PREVALENCE OF UNCONTROLLED HYPERTENSION AND ASSOCIATED FACTORS AMONG HYPERTENSIVE PATIENTS ATTENDING MEDICAL OUTPATIENT CLINIC, THIKA LEVEL 5 HOSPITAL, KIAMBU COUNTY, KENYA

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Prevalence of Uncontrolled Hypertension and Associated Factors among Hypertensive Patients Attending Medical Outpatient Clinic, Thika Level 5 Hospital, Kiambu County, Kenya

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DECLARATION

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

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DEDICATION

I dedicate this work to my family: husband Kennedy and children Collins, Sharon, Anne and Gabriel whose support I found priceless for the entire duration of this accomplishment.

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ABBREVIATIONS AND ACRONYMS

ACEI   Angiotensin Converting Enzyme Inhibitor

AHT   Antihypertensive

ARBs   Angiotensin II Receptor Blockers

BP   Blood Pressure

BMI   Body Mass Index

CCBs   Calcium Channel Blockers

CVD   Cardiovascular Disease

DALYs   Disability Adjusted Life Years

DBP   Diastolic Blood Pressure

ESC   European Society of cardiology

ESH   European Society of hypertension

FGD   Focus Group Discussions

ISH   International society of Hypertension

JNC   Joint National commission

KII   Key Informant Interview

KNH   Kenyatta National Hospital

MOH   Ministry of Health

MOPC   Medical outpatient clinic

NCDs   Non-Communicable Disease

SBP   Systolic Blood Pressure

UoN   University of Nairobi

USA   United States of America

WHO   World Health Organization

NHIF   National Hospital Insurance Fund

TL5H   Thika Level 5 Hospital

OPERATIONAL DEFINITION OF TERMS

Hypertensive
An individual with Systolic Blood Pressure equal to or more than 140mmHg; and/or Diastolic Blood Pressure ≥90mmHg; and diagnosed as so by a clinician

Uncontrolled hypertension is defined as systolic blood pressure ≥ 140mmHg and or diastolic blood pressure ≥ 90 mmHg in patients taking anti-hypertensive treatment.

Uncontrolled BP
is defined as when the Blood pressure readings are as systolic blood pressure ≥ 140mmHg and or diastolic blood pressure ≥ 90 mmHg in patients taking anti-hypertensive treatment.

Hypotension
Is defined as when the systolic BP is ≤ 90 mmHg and Diastolic is≤50mmHg

Associated Factors
Is defined as when two things are connected with each other or have a relationship.

Lifestyle factors
Modifiable habits and ways of life such as physical activities and eating and maintaining new behaviour for months or years in order to prevent, treat or manage a disease such as hypertension.

ABSTRACT

Hypertension is a public health concern, which accounts for high morbidity and mortality globally every year. High hypertension burden is reported in Middle- and Low-income Countries (LMICs) due to an increase in hypertension risk factors in populations with 33% prevalence rates in Africa including 26.6% prevalence rate in Kenya. In many communities in the world, less than half of all hypertensive patients have controlled blood pressure despite well-established approaches to diagnosis and treatment, leading to inadequate achievements in hypertension management. The main objective of this study was to determine the prevalence of uncontrolled hypertension and associated factors among hypertensive patients attending Medical Outpatient Clinic, Thika Level 5 Hospital (TL5H) Kiambu County Kenya. The specific objectives were to determine the proportion of patients with uncontrolled hypertension, their socio demographics, socioeconomics, lifestyle and the types of antihypertensive drugs prescribed to the patients. This was a hospital based cross-sectional study. Questionnaires were administered to a total of 394 patients who were selected by systematic random sampling to participate in the study at an interval of 2, whereas all 6 health professionals were purposively selected as Key Informants to give in-depth knowledge of hypertension management. Four Focused Group Discussions composed of 35 patients (17 Males and 18 Females) were used to solicit data for providing context to the quantitative data. Quantitative data were coded, checked and analysed using STATA 14 and Qualitative data was thematically organised using NVIVO. The study showed that 48% of the study participants had uncontrolled hypertension at the time of the study. Bivariate analyses showed Significant association between uncontrolled hypertension and level of education (χ^2= 10.21 (3); p= 0.017), source of finance for drugs (χ^2=9.01 (1); p=0.011), BMI (χ^2= 10.78 (2); p=0.005). Salt intake (χ^2= 3.11 (1); p= 0.078.) at 90% Confident interval. Multivariable analyses revealed the independent predictors of uncontrolled hypertension include level of education primary COR 2.16[1.084-4.304], secondary school education COR 2.21[1.072-4.55], post-secondary education COR 0.822[0.293-2.312]. Patients who maintained their BMI COR0.275[0.131-0.575] and those who reduced their BMI COR 0.767 [0.475-1.240]. Source of finance for drugs NHIF COR 0.667[0.209-2.128] Out of pocket COR 1.213[0.392-3.760] and salt intake COR 0.6[0.350-1.028]. The study concluded that BMI, level of education, source of finance for drugs and salt intake were predictors of uncontrolled hypertension and these are supported by insights from KIIs and FGDs. Following the findings, the study recommends: community health promotion activities to increase awareness of how to modify these significant factors to reduce hypertension. Findings from this research within a county referral hospital context is critical and will guide the policy makers on the appropriate measures to take so as to reduce hypertension burden in Kiambu county and Kenya.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Non-Communicable diseases (NCDs) are increasingly becoming a public health concern in Low-and Middle-income countries(LMICs) in addition to earlier burdens characterized for high income countries (Heller et al., 2019). Globally, hypertension is estimated to affect about 1.13 billion people with the prevalence in adults 28.5% (27.3-29.7%) in high-income countries and 31.5% (30.2-32.9%) in low- and middle-income countries (Adeloye & Basquill, 2014; Mills et al., 2016) Uncontrolled hypertension is a major contributor to health complications such as stroke, blindness, heart attack, kidney failure leading to premature deaths globally (Mahmood et al., 2014). A high burden of hypertension is due to physical inactivity, unhealthy diets, tobacco smoking and excess intake of alcohol(Carson et al., 2013; Mohsen Ibrahim, 2018; Unger et al., 2020).

Hypertension is a chronic disease which requires life-long medication, and as such, proper management is important so as to attain optimum BP control and prevent complications (Nguyen et al., 2010).Globally, there are international standard guidelines for the management of hypertension and these include the latest JNC-8 on evidence-based guidelines for management of high BP in adults (James et al., 2014).The guidelines require that prescription should be based on lifestyle changes, drug therapy and special cases. Lifestyle changes include consumption of 3-5 servings of fruits and vegetables daily, lose weight, reduce dietary salt, reduce alcohol intake and stop smoking. Drug therapy should be prescribed as mono-therapy or combined therapy(James et al., 2014; Piepoli et al., 2016) Effective hypertension treatment outcome is usually indicated by Blood pressure readings, a systolic BP of <140 and a diastolic BP of<90 when on treatment in most cases this is not achieved as shown by various studies(Unger et al., 2020).

According to World Health Organisation (2013) uncontrolled hypertension contributed to 9.4 million deaths which is over half of the 17.5 million deaths and

contributed to mortality for at least 51% of stroke and 45% of heart diseases. The condition accounted for 37 million disability adjusted life year's (DALYs) equivalent of 3.7% of the total DALYs(WHO, 2013). Several studies have shown that uncontrolled hypertension is a major public health concern for the 21st century. A global study done on analysis of blood pressure screening in 80 countries showed that 46.3% of the hypertensive patients who were on treatment had uncontrolled blood pressure (Beaney et al., 2019).In Nepal, an analysis of blood pressure screening results showed that 45.2% of hypertensive patients on treatment had uncontrolled hypertension and the predictors were, smoking and alcohol intake(Mishra et al., 2019). In Ethiopia studies revealed 52.7% of the patients had uncontrolled hypertension where middle age, old age ,overweight, comorbidity, non-adherence to medications physical inactivity and alcohol taking were significant predictors of uncontrolled hypertension(Gebremichael et al., 2019; Tesfaye et al., 2017) . Results from a studies carried out in Kenya, Sub –Saharan Africa, on blood pressure screening among adult hypertensive patients showed that 45.5% of hypertensive patients on treatment had uncontrolled hypertension (Ogola et al., 2020).

Factors associated with uncontrolled hypertension remain unclear in LMICs such as Kenya(Kubo et al., 2015; Ogola et al., 2019). This study determined the prevalence of uncontrolled hypertension and associated factors among hypertensive patients at MOPC Thika level 5 Hospital, Kiambu County, Kenya. The study specifically aimed at describing the socio-demographic characteristics, socio-economic, lifestyle and clinical management factors.

To achieve WHO global targets of reducing hypertension prevalence to 25% by 2025, the Kenyan government formulated Kenya national strategy for prevention and control of non-communicable diseases 2015-2020 to reduce hypertension and NCD-led morbidity and mortality by 25% by 2025 this blends well with SDG 3 targets(MOH, 2015).

1.2 Statement of the Problem

Prevalence of uncontrolled hypertension has remained high both globally and locally, being as high as 45.5% to 64.7% in some parts of Kenya (Beaney et al., 2019; Kubo et al., 2015; Ogola et al., 2019).Evidence from studies have shown that uncontrolled hypertension can cause adverse effects to the heart, hardening of arteries reducing blood flow to the heart that leads to chest pain, heart attack, heart failure and death (Lippi et al., 2020; WHO, 2013). Various studies have shown that there is a huge socio-economic burden of uncontrolled hypertension on individuals, families, communities and society at large. Complications due to uncontrolled hypertension are costlier to manage as they need procedures such as cardiac bypass, kidney dialysis, and kidney transplant (Nguyen et al., 2010; WHO, 2013).Factors associated with uncontrolled hypertension are expected to vary among patients(Cordero et al., 2011).Since there is no published data at Thika level 5 Hospital to show the burden of the condition in a county referral hospital hence the research gap. Identifying specific associated factors can lead to better hypertension management. This will inform hospital managers, clinicians and patients on areas of intervention to reduce the complications and prevalence of uncontrolled hypertension. With the current dearth of information on these factors, the burden of uncontrolled hypertension continues to rise, thus attaining the target of 25% reduction set by the Kenya National Health Strategy for prevention and control of non- communicable diseases 2025 and SDGs 3 will be difficult.

1.3 Justification

Proper hypertension management usually leads to reduced rate of complications, reduction in management costs and improvement of quality of life for individuals thus decreasing morbidity and mortality (Jafar et al., 2018). Multiple evidence from different parts of the world shows that blood pressure control is very much attainable (Modey Amoah et al., 2020; Wei et al., 2020). Factors associated with uncontrolled hypertension remain a challenge in low and Middle income countries(Salem & Kinsara, 2017). Kenya is among these countries with majority of the hospitals being in low resource settings hence need for more studies in these areas. Identifying the

gaps in management of hypertension in relation to socio-demographic, economic, clinical management and institutional factors is important for the patients, the caretakers, clinicians and institutional managers so that they can be able to intervene at different levels of management. This research contributes to building knowledge on and adds to the body of international literature on hypertension management. The Choice of Thika level 5 hospitals is ideal as there is no research of this kind that has been done and published in this area. It is expected that the findings will contribute to providing baseline information for future monitoring, management strategies, programmes and policy guidelines towards achieving SDG3 by lowering the prevalence of hypertension by 25% by the year 2025.

1.4 Objectives

1.4.1 Broad Objective

To determine the prevalence of uncontrolled hypertension and associated factors among hypertensive patients attending MOPC, Thika Level 5 Hospital.

1.4.2 Specific Objectives

(i) To determine the proportion of individuals with uncontrolled hypertension among hypertensive patients attending MOPC Thika level 5 Hospital, Kiambu County, Kenya.

(ii) To determine socio-demographic and socio-economic factors associated with uncontrolled hypertension among hypertensive patients attending MOPC, Thika Level 5 Hospital, Kiambu County, Kenya.

(iii) To determine life style factors associated with uncontrolled hypertension among hypertensive patients attending MOPC, Thika Level 5 Hospital, Kiambu County, Kenya.

(iv) To determine the types of antihypertensive drugs prescribed to hypertensive patients attending MOPC, Thika Level 5 Hospital, Kiambu County, Kenya.

1.5 Research Questions

Due to the highlighted challenges, the study sought to answer the following questions.

(i) What is the proportion of individuals with uncontrolled hypertension among hypertensive patients attending Medical outpatient clinic (MOPC) Thika level 5 Hospital, Kiambu County, Kenya?

(ii) What is the socio-demographic and socio-economic factors associated with uncontrolled hypertension among hypertensive patients attending Medical outpatient clinic (MOPC), Thika Level 5 Hospital, Kiambu County, Kenya.

(iii) What are the life style factors associated with uncontrolled hypertension among hypertensive patients attending MOPC, Thika Level 5 Hospital, Kiambu County, Kenya.

