scheduled HIV-linked care among PLWHIV. To improve global health, identifying and understanding determinants of missed HIV care appointments will help to re-engage defaulters while promoting regular screening for NCD profiles.

Appendix VIII: AMREF Ethical Review Letter

amref health africa

Amref Health Africa in Kenya

REF: AMREF – ESRC P769/2020 March 2, 2020

Silvia Ngugi
Jomo Kenyatta University of Agriculture and Technology
483 Ruaraka
Tel. +254 722 731 179
Email: silvi@gmail.com

Dear Silvia Ngugi,

RESEARCH PROTOCOL: RISK FACTORS ASSOCIATED WITH SELECTED NON-COMMUNICABLE DISEASES AMONG PEOPLE LIVING WITH HIV/AIDS ATTENDING CCC MURANG'A COUNTY REFERRAL HOSPITAL

Thank you for submitting your protocol to the Amref Ethics and Scientific Review Committee (ESRC)

The committee noted that this is a very important study. However, the following are comments that can improve your protocol:

1. Provide a CV for all investigators as per the ESRC guidelines.
2. Revise the acronym AIDS to have a capital S because it stands for Syndrome and STI stands for Sexually Transmitted Infection, not as stated.
3. Revise the definition of Non-communicable diseases (NCDs). It is true that non-communicable disease (NCD) is not transmissible directly from one person to another, but it is not true that causative agents are not known. For some, causative agents or mechanisms are known. For example, genetically-based diseases; Type 1 diabetes mellitus.
4. Restructure the abstract as per the ESRC guidelines. It should have a maximum 300 words with subsections including background, objectives, methods, duration and total budget.
5. Under the abstract; non-communicable diseases are not the same as non-communicable medical complications. Complications arise as a result of diseases.
6. Under the Introduction; Is HIV/AIDS the greatest health problem in the world? NCDs by themselves are greater. Please revise accordingly.
7. The introduction section of the study should focus more on the HIV/AIDS and NCD situation in Kenya leading to the justification of the study in Murang'a. Studies outside and within Africa belong in the Literature review. Also, justify why HIV/AIDS data outside Africa was picked.
8. On page 5. This statement is no longer correct: "HIV/AIDS infected patients in care with low CD4 counts based on prevailing national guidelines were declared eligible for HIV treatment". Treatment is now given to all HIV infected individuals regardless of CD4 counts. See 2018 Guidelines on the Use of Antiretroviral Drugs for Treating and Preventing HIV in Kenya. Please revise accordingly.
9. Consider focusing on objective 1 and 3 of the study. Objective 2 is not properly covered in the questionnaire and would add too much complexity to this study.
10. Provide a conceptual framework for this study.
11. Revise the study timelines to reflect the current status of the protocol.
12. The process of simple random sampling of patients attending the CCC needs to be fully explained. Please revise accordingly.
13. There is inconsistency in the description of the data collection process. The protocol states "The questionnaire will be administered by the researcher because of cases of illiteracy levels among the study subjects" and "Two research assistants will .... assist in the questionnaire administration during the study". This needs clarity.
14. Justify why the research assistants have to be below 30 years of age, they also have to be experienced.

15. Under the Data collection procedures: Provide clarification for this statement; "Structured questionnaire will be administered by the trained research assistants and in case if any explanation required by the respondents, the research assistants will step in".
16. Under the ethical considerations: the protocol states that scientific and ethical approval of the study will be obtained from Ethical Review Committee and Scientific Steering Committee of the Kenya Medical Research Institute: KEMRI SSC. Please revise accordingly.
17. Study participants involved in the evaluation need to consent to the study and sign consent form, and permission obtained from Taita Level 5 Hospital.
18. The Information Sheet/Consent Form provided in the protocols as well as in the first part of the separate Consent Form is not adequately detailed and should not be used. Consider using a detailed Consent Form that follows the ESRC form.
19. Include the study limitations and mitigating measures.
20. On appendix 2: Questionnaire. Please revise the following accordingly;
    a. "Other" should be an option for all questions and stating "Muslim/Other" is not appropriate. Muslim should be a category on its own. Please revise accordingly.
    b. Question 12: "Major non-communicable infections" is not a correct statement.
    c. Health seeking behaviour: questions to do with alcohol, smoking, measuring blood pressure at home are not related to health seeking behaviour. They are socio-economic. The questions about Health Seeking Behavior are few and do not adequately cover the broad topic.
    d. Asking whether each participant's residence is "slum" or "non-slum" is not appropriate.
    e. Questions about spouses are not environmental questions.
21. The questionnaire needs to be translated to Kiswahili before data collection and presented to ESRC.

Verdict: Major Revision

In reference to the issues and recommendations raised above, please revise your protocol accordingly and resubmit the revised document (with highlighted changes) and a response letter at your earliest convenience but not later than March 16, 2020. Ensure you quote your protocol number (P769/2020) in your email subject line.

Kindly note that any revised protocol received three months from the initial review date will have to be resubmitted as a new protocol and review fee paid.

In case of any clarification or query, please do not hesitate to contact the ESRC Secretariat (esrc.kenya@amref.org).

AMREF - ESRC
P.O. Box 30125 - 00100, NAIROBI

Yours sincerely,

for

Prof. Mohamed Karim
Chair, Amref ESRC
CC: Samuel Mutula, Monitoring & Evaluation and Research Manager, Amref Health Africa in Kenya