(iv) What are the types of antihypertensive drugs prescribed to hypertensive patients attending MOPC, Thika Level 5 Hospital, Kiambu county Kenya.

1.6 Limitations of the study

The study used a cross-sectional study design which is limited by the need for a large sample size to ensure statistical power. To overcome this limitation, the researcher used Cochran's (2007) sample size calculation formula to determine the minimum sample size required for the precision of this study. The data generated in this study was cross-sectional and, therefore, difficult to make causal inferences besides providing differing findings had another timeframe been chosen. (Mendenhall et al., 2017).

1.7 Conceptual Framework

This study conceptualized Socio-demographic, socio- economic, lifestyle as well as clinical management factors, associated with uncontrolled hypertension in the health facility. The most important aspect of hypertension management is maintaining Blood pressure within normal ranges so as to prevent complications, reduce morbidity and mortality. Various factors influence Bp management positively or

negatively. Socio-demographic and socio-economic factors such as gender, age, marital status, education, income, religion, employment status, cost of drugs, and family history of Hypertension can affect blood pressure control and it is important to identify them so as to know the different level of interventions. Clinical management were assessed based on variables such as the class and number of hypertensive drug and lifestyle modification (whether drug-based or lifestyle modification). Application of national and international guidelines, availability of drugs and concurrent conditions were considered under clinical management factors. Under lifestyle modification, various factors were assessed including use of salt in diet, alcohol use, cigarette smoking and deliberate physical exercise.

The outcome variable was measured based on the value of blood pressure (BP) in the last two visits and were recorded crudely. Thereafter these values were recorded into two categories (controlled <140/90, and uncontrolled ≥140/90) hypertension.

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┌─────────────────────────┐
│ **Demographic**         │
│                         │
│ • Age                   │
│ • sex                   │
│ • Religion              │
│ • Leve of education     │
│ • History of HTN in     │
│   blood family member   │
│                         │
└─────────────────────────┘

┌─────────────────────────┐        ┌─────────────────────────┐
│ **Economic**            │        │ Antihypertensive        │
│                         │        │ drug                    │         ┌─────────────────────┐
│ • Type of employment    │        │                         │         │ Uncontrolled        │
│   (self/Business)       │   →    │ Concurrent              │    →    │ hypertension        │
│ • Respondents     and   │        │ conditions              │         │                     │
│   family Income         │        │                         │         └─────────────────────┘
│ • Source of finance for │        │ Hypertension            │
│   drugs                 │        │ management              │
│                         │        │ guidelines              │
└─────────────────────────┘        │                         │
                                   │ Availability    of      │
┌─────────────────────────┐        │ drugs  at  health       │
│ **Life style**          │        │ Facility                │
│                         │        └─────────────────────────┘
│ • Period since last clinic│
│   visit.                │
│ • Current       smoking │
│   status                │
│ • Current alcohol use   │
│ • Current       physical│
│   exercise              │
│ • Use of salt in diet   │
│ • BMI                   │
└─────────────────────────┘
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Independent Variable   **Intermediate Variables**   **Dependent Variable**

Figure 1.1: Conceptual Framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Definition and classification of hypertension

Hypertension refers to a condition where an individual has a systolic blood pressure equal to or more than 140 mmHg or/and a diastolic blood pressure at or above 90 mmHg. Systolic blood pressure (SBP) refers to the highest pressure in the arteries when the heart contracts. Diastolic blood pressure (DBP) refers to the least pressure in the arteries between the heart's contractions(Unger et al., 2020)

Table 2.1: Categorization of blood sugar levels (mmHg)

Class	Systolic		Diastolic
Optimal	<120	and	<80
Normal	120 -129	and/or	80 -84
High Normal	130 -139	and/or	85 89
Grade 1 hypertension	140 -159	and/or	90 99
Grade 2 hypertension	160 -179	and/or	100 -109
Grade 3 hypertension	>_180	and/or	>_110
Cut-off systolic hypertension	>_140	and	<90

Source: Mancia et al. (2013)

According to (Mancia et al., 2013). The Blood Pressure level is described by the highest level of BP, whether systolic or diastolic. Cut-off systolic hypertension should be graded 1, 2, or 3 according to systolic BP levels in the ranges indicated. Uncontrolled hypertension is defined as systolic blood pressure $\geq$ 140mmHg and or diastolic blood pressure $\geq$ 90 mmHg in patients taking anti-hypertensive treatment (Unger et al., 2020).

2.1.1 Epidemiology of uncontrolled hypertension

Globally, Epidemiologic studies have played a crucial role in explaining the factors that predispose to cardiovascular disease and highlighting opportunities for prevention. The Framingham Heart Study, provides a link to the premature death of President Franklin D. Roosevelt of USA that resulted from uncontrolled hypertension complications in 1945(Mahmood et al., 2014).Findings from observational studies show that Uncontrolled hypertension is a powerful risk factor for fatal and non-fatal cardiovascular disease events. (Carson et al., 2013; Wang & Vasan, 2005). Prospective population epidemiological cardiovascular research in Framingham has played an important role in the prevention of cardiovascular disease (CVD) including stroke.

The common major gap globally and locally is that the prevalence of uncontrolled hypertension remains high. Results from a recent global study done on analysis of blood pressure screening in 80 countries showed that 46.3% of the hypertensive patients who were on treatment had uncontrolled blood pressure Predictors were antihypertensive medication, diabetes, cerebral-vascular disease, smoking, and alcohol consumption(Beaney et al., 2019).Research done in Nepal, South Asia, May Measurement Month 2017: on analysis of blood pressure screening results showed that 45.2% of hypertensive patients on treatment had uncontrolled hypertension and the predictors were smoking and alcohol intake (Mishra et al., 2019). A national-wide survey carried out on Prevalence and associated factors of uncontrolled hypertension among hypertensive patients in Thailand showed that 25.6% of the hypertensive patients had uncontrolled hypertension. Being male, age, regions, hospital levels, diabetes comorbidity, higher body mass index, low density lipoprotein cholesterol level and the number of antihypertensive medications were major predictors of uncontrolled hypertension (Burnier & Egan, 2019; Sakboonyarat et al., 2019)

While hypertension remains undiagnosed in the majority of Africans, hypertension remains uncontrolled (Babiker et al., 2013) Indeed, hypertension was declared as one of the greatest medical challenges across Africa .Studies done in sub Saharan African

countries such as   Ethiopia on uncontrolled hypertension and associated factors showed that 52.7% hypertensive patients had uncontrolled hypertension where old age, Overweight, co-morbidity , non-adherence to anti-hypertensive medication , non-adherence to physical activity,   non-adherence to alcohol abstinence were independent predictors of uncontrolled hypertension (Gebremichael et al., 2019; Tesfaye et al., 2017).

In East African region ,a study done in Tanzania showed that 95.3% patients had uncontrolled hypertension and the predictors were barriers to optimal care, including poor point-of-care communication, poor understanding of hypertension and structural barriers such as long wait times and undertrained providers (Galson et al., 2017). Results from a studies carried out in Kenya, Sub –Saharan Africa, on blood pressure screening among adult hypertensive patients showed that 45.5% of hypertensive patients on treatment had uncontrolled hypertension (Ogola et al., 2020). In Kenya from the morbidity register central Kenya is a region leading broadly in non-communicable diseases (KNBS, 2016) and Thika level 5 Hospital is located in this region as shown in the bar chart below.
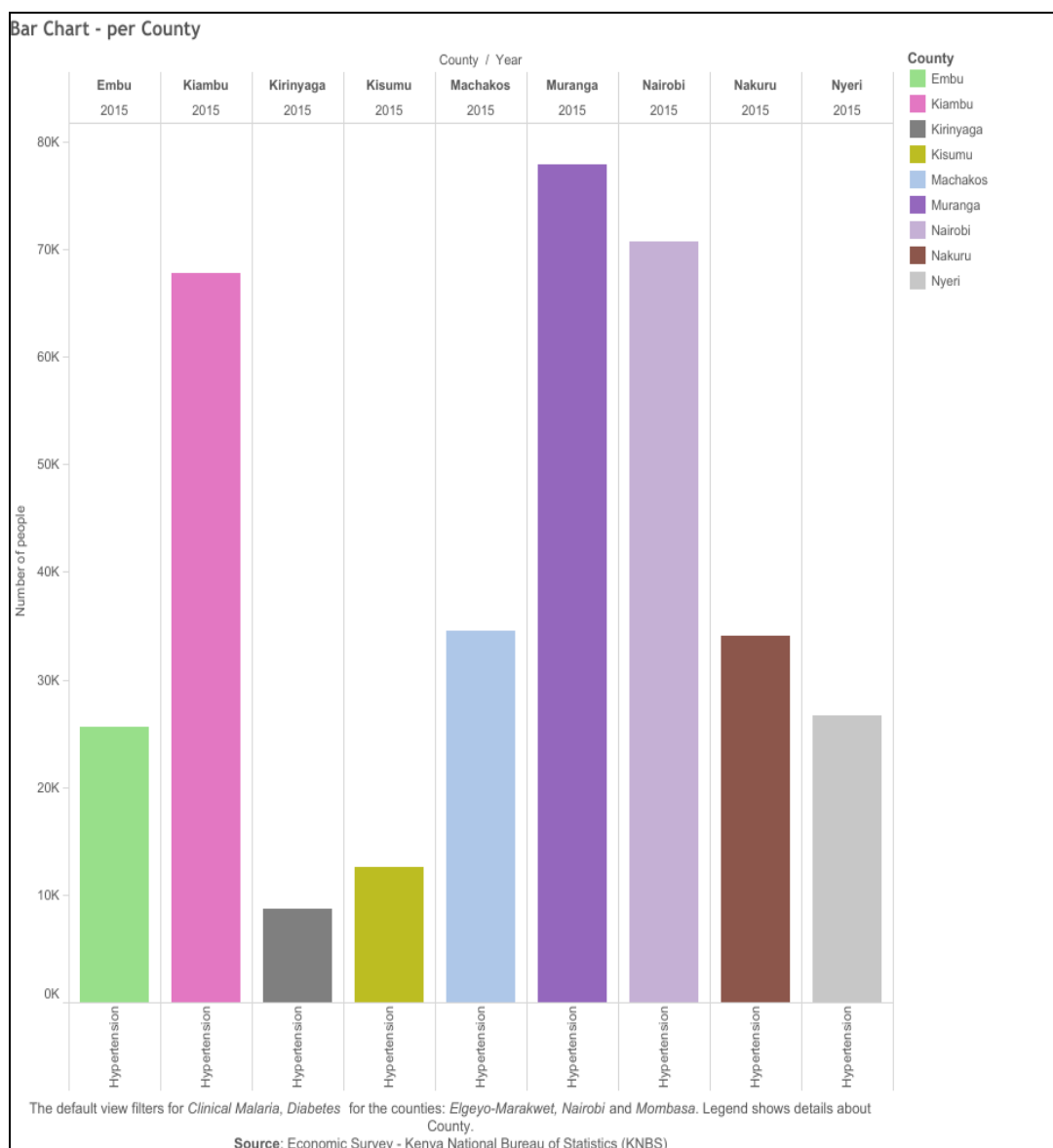
Figure 2.1: Morbidity register central Kenya

Source: (KNBS, 2016)

2.2 Factors Associated with uncontrolled hypertension

Studies spanning several decades have identified myriad factors related to uncontrolled hypertension. These factors can be divided, arbitrarily into socio-demographic, economics and health facility factors which vary among individuals, communities and regions globally. The following section, highlights how they

contribute to the burden of uncontrolled hypertension in different, communities and societies.

2.2.1 Socio demographic Factors

(i) Age

Various patient characteristics have been associated with uncontrolled hypertension, including age, gender, educational level, source of income, obesity, alcohol use, smoking, use of salt in diet and lack of exercise. These characteristics are risk factors for hypertension itself contribute directly to uncontrolled hypertension.(Pinto, 2007; Tesfaye et al., 2017).Advanced age is the most important predictor of uncontrolled hypertension,(Buford, 2016). Age is most strongly related to systolic blood pressure, and isolated systolic hypertension accounts for the vast majority of cases of uncontrolled hypertension in individuals >60 years of age.(Oliveira et al., 2019) The effect of age on hypertension from different studies show that hypertensive patients aged 60 years and above were more likely to have uncontrolled hypertension than those younger than 60 years of age (Shukuri et al., 2019). While the result of other studies showed that patients aged younger than 60 years were more likely to have controlled hypertension(Mutua et al., 2014).

In another study (Shukuri et al., 2019) on prevalence of old age hypertension and associated factors among older adults in rural Ethiopia, the study revealed that there was an increasing prevalence among older patients. (Kika et al., 2016) also reported similar findings; further listing comorbidities and risk of disabilities as contributing factors to lack of control among hypertensive patients.

(ii) Gender

Data on the association of gender with hypertension control have been conflicting. Rates of awareness and control among hypertensive's were significantly higher in women compared with men (Reckelhoff, 2001). These differences persisted even after adjustment for age and other demographic characteristics however, there was no significant difference between men and women as a result of significant increases in

treatment and control rates in men.(Ramirez & Sullivan, 2018) Several studies of ambulatory practices have found female gender to be a significant predictor of blood pressure control in multivariable models, but other studies have reported either no difference or better control in men(August & Oparil, 1999). Female patients were reported to have good odds of controlled hypertension than males (Choi et al., 2017; Daugherty et al., 2011; Mohamed et al., 2018; Ornstein et al., 2004) Differences in health outcomes across gender has previously been explained by differences in more active health seeking behaviour among females relative to males(Everett & Zajacova, 2015; Rahman et al., 2017).

(iii)Educational level

A study by(Jaramillo et al., 2015; Legido-Quigley et al., 2015) on educational levels among hypertensive patients, found that higher education level was associated with low prevalence of hypertension for all patients while higher level of education was also associated with control, awareness and treatment. (Mohsen Ibrahim, 2018; Thomas L. Schwenk, 2017) reported that lower education level was associated with increased risk of cardiovascular disease.(Huang et al., 2021) Results from a study done in China showed that elderly, living in rural and suburban areas, low education level, family history of hypertension, smoking, excessive salt consumption, lack of physical activity, overweight, obese and diabetes were associated with uncontrolled hypertension.(Liu et al., 2011; Yang et al., 2014).

(iv) Religion

A study done in China among adult Buddhists and residents in China showed protective role of religion on hypertension control which may be applied to general population.(Meng et al., 2018).Findings from a research done in America on Neighbourhoods conditions, religious coping, and uncontrolled hypertension showed that stronger God-mediated beliefs reduce uncontrolled blood pressure (Krause et al., 2017). In another study in the USA on Hypertension in the Black Women's Health Study revealed that Religious and Spiritual Coping was associated with decreased risk of hypertension in African American women, (Cozier et al., 2018)

2.3 Socio-economic factors

Various studies have shown the role of socioeconomic status on blood pressure control. In many developed and undeveloped countries, epidemiologic data show that hypertension control is still poor and even more so among some subgroups of the population (Gatimu & John, 2020; Lang, 1998)A study done in France showed that uncontrolled hypertension was higher in the low-income group with a cost-sharing plan, and compared with the group with a free care plan. Met analysis done in high income countries showed that Low SES is associated with higher blood pressure, and this association is particularly evident in the level of education.(Leng et al., 2015).Findings from a study done in Nigeria among rural hypertensive patients in Nigeria showed that monetary implications and cost-effectiveness had an impact on outcome of hypertension (Ukwaja&Onyedum, 2013).In Chile uncontrolled hypertension associated significantly to no adherence and both to male sex, socioeconomic, and psychosocial factors. Global low adherence (38.4%) and improved BP control and adherence in diabetics were noted.(Sandoval et al., 2018).

2.4 Selective Life style factors

A high burden of hypertension is due to physical inactivity, unhealthy diets, tobacco smoking and excess intake of alcohol(Carson et al., 2013; Mohsen Ibrahim, 2018; Unger et al., 2020).Studies in various populations demonstrate a direct, nearly linear association of body mass index (BMI) (J. E. Hall, 2003; M. E. Hall et al., 2014)The risk of hypertension increases continuously with increasing anthropomorphic measurements (waist circumference, waist-to-hip ratio, and waist-to-weight ratio) in parallel with BMI(Chen et al., 2018; Jayedi et al., 2018) . About 40% of adults with hypertension in the United States are obese (BMI >30 kg/m^2), and over one-third of the obese population has hypertension (SBP/DBP >140/90 mmHg or treatment with antihypertensive medication), compared to less than one-fifth of normal-weight individuals(Egan et al., 2013; Saydah et al., 2004)Clinical studies have repeatedly demonstrated that weight loss reduces the risk for hypertension and BP in adults with hypertension (Jones et al., 2020; Stevens et al., 2001)

2.5 Antihypertensive drug prescription factors.

Hypertension is one of the most common conditions encountered in primary care. Adequate measurement of BP is the most-important requirement for the diagnosis and treatment of patients with suspected hypertension (Unger et al., 2020). The use of methodologies such as ambulatory and home BP monitoring have become powerful tools for defining the 'real' BP of patients, discarding the white-coat effect, and discovering masked hypertension(Carey, Calhoun, et al., 2018; Sheikh et al., 2017)Diagnosis of hypertension is based on the average of two or more seated BP readings during each of two or more outpatient visits (Chobanian et al., 2003; Mancia et al., 2013; Weber et al., 2014; Williams et al., 2018).These BP levels apply to all adults aged ≥18 years and indicate the level of BP at which the initiation of treatment leading to reduction of hypertension related morbidity and mortality. In adults with hypertension, controlling BP to non-hypertensive levels through non-pharmacological and pharmacological treatment reduces the risk for CVD events. A collaborative effort between health care professionals and patient is important so as to initiate early intervention with life-style changes and antihypertensive drugs to obtain the best outcome for the patient(Rivera et al., 2019).The initial treatment according to the latest JNC 8: are ACEIs, thiazide-type diuretics, Adrenergic Receptor Blockers (ARBs), and CCBs(James et al., 2014).as shown in figure 2.1 below.
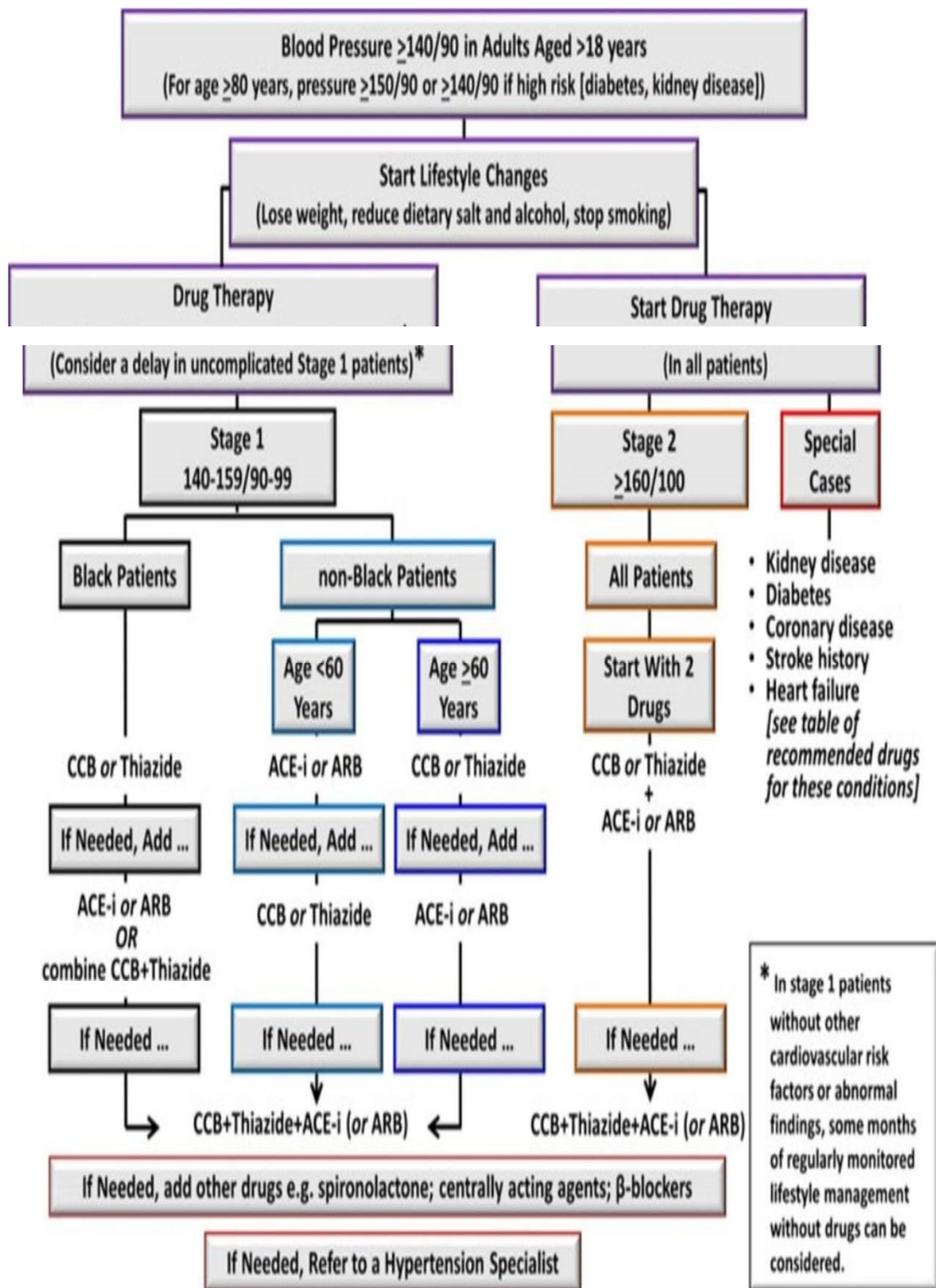
Figure 2.2: Hypertension treatment approach clinical practice in a community

Source: Adapted from JNC-8 guidelines.

(i) Lifestyle modification in hypertension management

Promotion of healthy lifestyles by all individuals is vital for the prevention of hypertension and it is part of the management of hypertension.(Modey Amoah et al., 2020) Modification of lifestyle strategies have been shown to reduce hypertension and manage most of the cardiovascular risk factors (Weber et al., 2014; Williams et al., 2018).

Lifestyle changes for the management of hypertension includes reducing salt intake less than 50 grams. Regular aerobic exercise 30 minutes a day and eating a diet serving of 3-5 fruits and vegetables. Consumption of low-fat dairy products with a reduced content of dietary cholesterol as well as saturated and total fat. Reducing alcohol intake to two drinks per day in most men and one drink per day in women and stop smoking (Fekadu et al., 2020; Johnson et al., 2016; H. Yang et al., 2017)

In a study conducted in South Korea among Hypertensive patients, reduced salt intake and physical exercise translating in weight lost were associated with controlled hypertension(Yang et al., 2017). There is strong and consistent evidence that reducing sodium intake reduces blood pressure (Payne Riches et al., 2019).Adults who would benefit from lowering blood pressure should be advised to limit their sodium intake to no more than 2,400 mg per day (Eckel et al., 2014).Further reduction of sodium intake to 1,500 mg per day is desirable because it is associated with an even greater reduction in blood pressure. The average blood pressure reduction in patients consuming a sodium-restricted diet of 2,400 mg per day is 2/1 mm Hg, or 7/3 mm Hg for those restricting sodium to 1,500 mg per day (Harsha et al., 2004; Sacks et al., 2001).Reducing baseline sodium intake by at least 1,000 mg per day will lower blood pressure even if the desired daily sodium intake is not yet achieved.

Food prepared in restaurants, canned foods, and pre-packaged foods (dry or frozen) tend to contain more sodium than home-cooked meals or frozen vegetables. Other studies also revealed that lack of awareness of hypertension-related complications, overweight status, non-adherence to smoking abstinence, non-adherent to alcohol

abstinence were associated with uncontrolled hypertension (Tesfaye et al., 2017; Teshome et al., 2018).

Adults should engage in moderate to vigorous aerobic physical activity three or four times per week for an average of 40 minutes per session to lower blood pressure (Eckel et al., 2014; Pescatello et al., 2015)Most health benefits occur with at least 150 minutes per week of moderate-intensity physical activity, such as brisk walking . Some physical activity is better than none, and more activity results in greater benefits (Pescatello et al., 2015). Health benefits of exercise include reduced rates of all-cause mortality, coronary heart disease, hypertension, stroke, type 2 diabetes, metabolic syndrome, colon cancer, breast cancer, and depression. These exercises include, Aerobic exercise, class Bicycling, Dancing, Gardening or yard work (e.g., raking, pushing a lawn mower) Golfing without using a cart, Jogging, Moderate-intensity swimming, Tennis Walking briskly (Whelton et al., 2018).

Results from a study done in Ghana revealed that increased physical activity, abstaining from alcohol and smoking, increased intake of fruits and vegetables, and reduced intake of carbohydrates, meat, and fat have a positive influence on blood pressure control. Lifestyle modifying factors have a key role in complementing pharmacotherapy in hypertension control (Modey Amoah et al., 2020).

(ii) Prescribing antihypertensive drugs for hypertension management

 Antihypertensive drugs are used to control hypertension and reduce clinical features and they are used as combined therapy to achieve optimal benefits as their intended outcome is 40-60% (Q. Yang et al., 2017). Factors that direct the choice of drugs include cost, convenience to the patient, efficacy, comorbid conditions and side effects (Chobanian et al., 2003; Cushman, 2003; Karnes & Cooper-DeHoff, 2009).Combination therapy ensures better hypertension control while lower dosages, leads to fewer adverse effects. Low doses of aspirin are recommended to reduce risk of cardiovascular, stroke and use satins to lower Cholesterol. Treatment of hypertension depends on the degree of BP elevation and strong indications (Chobanian et al., 2003; James et al., 2014)

Various studies globally and locally show the benefits of monotherapy or combined antihypertensive therapy in the reduction of cardiovascular diseases thus reducing morbidity and mortality (Epstein et al., 2013).

Findings from a hospital-based study from Kenya showed that the odds of hypertension control were notably reduced if the patient was taking three or more antihypertensive drugs. The most prescribed categories of drugs were Thiazide diuretics (Mutua et al., 2014).In Ghana, a cross-sectional study done on uncontrolled blood pressure revealed that longer duration of hypertension diagnosis, reported difficulties in obtaining antihypertensive medication and a number of antihypertensive medications prescribed were associated with uncontrolled hypertension (Sarfo et al., 2018).

North African countries had the highest level of treatment while East African populations had the lowest levels of treatment(Kayima et al., 2013). Most frequently used antihypertensive drugs are Beta-blockers, followed by diuretics. A study in Chilean health centres reported ACEIs, diuretics, Calcium Channel Blockers (CCBs), and Beta-blockers to be the often-used drugs (Sandoval et al., 2012). While most used drug classes in the US were ACEI, Thiazides, Beta-blockers and CCB Moreover, in another study, it was reported that the most common category of antihypertensive medications used were diuretics, ACEI, CCB (55%) and Beta-blockers (Horsa et al., 2019).

(iii) Factors associated with hypertension awareness, treatment, and control.

A collaborative partnership among the patient, provider, and health system, incorporates a multilevel approach to the control of hypertension. Optimizing prevention, recognition and care of high blood pressure will require a paradigm shift to team-based care and use of strategies known to control blood pressure.(Carey, Muntner, et al., 2018) . A study done in Zimbabwe on factors affecting diagnosis and management of hypertension revealed that untrained health workers, lack of Guidelines, digital BP machines and inadequate drug supply. (Mungati et al., 2014)

The major determinant of adherence to long-term treatment in chronic illness such as hypertension is cost(Nazar et al., 2016) Cheap and effective drugs are preferred in the resource limited settings as they are cost-effective and aid in adherence to treatment thus reducing complications associated with uncontrolled hypertension (Rimoldi et al., 2014).

Determinants of low rates of hypertension control include number of drugs and poor access to health care facilities(Jarari et al., 2015).A study conducted in India showed that antihypertensive prescription patterns were in line with the JNC-8 guidelines. The results of that study showed that the most classes of drugs prescribed were CCB followed by Angiotensin II receptor antagonist as monotherapy (Vrijens et al., 2008) In their study, the researchers also found that there was evidence of use of combination therapy(Sharma et al., 2018). In a study done at Ruiru Sub County Hospital in Kenya, 82% prescribing patterns of antihypertensive drugs were consistent with treatment guidelines where most patients were on ACEIs and Thiazide diuretics and BP control was observed at 46 (Mbui et al., 2017).). A study on antihypertensive prescribing in a Nigerian hospital showed that the most common prescribed drugs were diuretics and ACEIs. Ninety percent of the hypertensive patients used dual therapy as recommended in the hypertension management guidelines (Ukwe & Ubaka, 2012)

A national cross-sectional survey conducted in China on availability, cost, and prescription patterns of antihypertensive medications in primary healthcare. The results showed that 8.1% sites did not stock antihypertensive medications and 33.8% stocked all four classes that were routinely used. Village clinics and sites in the western region of China had the lowest availability. Close to one-third of all sites stocked high value medications, and a few high-value medications were prescribed and 11.2% of all prescription records. High cost medications were more likely prescribed than low-cost drugs (Li et al., 2017).

2.6 Concurrent Conditions

Chronic co-morbidities such as Diabetes, heart disease, kidney failure and stroke are additional factors reported to have association with hypertension control. (DiPette et al., 2019; Oliveros et al., 2020; Tapela et al., 2021).Multiple studies indicated that presence of chronic co-morbidities also resulted in lower hypertension control especially for patients with hypertension-diabetes specifically observed reduced odds of hypertension control among patients with renal disease.(Adeniyi et al., 2016; Bozkurt et al., 2016; J. Wang et al., 2017)Compared to the previous studies, BP was better controlled among hypertensive diabetic patients in the present study. Older age, longer duration with hypertension, cigarette smoking, non-adherence, and uncontrolled glycaemia were predictors of uncontrolled BP. Thus, interventions on modifiable factors should be done to improve BP control of patients' comorbid with diabetes..(Dedefo et al., 2020)

2.7 Gaps in knowledge

In Kenya there is limited recent data on uncontrolled hypertension and in the study area there is. This study will be important as a baseline source of information for the subject of uncontrolled hypertension at the hospital. The identification of factors associated with uncontrolled hypertension within a county referral hospital context is critical and will guide the policy makers on the appropriate measures to take so as to reduce hypertension burden in Kiambu County and Nationally in Kenya.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study site

The study was conducted at Thika Level 5 Hospital (TL5H) Medical out-patient clinic in Kiambu county Kenya. Located at the centre of Thika Town, Kiambu County, TL5H covers an area of 7.97 Ha. The hospital serves a catchment population of approximately 10 million who originate not only from Kiambu County but also from neighbouring counties such as Machakos, Nairobi, Murang'a and Kirinyaga Counties (KNBS, 2019) a region leading broadly in non-communicable diseases (KNBS, 2015). The hospital serves an average of 350,000outpatients and 20,000 in patients annually from January to December 2018. Part of the outpatient department is the Medical outpatient clinic (MOPC) that serves approximately 875active hypertensive patients monthly according to data from the Hospital medical records. The hospital provides a variety of services such as antiretroviral therapy, Reproductive Health, Radiology, Medical Outpatient and Inpatients. At the MOPC a triage system is in place at the registration point upon entry into the clinic and medical record office where patients' medical files are kept.

3.2 Study design

A hospital based cross-sectional study design was used to determine the burden of uncontrolled hypertension to inform planning and allocation of health resources. Cross sectional design was used so as to give a snapshot of the status of hypertension management in the study location Data was collected at one-point time between 17th January and 29th march 2019.

3.3 Study population

The study population comprised of all adult hypertensive patients under treatment follow up at MOPC Thika level 5 Hospital.

3.3.1 Inclusion criteria

All adult patients 18 years and above, diagnosed, on either lifestyle or antihypertensive treatment and follow up at the clinic for at least 1 year before the study. This time frame was important for assessing patient response to treatment and capture management trend.

Those patients with other medical conditions and they were hypertensive

Those patients who consented to participate in the study.

3.3.2 Exclusion criteria

Those who needed to be included but declined to sign consent forms.

Patients who were critically ill.

Patients with incomplete medical records

3.4 Procedure and sample size

3.4.1 Sample Size Determination

The sample size calculation was derived from the Cochran 2007 formula.In a study carried out in Kenya Sub –Saharan Africa on blood pressure screening among adult hypertensive patients uncontrolled BP rate was 45.5% (Ogola et al., 2020)..Since our primary outcome is uncontrolled hypertension 45.5% was used as the expected estimated proportion in calculating the sample size. Hence the following formula was used.

The formula for sample size determination was $n = [z^2 (p) (1-p)/e^2]$

$n = (1.96)^2 \times 0.455(0.545) / (0.05)^2 = 383$

n=minimum sample size e^2=degree of precision, 5% was used

z=is the standard normal deviate that corresponds to 95% confidence interval

p=prevalence of the condition of interest (45.5 %.)

The above formula gave a sample size of 383 required to obtain the specified margin of error and adjusted upwards for a 3% to get 394 subjects for the study to accommodate potential missing data from the patients' historical records. According ,(Martínez-Mesa et al., 2016) one challenge of hospital clinics' attendance registers and lists is that the historical data may be incomplete and/or outdated. To accommodate this limitation, adjustment for a 3% "missing data rate" was made as recommended by(Kang, 2013; P. Li et al., 2015) since this was a study based in the hospital TL5H MOPC.

3.4.2 Sampling approach

 Systematic random sampling method was used to pick the patients. The formula, k=N/n, where k=sampling interval, N=sampling frame, and n=the desired sample size, was used to calculate the interval for systematic sampling. N was 875 as these were the total active individual hypertensive patients seen monthly at the clinic obtained from the medical records register.

k= N/n =875/394= 2 Therefore, an interval of 2 was used.

A sample size of 394 was required and distributed in 60 days. On average, 7 participants were recruited daily. At every beginning of the day, the first participant was picked from the hypertension medical clinic register by random sampling by assigning numbers and then the researcher picked every 2nd patient systematically until the sample size of 394 was attained.

3.4.3 Sampling for key informants and focussed group discussions.

All (6) health workers at MOPC directly involved in patient care were sampled purposively as key informants since they were directly involved in managing the patients to give in depth knowledge on hypertension management as experts.

Four groups of patients were formed to take part in discussions since they are the ones who take medications to give insights in hypertension management experiences. The breakdown of the study participants in the qualitative data collection approaches are outlined in Table 3.1 below.

Table 3.1: Study Population Target for Key informants and Focus Groups

KEY INFORMANTS INTERVIEW			
Professional Cadre	**Male**	**Female**	**Total**
Medical doctors	1	0	1
Nurses	1	1	2
Clinic officers	0	1	1
Nutritionist	1	0	1
Pharmacists	0	1	1
Total Participants	3	3	6

FOCUS GROUP DISCUSSIONS					
Focus Group Composition	1st group	2nd group	3rd group	4th group	Total
Female	8		10		18
Male		9		8	17
Total	**8**	**9**	**10**	**8**	**35**

3.5 Pre-testing of tools

A pilot study for testing of the tools for reliability and validity was done on all the data tools in Murang'a Level 5 Hospital, Murang'a County, Kenya. The choice of this pre-test site was based on its similarity to the actual study location. Reliability was checked for all the elements of the respective tools. The reliability was computed based on the Cronbach alpha, such that an alpha value of above 0.7 was considered reliable. The results of the pre-test were as follows: Questionnaires (0.72), KII guides (0.75), observation checklist (0.9), and FGD guide (0.75). The tools were also checked for content validity (Cochran, 2007).

3.6 Data collection methods and tools

Following consent, interviewer administered questionnaires were tested among 40 patients representing 10% of the sample size for a pre-test but were not included in the analysis of the results. After pre-testing the necessary modifications were made in the questionnaires.

The researcher was responsible for conducting all the interviews assisted by 4 research assistants. The participants were requested and explained to the need to participate in the study where consent of the participants was obtained. The BP machines and weighing scales were calibrated to give correct measurements so as to minimize errors to improve the quality of data.

The researcher and research assistants took the Blood pressure using a digital BP machine while patients seating, weighed using a weighing scale and height then recorded in their files. The participants were reviewed by the clinicians before the interview was conducted so that they were not kept waiting in the queue. The researcher and research assistants checked patients' hospital medical records for previous BP readings, concurrent conditions, height, weight and recorded them in the data abstraction form. The abstraction form had also part of current BP readings, weight, and drugs. Uncontrolled hypertension was ascertained when systolic blood pressure $\geq$ 140mmHg and or diastolic blood pressure $\geq$ 90 mmHg in one or both from the previous at least within the last 3 months and current BP readings and patient was on treatment 1 year prior to the study.

Key informant interview guide had six questions; characteristics considered when prescribing, use and presence of national and international guidelines, patients' characteristics, patients' knowledge on hypertension, linkage with uncontrolled hypertension and availability of drugs in the health facility. Patients' social demographics were described as young or elderly.

FGD interview guide had four themes including community knowledge on hypertension, individual experience with hypertension, lifestyle behaviours and enabling treatment factors these gave insights on management of hypertension. The

researcher conducted the focus group discussions while one research assistant took notes.

Consent forms and Questionnaires were written in English and translated to Kiswahili to improve on reliability. Research assistants were trained on the objectives and data collection tools used in the study. The researcher and research assistants filled in the questionnaires to ensure that questions were understood uniformly and answers were consistent. An observation checklist was used to capture information on management guidelines and drugs at the facility.

3.7 Data cleaning and analysis

Quantitative data from the participants was recorded in questionnaires and a structured clinical data collection record. Data entry was done on a password protected computer to limit unauthorized access to data and protection from loss was achieved by backing up the data on emails and hard disks. Quantitative data was coded, checked and analysed using STATA 14 which generated both descriptive and inferential statistics. Quantitative data was collected, grouped according to the age of the patient, gender, body weight, height and source of finance for drugs and BP levels, types of antihypertensive drugs, availability of drugs and guidelines used. Data was then summarized and presented using frequencies, percentages, text and tables. Pearson Chi-square was used to test for categorical variable associations while correlation analyses were used for continuous variables to assess the relationship between all the independent variable elements and the outcome variable. The data analysis also involved binary logistic regression for the categorical variables that were significant at the bivariate level of analysis. All the inferential statistics was tested at a .05 level of significance.

Qualitative data was organised thematically using NVIVO. The analysis began with pre-set codes which were modified using emerging codes until a point of saturation was reached. The data was then presented through explaining the findings in a narrative way. The factors considered when prescribing, availability of hypertension management guidelines, characteristics of patients on antihypertensive treatment,

patients'knowledge on hypertensive management and factors contributing to antihypertensive prescription patterns in the health facility.

3.8 Ethical considerations

Data collection emphasized on the issues of confidentiality done by restricted access to the collected information and coding of questionnaires. Ethical clearance was sought from Scientific Steering Committee of Kenyatta National Hospital/University of Nairobi Ethical Review Committee (KNH/UoN ERC), and approval from Thika level 5 Hospital administrations. An informed consent was obtained from the participants and confidentiality was strictly observed. Fairness and justice were observed by asking same questions to all the patients and   drop out was minimized by explaining the importance of the research to the patients before the actual data collection. The patients were set free to participate without coercion and there was no monetary benefit to the patients except gain knowledge on hypertension management. Interview was conducted in enclosed rooms this ensured privacy and the questionnaire was translated to Kiswahili for ease communication and understanding of the questions. Hospital protocols and regulations were adhered to while collecting the data.

CHAPTER FOUR

RESULTS

The results presented in this chapter were obtained from both quantitative (questionnaires) and qualitative (key informant and focussed group discussions) sources. A total of 394 patients took part in the study at MOPC Thika Level 5 Hospital, 6 health professionals as key informant and 35 patients participated in Focus group discussion. The following sections provide the detailed analysis of the data. Uncontrolled hypertension was defined by a systolic blood pressure $\geq$ 140mmHg and/or a diastolic blood pressure $\geq$ 90 mmHg in one or both visits from previous within 3 months before study time and current BP readings.

4.1 Socio-demographic factors of hypertensive patients.

The variables presented in table below shows the socio-demographic characteristics of the patients including age, gender, religion, marital status, level of education, and positive history of hypertension in family. Elderly patients above 65 years old (39%), none of the patient was aged below 26 years although there were a number within child bearing age.

Female patients were also more (66%) than the males (34%). Ninety-seven percent (383) of the patients were Christian, 67% (263) were married at the time of study, and 52% (203) had a positive history of a blood family member with hypertension. For the education level, most had secondary school level (47%), followed by post-secondary level (32%), whereas those who had primary school level were the least (7%).
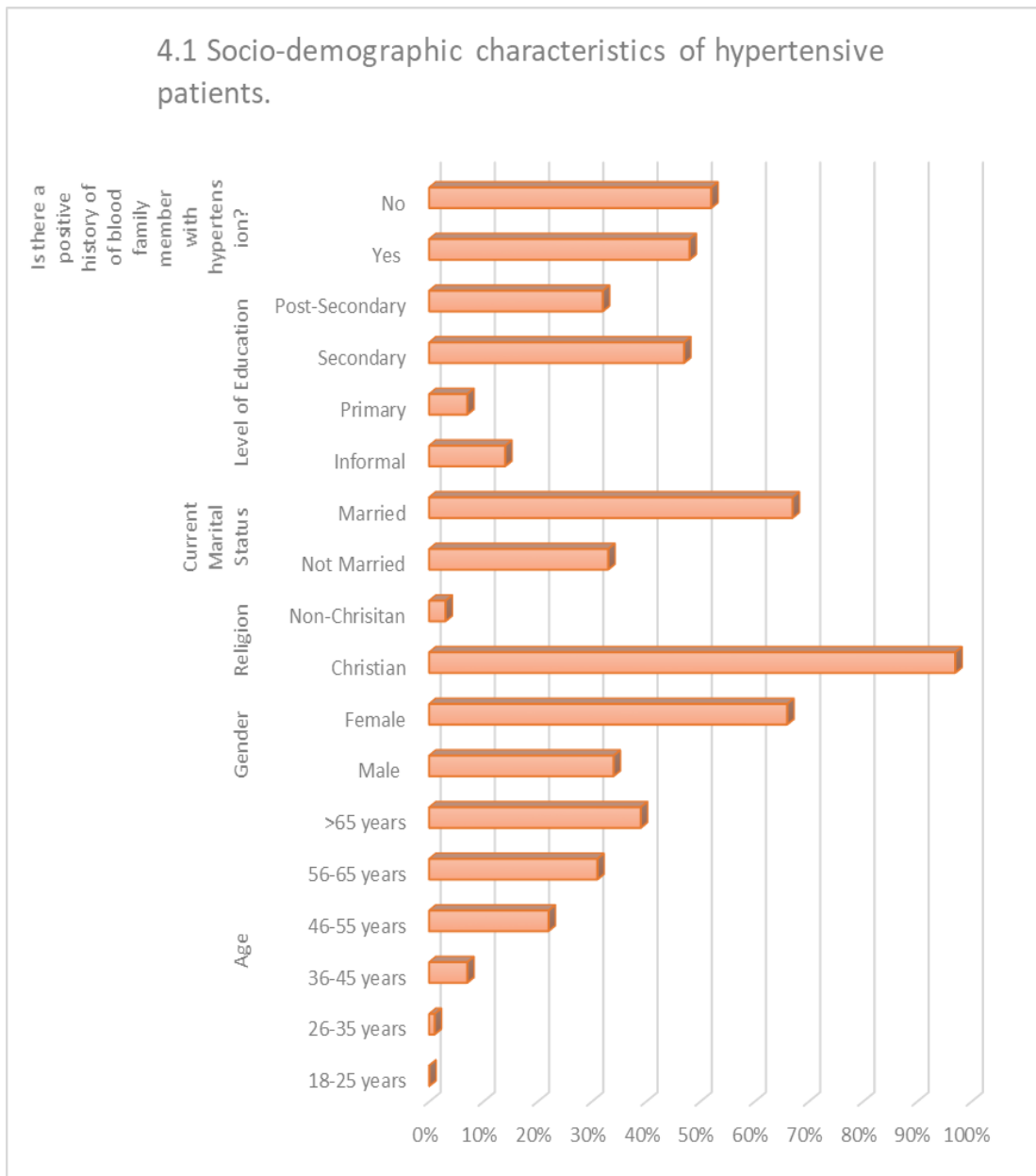
Figure 4.1: Socio-demographic characteristics of   hypertensive patients.

4.2 Socio-economic factors of hypertensive patients

Socio-economic characteristics of the patients are shown in the table below. Variables assessed were the employment status, respondent income, family income, and sources of finance for drugs.

Ninety percent (353) of the study patients were not formally employed an indication of unstable income sources. However, looking at the income levels, most of the study

patients (84% and 74%) had an income of at most 15,000 Kenyan Shillings for self and family respectively. Most patients (61%) used their out of pocket money to purchase their hypertensive medication, compared to 35% (138) who used their NHIF contribution, whereas only 4% were given medication free of charge.
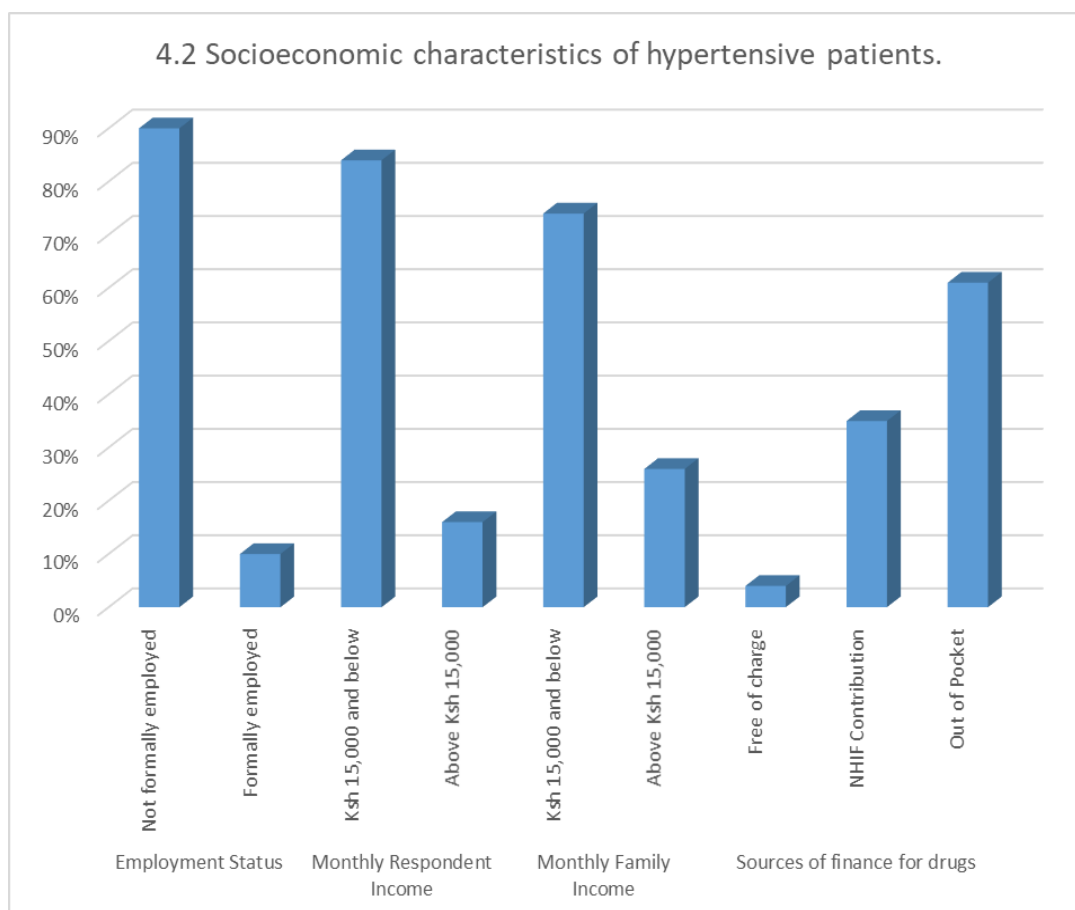
Figure 4.2: Socioeconomic characteristics of hypertensivepatients.

4.3 Life style factors of the hypertensive patients

Variables assessed for lifestyle-related interventions or changes include period since last visit, current smoking and alcohol use status, current physical exercise, use of salt in diet, and change in BMI relative to last visit. As shown in table below.

Most patients (62%) last visited the hospital 2-3 months ago, whereas only 8% (30) came more than 3 months ago. Only 2% (9) are currently smoking compared to 5% (18) who take alcohol presently. Eighty-three percent (328) of the patients physically

exercised presently, whereas 77% (305) used salt in diet. 206 (52%) of the patients had lower BMI in the current visit compared to the BMI obtained in their previous visit, 116 (34%) increased their BMI, whereas 55 (14%) had no change in BMI.
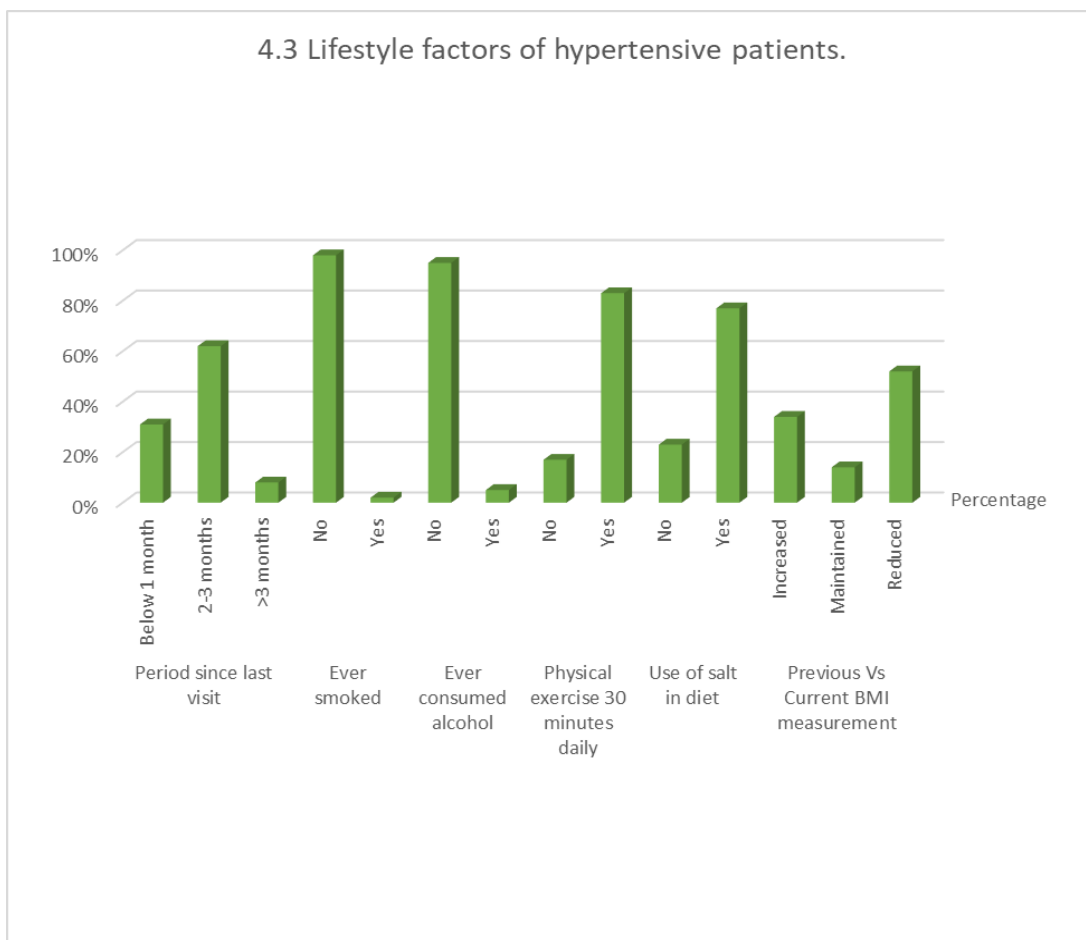
Figure 4.3: Lifestyle factors of hypertensive patients

4.4 Types of Antihypertensive drugs prescribed to hypertensive patients.

Thirty-seven percent of participants received Nifedipine, followed by Hydrochlorothiazide (35%), then Enalapril (33%), Atenolol (15%), and Methyldopa (6%). Only 5% were on lifestyle modification which included ever smoked, ever took alcohol, if they exercised and use of salt less than 5grams per day whereas 37% received two drugs. Generally, the prescription patterns for the drugs were similar across the sex categories. Female patients accounted for the majority of those

prescribed for Hydrochlorothiazide (59%), Nifedipine (67%), Enalapril (65%), Atenolol (68%), and Methyldopa (60%). (Table 4.4).
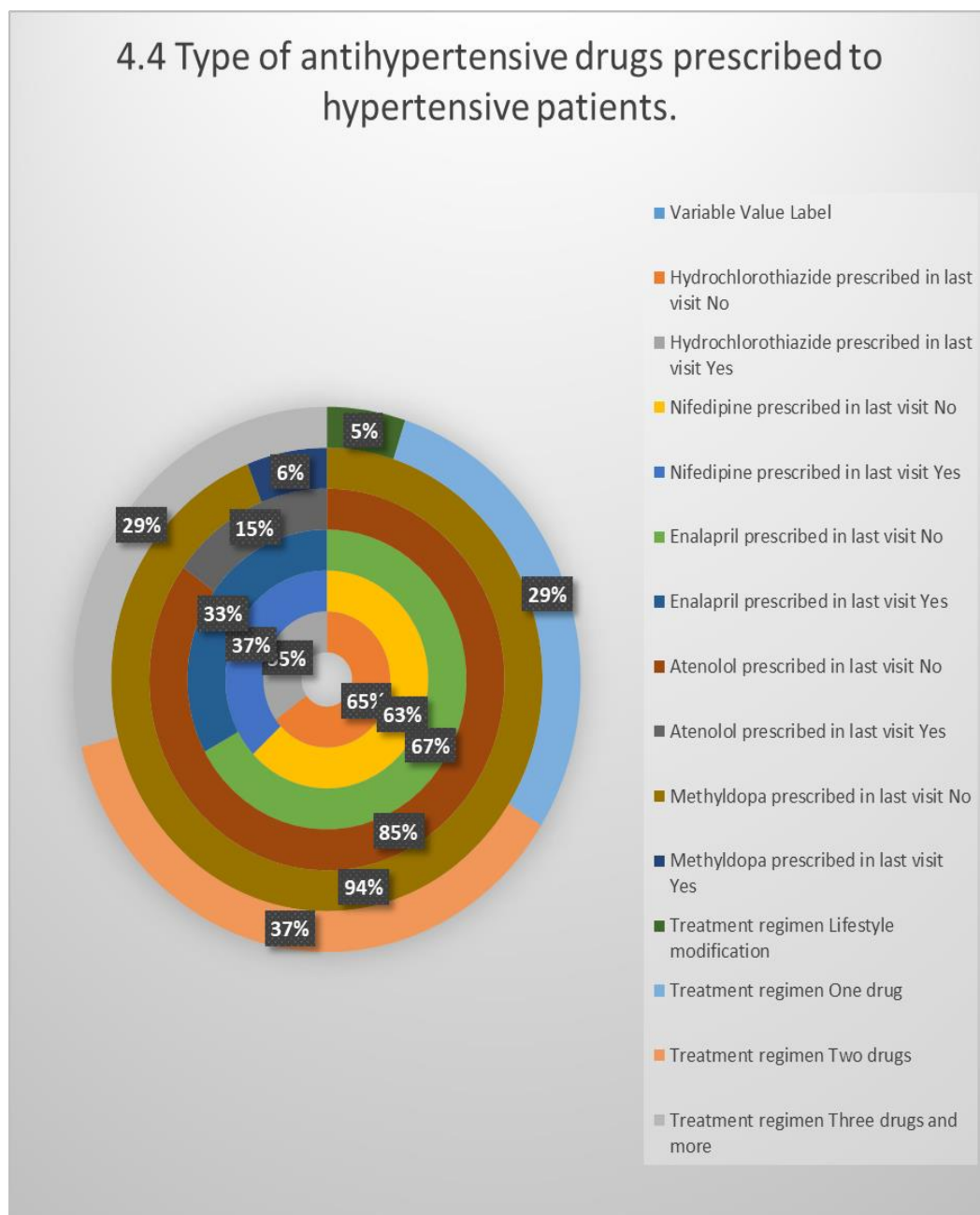
Figure 4.4: Types of antihypertensive drugs prescribed to hypertensive patients

4.5 Availability of drugs in the health facility

Eighty-one percent (n=318) of the patients indicated that they did not always find the drugs prescribed. Most of the drugs prescribed were unavailable within the facility.

Precisely, only 76 (19%) of the patients indicated that they usually found drugs within the facility. As shown in table 4.6 below.
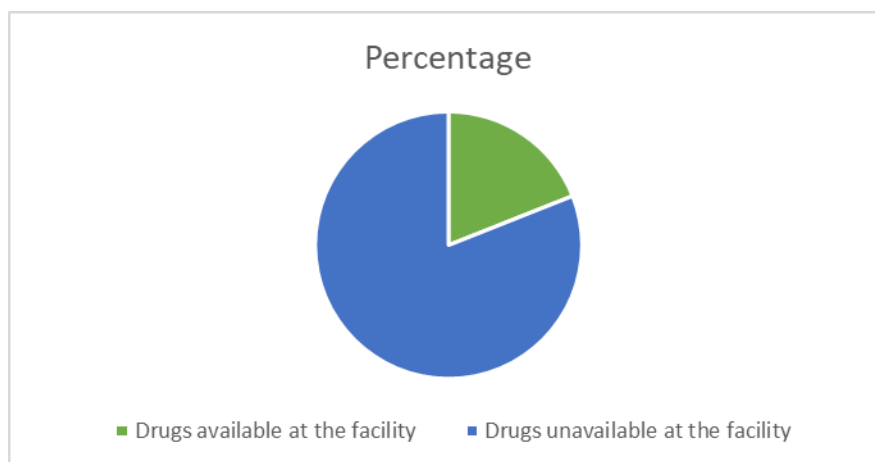
Figure 4.5: Availability of drugs in health facility

For concurrent conditions (n=295)75% of the participants had other medical conditions and (n=99) 24% did not.54 %(n=159) had diabetes mellitus, 6 %(n=17) had stroke, (n=11)4% had kidney complications and (n=108)36% hadother medical conditions.

From the KII findings, the respondents indicated that factors that influenced their prescription includes: Patient's residence's distance from the health facility; Cost of the drugs, a patient's having or not having insurance cover; and the likelihood to find the drugs in the pharmacy in stock guided the choice of the treatment options given to the patients.

As far as the availability of relevant hypertension management guidelines or SOPs was concerned, the respondents indicated that:

"Both national and international guidelines physically absent from the clinics" and that

"The national guidelines are present within the facility though not centrally located or found in the clinics. As such, clinicians use their soft copy versions"

Additionally, all KII informants the role of guidelines and drugs availability on the management of hypertension with key responses to this enquiry being:

> *"Hypertension control is a process that starts with the patient visiting the facility"*

> *"Patients decide whether or not to come to the hospital, that's an individual factor"*

> *"The facility then has the task of making the drugs available, which is not always the case for certain drugs here"*

> *"Staff attitudes then come into play as institutional factors which determine whether or not the patient comes back for a BP check"*

> *"The patients coming back is adherence (which is a factor of both the patient and the institution)"*

> *"Presence of guidelines, protocols and handbooks could be useful as the various flow-chart on helpful lifestyle practices could increase chances of gaining BP control"*

From the FGD findings, some participants admitted that they sometimes skip clinic appointments as it stresses them more due to lack of drugs. Most of the time they had to buy the prescribed drugs from elsewhere – some of which are very expensive.

> *"You come to the clinic, there are no drugs. They tell you that the machine used to check blood pressure levels is not working, there are no drugs at the pharmacy yet we pay 500 shillings monthly for N.H.I.F yet we lack drugs. Sometimes it's better to stay home rather than use money to come to the hospital and leave without your required dosage."*

All FGD participants agreed that at the hospital, they receive educational support where health care providers educate them on how to manage hypertension, they are taught about dietary requirements among other things. They further said that at this

hospital, the health providers at the clinic are friendly; they give them information about their dosage, at what time to take drugs, their water intake requirement and answer any other hypertension related questions.

4.6 proportion of patients with uncontrolled hypertension

One hundred and eighty-nine (48%) of the patients had uncontrolled hypertension.
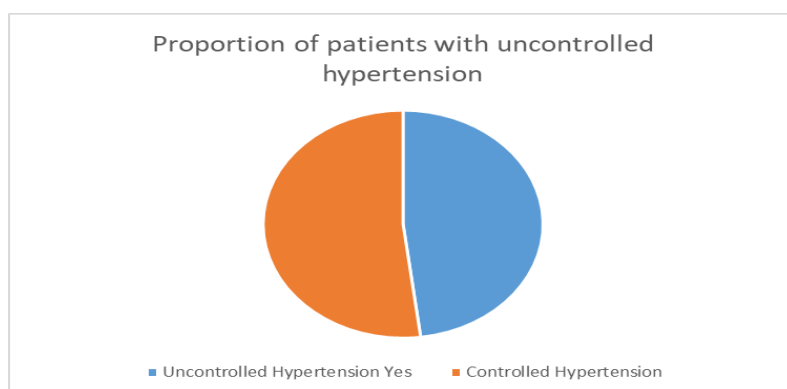
Figure 4.6: Proportion of hypertensive patients with uncontrolled hypertension

Association of socio-demographic factors and uncontrolled hypertension are presented in table below. Pearson's Chi-square was calculated for each of the variables. The chi-square, degrees of freedom, or (fisher's exact test for low cell frequency counts <5), and p-value statistics are presented. Of the socio-demographic variables assessed against uncontrolled hypertension, level of education revealed statistically significant differences ($X^2 = 10.21$ (3); $p = 0.017$).

Although the differences in age were not statistically significant across the outcome categories, the qualitative data revealed that age was a critical feature in the management of Hypertension. Findings reported from the KII assessment of the age profile included details such as:

"We have a good number of elderly patients"

"We have some patients who are within child bearing age, and as such require specific indications for certain drugs,

36

And that

"Most of our patients have retired (10), although they do businesses"

From the FGDs, male participants indicated that their sex libido has gone down because of the disease and the drugs they use that give them a problem with their wives who think of them otherwise and sometimes they skip their drug doses. Some of the participants noted that the disease burden affects the relationship with children and spouses.

Table 4.1: Association of Socio-demographic factors and uncontrolled hypertension

Variable	Value label	Uncontrolled hypertension			
		No	Yes	Total	P-value
Age	18-25 years	0	0	0	
	26-35 years	0	3	3	
	36-45 years	13	16	29	0.190*
	46-55 years	35	51	86	
	56-65 years	70	51	121	
	>65 years	87	68	155	
Gender	Male	67	67	134	
	Female	138	122	260	0.562
Religion	Christian	199	184	383	
	Non-Christian	6	5	11	0.866
Current Marital Status	Not Married	75	56	131	0.143
	Married	130	133	263	
Level of Education	Informal	35	20	55	
	Primary	21	8	29	
	Secondary	86	99	185	0.017*
	Post-Secondary	63	62	125	
Is there a positive history of HTN in a blood family member?	Yes	98	93	191	
	No	107	96	203	0.781
	Total	**205**	**189**	**394**	

*Fisher's exact test

Table 4.2 shows Association of socioeconomic factors and uncontrolled hypertension. Pearson's Chi-square was calculated for each of the variables. The chi-

square, degrees of freedom, or (fisher's exact test for low cell frequency counts <5), and p-value statistics are presented.

Source of finance for drugs was statistically significantly associated with uncontrolled hypertension ($X2 = 9.01$ (1); $p = 0.011$). None of the other economic variables studied were statistically significant at alpha level of 5%.

From the FGD, participants implied that their life experiences changed since they were diagnosed with hypertension. Many noted that they were productive before, but their productivity level had gone low. It was also established that the participants indicated that living with hypertension is financially draining as it is a costly disease to manage. The prices of drugs for this disease were noted to be expensive and some participants struggled so much in meeting that need. One of the female participants said that lack of money to buy drugs causes her to be more stressed since she knows the consequences of skipping the recommended dosage.

One participant said that he no longer works in the farm as even small chores cause him to feel dizzy. He depends on himself to provide; this causes a financial strain. Other respondents said that they depend on their husbands, wives and children as well as relatives for support. This they say is a disease that makes a family poor. For instance; one female participant said that:

> "My daughters help me by buying my drugs, they get tired sometimes and sometimes I even don't know how to ask them for money, I feel like I am always a bother to them. They also keep questioning me, asking me why I'm stressed, this irritates me at times because they think that I intentionally over think. My husband also keeps telling me to stop stressing myself. Sometimes he avoids talking to me because he thinks I'll overreact."

Some respondents' budgets for their food separately, therefore, the issues of two budget in the household, while others indicated that they do one budget for the whole family which includes their food. They don't buy their food separately.

Table 4.2: Socioeconomic factors and uncontrolled hypertension

Variable	Value label	Uncontrolled Hypertension			P-value
		No	Yes	Total	
Employment Status	Not formally employed	182	171	353	0.582
	Formal employed	23	18	41	
	Total	205	189	394	
Monthly Respondent Income	Ksh. 15,000 and below	170	159	329	0.802
	Above Ksh. 15,000	35	30	65	
	Total	205	189	394	
Monthly Family Income	Ksh. 15,000 and below	153	139	292	
	Above Ksh. 15,000	52	50	102	0.642
	Total	205	189	394	
Source of finance for drugs	Free of charge	8	9	17	
	NHIF Contribution	86	52	138	0.011*
	Out of Pocket	111	128	239	
	Total	205	189	394	

From the analysis, having non-formal or post-secondary Education was associated with better hypertension control. Those with the highest level of education as primary and secondary were twice as likely to have uncontrolled hypertension compared to those who had informal education (2.16 [1.084 - 4.304]; 2.21 [1.072 - 4.555]). Those with a post-secondary level of education were 0.8 times less likely to have uncontrolled hypertension compared to those who had informal education, although that association was not statistically significant. For the source of drugs, those who bought drugs from out of pocket were 4 times more likely to have uncontrolled Hypertension compared to those who got their drugs free of charge (Table 4.3).

Table 4.3: Association between highest education level, Source of finance for drugs and uncontrolled hypertension

Outcome: Uncontrolled Hypertension		Crude Odds Ratio [95% Conf. Interval]	Std. Error	P-value
Education Level	Informal	1		
	Primary school	2.16 [1.084 - 4.304]	0.760	0.029
	Secondary school	2.21 [1.072 - 4.555]	0.815	0.032
	Post-Secondary school	0.822 [0.293 - 2.312]	0.434	0.711
Source of finance for drugs	Free of Charge	1		
	NHIF Contribution	1.275 [0.131 - 2.575]	0.130	0.929
	Out of the Pocket	3.767 [0.475 - 5.240]	0.421	0.094

Lifestyle factors and uncontrolled hypertension are presented in table 4.4. Pearson's Chi-square was calculated for each of the variables. The chi-square, degrees of freedom, or (fisher's exact test for low cell frequency counts <5), and p-value statistics are presented.

Increase in BMI was significantly associated with uncontrolled hypertension at (χ^2 = 10.78 (2); p = 0.005). There were significantly fewer patients with increased BMI and controlled hypertension than those with increased BMI and uncontrolled hypertension. Of the patients (205) who had their hypertension controlled, 101 (49%) had reduced their BMI. Salt intake was significant at 90% Confident interval (χ^2 = 3.11 (1); p = 0.078). Some of these observations were evident from the qualitative data collected from the FGDs. In terms of preparation of the food, the difference was noted. Some talked of having to prepare their food separately from that of the other family members while others would eat what has been prepared for the whole family. This means Hypertension dietary restrictions makes some participants prepare food twice. Many participants noted that their food is prepared with little or no cooking oil, little salt unlike the non-restrictive food for the rest of the family.

The FGD participants said that since diagnosis they have had to change their diet as advised by their clinicians. Most participants said that their recommended diet was expensive, and they are often unable to afford the foods therefore they do not fully

follow the recommended diet. The recommended diet includes a lot of vegetables and fruits. On vegetables, all participants noted to have plenty.

However, on fruits some noted to have challenges emanating from the prices. One participant noted that:

> "Most of the food's doctors tell us to eat have to be bought. The beans, green peas and fruits recommended are expensive. I have to buy all this and also buy drugs. I don't have sufficient money to sustain this lifestyle. I sometimes do without fruits and only eat the cheap ones and the easily accessible ones such as watermelon and bananas."

In supporting the above sentiments another participant opined that:

> "I don't follow the recommended diet because of lack of money to buy fruits. I don't eat fruits that much because they are very costly. I like passion fruits, but they sell 4 at 100 shillings. How can I afford eating them often? I must go for the cheaper options, mostly water melon and oranges.

Watermelon and bananas were the most eaten fruits by these participants owing to their being cheap and easily available compared to other fruits like apples. The region is known for growing pineapples but unfortunately it was not mentioned as a readily available and cheap fruit.

Most participants said that they have sufficient vegetable intakes as majority of them are farmers and vegetables such as cabbages, spinach and kales are very accessible. However, there was a concern on the perception that cabbages are too sugary, and it might affect their sugar levels.

On salt intake, most participants said they have substantially reduced their salt intake. They still cook and consume 'little' amounts of salt since they indicated that they find food without salt tasteless and they don't get full fast. They said that they ensure they consume cooked salt and not add salt directly onto ready meals.

Almost all the participants indicated that they don't use alcohol or tobacco while only one male participant noted to still use beer on occasion he feels stressed as a stress reliever. Most FGD participants are aware of the effects of tobacco and alcohol consumption on individuals living with hypertension. They disclosed that individually they do not consume alcohol but they are aware of individuals with hypertension who consume alcohol and how alcohol consumption affects the effectiveness of hypertension treatment. They said that alcohol speeds up deaths in individuals living with hypertension.

Most of the participants' said that their form of exercise and physical activities include walking while running errands such as going to the market and hospital. Carrying out home chores and working in their farms, fending their animals. They are aware of the importance of movement and exercises.

Table 4.4: Lifestyle factors and uncontrolled hypertension

Variable	Value label	Uncontrolled Hypertension			P-value
		No	Yes	Total	
Period since last visit	Below 1 month	59	62	121	
	2 – 3months	133	110	243	0.343
	>3 months	13	17	30	
Current smoking status	No	200	185	385	0.830
	Yes	5	4	9	
Current alcohol use	No	196	180	376	0.860
	Yes	9	9	18	
Physical Exercise 30 minutes daily	No	29	37	66	0.149
	Yes	176	152	328	
Use of salt in diet	No	39	50	89	**0.078**[*]
	Yes	166	139	305	
BMI	Increased	55	61	133	
	Maintained	40	14	55	**0.005***
	Reduced	101	88	206	
	Total	**205**	**189**	**`394**	

In table 4.5 the antihypertensive drugs prescribed factors are presented alongside the outcome variable. Of the 19 patients who did not receive a drug prescription in their current visit, 14 had uncontrolled hypertension, indicating that lifestyle modification on its own was not effective in hypertension control.

Findings from the Focus group discussions: One participant narrated the following experience:

> "I have to take 4 pills a day, 1 for my diabetes and 3 for my blood pressure. Every time I come to the clinic at the pharmacy. I'm told that there are no drugs. I have to go buy them at the chemist. At the chemist, the drugs are very expensive; I think they intentionally hike prices because they know we must use them. Also, the drugs from the chemist are not as strong as the ones we get from the hospital."

Another participant also stated that:

"I use different types of drugs. I also have to use injection drugs twice a day, and I have to buy them from the chemist. They are very expensive."

Table 4.5: Types of drugs prescribed and uncontrolled hypertension

Variables	Value label	Uncontrolled Hypertension			P-value
		No	Yes	Total	
	Lifestyle Modification	5	14	19	
Treatment regimen	One drug	67	49	116	0.091
	Two drugs	85	59	144	
	Three drugs and more	48	67	115	
	Total	**205**	**189**	**394**	

Table 4.6 below shows the rate at which the hypertensive medications prescribed were missing at the hospital pharmacy. More than eighty percent (n=318) of the patients indicated that they found the drugs prescribed missing at the facility.

However, failure to find drugs at the facility was not statistically significantly associated with uncontrolled BP among the study participants.

Table 4.6: Missing drugs at the facility and hypertension

Variables	Value Labels	Uncontrolled Hypertension			P-value
		No	Yes	Total	
Prescribed drugs missing at the facility	No	37	39	76	0.516
	Yes	168	150	318	
	Total	**205**	**189**	**394**	

Logistic regression model involving behavioural factors and latest BP are presented in table 4.7 below. The model included the independent variables: education level, BMI status, and drug cost burden.

Those who had primary school level of education and secondary school had twice as higher odds of having uncontrolled blood pressure compared to those who had no education. However, having post-secondary education reduces the odds of uncontrolled pressure by 0.7. Keeping all the other variables constant, those who neither increased nor decreased their BMI had 0.22 times less odds of having uncontrolled hypertension compared to those who increased, whereas those who reduced their BMI had 0.8 times the odds of uncontrolled BP compared to those who had increased BMI.

Table 4.7: Logistic regression predicting education level, BMI and source of finance for drugs by uncontrolled hypertension of 189 patients on follow up at MOPC Thika Level 5 Hospital 2019

	Uncontrolled Blood Pressure	Adjusted Odds Ratio	Std. Err.	P-value	[95% Interval]	Conf.
	None	1				
Education	Primary school	2.178	0.762	0.026	1.097	4.325
Level	Secondary school	2.144	0.786	0.037	1.045	4.398
	Post-Secondary school	0.784	0.412	0.644	0.280	2.196
	Increased	1				
BMI	Maintained	0.294	0.109	0.001	0.142	0.608
	Reduced	0.780	0.190	0.309	0.484	1.258
Sources of	Free of Charge	1				
finance for	NHIF Contribution	0.609	0.358	0.399	0.192	1.929
drugs	Out of the Pocket	1.074	0.614	0.901	0.350	3.294

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Preamble

This chapter shows the findings from this study and how they relate with other studies in the following areas: socio-demographic, socio-economic, lifestyle, antihypertensive prescription factors and uncontrolled hypertension.

5.1.1 Discussions and overall findings

The study sought to address an issue of global health concern and currently more in low and middle-income countries (Heller et al., 2019) Thika Level 5 hospital serves a catchment population of approximately 10 million who originate not only from Kiambu County but also from neighbouring counties such as Machakos, Nairobi, Murang'a and Kirinyaga Counties (KNBS, 2019) –a region leading broadly in non-communicable diseases (KNBS, 2015).

Study findings revealed 48% of the study participants had uncontrolled hypertension. Significant factors included level of education, source of financing for hypertensive drugs and change in BMI. Further insights were obtained from focus group discussions and key informants. For instance, the participants reported that cost of drugs, adverse sexual side effects experienced by male patients, unavailability of drugs and desire for salt intake impeded their ability to manage hypertension.

5.1.2 Socio-demographic factors associated with uncontrolled hypertension.

Study participants were adults' ≥ 18 years of age who sought treatment at Medical Outpatient Clinic, Thika Level 5 Hospital. Although these cross-sectional results showed that patients>60 years old had better odds of having controlled hypertension compared to those aged ≤60 years, this was not statistically significant. This results contradict studies which shows age is a known risk factor for elevated BP and is associated with structural changes in arteries especially large artery stiffness which

leads to increased cardiovascular risk and Stroke (Buford, 2016; Oliveira et al., 2019; Shukuri et al., 2019). In the elderly, increased pulse pressure is the most vital predictor of increased Systolic Blood Pressure and decreased Diastolic Blood Pressure (Oliveira et al., 2019).Other studies have shown that patients aged ≤60 years were more likely to have controlled hypertension (Mutua et al., 2014). Perhaps aged people are more conscious of the aging process and its consequences and therefore have better control of hypertension in this study. This hypothesis needs to be studied in a cohort study design to inform this knowledge.

The study found that female patients had higher odds for hypertension control compared to their male counterparts, though this was not significant. This finding is consistent with a number of studies which indicated that female patients were more likely to have controlled hypertension than males (Choi et al., 2017; Daugherty et al., 2011; Mohamed et al., 2018; Ornstein et al., 2004)Females are reported to be more active in health seeking behaviour relative to males and this may explain the differences in outcomes across gender(Everett & Zajacova, 2015; Rahman et al., 2017).

Findings from this study showed that level of education was significantly associated with uncontrolled hypertension. Patients who had post-secondary education had their hypertension controlled as compared to primary and secondary education. This observation is consistent with a study by (Jaramillo et al., 2015; Legido-Quigley et al., 2015) which reported that higher education level was associated with reduced burden of hypertension for all patients while higher level of education was also associated with control, awareness and treatment. (Mohsen Ibrahim, 2018; Thomas L. Schwenk, 2017)reported that lower education level was associated with increased risk of cardiovascular disease. Association between education and uncontrolled hypertension is mediated by other clinical and non-clinical factors such as more educated people being more conversant with consequences of non-adherence to the treatment. The study also found out that those with informal education were less likely to have uncontrolled hypertension compared to those of primary and secondary levels. Combining the observations from this variable, both extreme levels of education could be indicative of better hypertension control. Perhaps those with low

levels of education are more receptive to instructions and advice by clinicians, whereas those with very high levels appreciate the implication of the instruction and advice, hence the better control. Further research of the effect of level of education on hypertension control within the context would be useful in informing this knowledge.

5.1.2 Lifestyle Factors associated with uncontrolled hypertension.

Increase in BMI taken in the 2 preceding clinic visits was associated with uncontrolled hypertension this finding agrees with(Chen et al., 2018; Jayedi et al., 2018). Increase in BMI is among the well-established predictors of uncontrolled hypertension. Vascular resistance strains the heart muscles increasing the workload for the heart to bump blood leading to uncontrolled hypertension.

From the study findings, most patients neither smoked cigarettes nor took alcohol though from the FGD the participants reported that excess alcohol use and smoking complicates hypertension leading to uncontrolled hypertension and early deaths. The link between low use of alcohol and cigarette smoking and knowledge among the participants helped them to avoid this risky behaviour as they are aware of the consequences. Studies have shown that high burden of hypertension is due to physical inactivity, unhealthy diets, tobacco smoking and excess intake of alcohol(Carson et al., 2013; Mohsen Ibrahim, 2018; Unger et al., 2020).Studies done in Ethiopia revealed that non-adherence to smoking abstinence and non-adherence to alcohol abstinence were associated with uncontrolled hypertension (Gebremichael et al., 2019; Tesfaye et al., 2017). Cigarette smoking causes accelerated atherosclerosis resulting from sympathetic nervous system by increasing blood pressure. Drinking too much alcohol increases blood pressure for example having more than one drink in a sitting temporarily increases blood pressure hence leads to uncontrolled hypertension. Reducing alcohol intake to two drinks per day in most men and one drink per day in women and stop smoking leads to better hypertension control (Fekadu et al., 2020; Johnson et al., 2016; H. Yang et al., 2017). '

Findings from this study did not show any significant relationship between current physical exercise and uncontrolled hypertension. From the FGD insight, almost all

patients were involved in various physical activities such as farming. However, it is common knowledge in healthcare that regular physical exercise makes the heart muscles strong to pump blood to the whole body without strain and therefore lowering blood pressure. Getting exercise can be enough to reduce drug therapy. (Modey Amoah et al., 2020).These findings were inconsistent with those reported by(Eckel et al., 2014; Pescatello et al., 2015; Whelton et al., 2018) that physical exercise translating in weight lost was associated with hypertension control among hypertensive patients. Perhaps farm work might replace daily physical exercise needed and studies exploring physical exercise will not find significance. A potential further investigation for this finding would be aimed at establishing the effect of different physical activities (including sports, exercises or farm work) on hypertension control.

Use of Salt in diet was a self-reported function of awareness and practice during food preparation and was not associated with uncontrolled hypertension. The study findings were consistent with those reported by(. Yang et al., 2017)that salt intake was a contributor to lack of hypertension control among hypertensive patients in Korea. From the FGD, participants reported that food without salt is tasteless, leading them to add salt to their cooked food – a possible explanation for majority of them having uncontrolled hypertension. Salt raises the sodium levels in the blood stream leading to water retention in the body which reduces the functionality of the kidneys to remove water from the body raising blood pressure. Retained water in the body puts pressure on the kidneys, arteries, heart and brain leading to uncontrolled hypertension(Tesfaye et al., 2017; Teshome et al., 2018)

5.1.3 Types of antihypertensive drugs prescribed to patients' factors associated with uncontrolled hypertension

The study found out that lifestyle modification on its own was not effective in hypertension control this agrees with studies that hypertension needs both lifestyle and drug therapy in the management to obtain the best outcome for the patient (Rivera et al., 2019).The study also reported that 25% of Angiotensin converting enzyme-inhibitors were the most commonly prescribed drugs for the patients,

although there was no significant association between the drug class prescribed and uncontrolled hypertension. Other classes of drugs prescribed were Calcium channel blockers, Angiotensin receptor blockers, and Thiazides. These findings were consistent with (James et al., 2014)who reported the prescription of Angiotensin converting enzyme inhibitors, Thiazide-type diuretics, Adrenergic Receptor Blockers, and Calcium channel blockers for initiation of hypertension treatment on diagnosis as monotherapy was the best option. From the FGD insights, male patients blamed their lack of hypertension control on reported side effects associated with the drugs prescribed leading to them skipping doses.

Monotherapy (use of one antihypertensive drug) revealed better outcome compared to use of multiple antihypertensive drugs although the differences were not statistically significant. This finding is consistent with(Epstein et al., 2013; Mutua et al., 2014) report which showed that the odds of hypertension control were notably reduced if the patient was taking three or more antihypertensive medications. The same sentiments were echoed that uncontrolled hypertension was linked to more antihypertensive medications prescribed (Jarari et al., 2015; Sarfo et al., 2018)A possible recommendation given these findings could include strategies (such as strict self-monitoring and adherence) that sustain monotherapy for as long as possible at onset of hypertension management to reduce progression to higher therapies.

Comorbidities

Diabetes was the most common comorbidity, although complications identified among the patients included cardiovascular events, neuropathy, retinopathy and renal complications. Patients with chronic comorbidities had less odds of having their hypertension controlled, although this odds ratio was not significant. This finding was inconsistent with the study by(Adeniyi et al., 2016; Bozkurt et al., 2016; J. Wang et al., 2017)that reported that presence of chronic comorbidities resulted in lower BP especially for patients with hypertension-diabetes or hypertension-CVD comorbidities.(Dedefo et al., 2020)suggested that patients with comorbidities were more likely to be aware of their health situation and risk, and therefore are more proactive in seeking medical attention as well as adhering to medication. However,

this may be particularly untrue if the complications are at advanced levels, and since this study did not focus on the stage of the complications, it is not possible to quantify the role played by various stages of comorbidities in uncontrolled hypertension.

Results from this study showed that the prescriptions were in line with both the national and international guidelines for hypertension management which were evidenced in soft-copy form though physical guidelines were absent. These findings are similar to studies done at Ruiru Sub County Hospital and Kenyatta National Hospital (KNH) which showed that 82% prescribing patterns of antihypertensive drugs were consistent with the local and international guidelines(Mbui et al., 2017).This finding was also in line with another Nigerian hospital-based study which reported that ninety percent of the hypertensive patients used dual therapy as recommended in the hypertension management guidelines(Ukwe & Ubaka, 2012) .A study done in Kenya reported that

the initial treatment according to the latest JNC 8: are Angiotensin converting enzyme inhibitors, Thiazide-type diuretics, Adrenergic Receptor Blockers, and Calcium channel blockers.(Mutua et al., 2014).

Additionally, from the KII, the informants reported that they considered the degree of BP elevation when deciding on the type of therapy to prescribe for patients. Interviews with health professionals informed this study that distance from the health facility, cost of the drugs, a patient's having or not having insurance cover, and the likelihood to find the drugs in stock at the pharmacy guided the choice of the treatment options given to the patients this agrees with other studies which showed that factors that influence the choice of drugs include cost, convenience to the patient, efficacy, comorbid conditions and side effects. (Nazar et al., 2016; Rimoldi et al., 2014)Health professionals have a good understanding and appreciation of the socio-economic conditions surrounding the patients, hence the consideration of the various factors during drug prescription.

The study found that less than one-fifth of the patients always received the prescribed drugs at the facility. Regrettably, most of these patients were in the category of

having uncontrolled hypertension perhaps exacerbating the condition. The study showed that 35% of patients paid for the drugs using NHIF though most of them did not always acquire the drugs as prescribed and were not statistically significant. From the FGD results, the unavailable drugs in the facility forced the patients to purchase the drugs themselves from private chemists, translating in an unbearable financial burden, with opportunities of being dispensed low quality drugs and consequently leading to missed or suboptimal doses. Most patients also lamented on the under stocking of the high-cost drugs, most of which were commonly prescribed by the clinicians. These findings were consistent with a study done in China which revealed that 8.1% sites did not stock antihypertensive medications and 33.8% stocked all four classes that were routinely used. Village clinics and sites in the western region of China had the lowest availability while Close to one-third of all sites stocked high value medications, and a few high-value medications were prescribed and 11.2% of all prescription records. High cost medications were more likely prescribed than low-cost drugs (J. Li et al., 2017)

5.2 Conclusions

The proportion of individuals with uncontrolled hypertension among patients at Thika level 5 Hospital is 48%.

The significant variable among the social demographic and socio-economic factors were level of education, and source of finance for drugs.

Among the lifestyle factors salt intake and BMI were the significant factor associated with uncontrolled hypertension.

Generally, drugs were prescribed according to the national and international guidelines. Most antihypertensive drugs prescribed were missing in the pharmacy and national guidelines were not displayed for clinicians use.

5.3 Recommendations

5.3.1 Recommendations for health facility and Ministry of Health Kenya.

1   The 48% of individuals with uncontrolled hypertension among patients at Thika Level 5 hospital should be reduced to 20% by 2030

2   Health care personnel to conduct continuous daily clinical level education addressing the hypertension complications to avert the burden of uncontrolled hypertension.

3   Community awareness on hypertension and its complications through health promotion strategies done by health professionals and community health workers under MOH Initiation of home visits to help patients within their home environments is paramount to teach patients, how to measure recommended daily salt use of less than 5 grams per day and teach them how to do exercises duration and intensity So as to lower their Bps.

4   The hospital management to avail all the hypertension management manuals and guidelines to the clinicians as hard copy and as well display them in all the departments for easy access to information. The hospital should ensure a constant supply of the antihypertensive drugs at an affordable fee to all the patients. Full utilization of NHIF and waiver system for patients unable to afford the medication but have NHIF cover

5.3.2 Recommendations for Further research

1. A longitudinal study to be carried out on uncontrolled hypertension at Thika Level 5 Hospital to explore more factors.

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APPENDICIES

Appendix I: Consent Document

Dear Respondent,

Please read and understand before signing the consent below.

Study title: Prevalence of uncontrolled hypertension and associated factors among hypertensive patients attending MOPC, Thika level 5 Hospital, Kenya.

Investigator:

My name is Gladys Monyenye Magara and I am an MSC student at Jomo Kenyatta University of Agriculture and Technology, I am conducting a study to determine the prevalence and factors associated with uncontrolled BP among hypertensive patients at Thika level 5 Hospital MOPC. Blood pressure control is one of the most important factors considered when managing hypertension among other factors such as individual attributes which include age, gender, weight, and clinical management factors include class of antihypertensive treatment, type of therapy and comorbidities.

Please feel free to ask questions as we go along. Before you decide whether to join or not, please remember that the decision to join the study is voluntary. If you decide not to join the study, you will not lose any benefits. If after joining the study you change your mind about taking part in the study, I will ask you to sign a form indicating withdrawal from the study so that the information gathered from you may not be used without your permission.

Study Procedure

If you meet the set inclusion criteria of the study and sign this consent form you will be given a self-administered questionnaire which has section **A** –To collect the demographic characteristics of the respondent such as age. Gender, income,

comorbidity, weight and **B-** clinical management factors class of hypertensive treatment, adherence, period under medication, type of therapy and medication**.**

During the study all information will be kept private and confidential by the principal investigator.

Benefits

You will not benefit from this study other than being careful and observant when giving information and may you want more information you can contact the signed below. Your participation in this study may result in better management of hypertension. It will not cost you anything to be part of this study. You will also not receive any money for taking part in this study.

Risks

There is a small risk of breach in confidentiality should the information collected be necessary in the process of management of hypertension and may end up being shared with other Health workers. However, no bodily harm will happen to you when taking part in this study.

Confidentiality

We will maintain confidentiality, initials and coded numbers will be used to identify the participants, source documents, study reports. All study records will be maintained in a secured location. Participants will be assured of confidentiality that their names will not appear in any report.

What if I have questions?

If you have further questions or concerns about taking part in this study, please call the principal investigator at this **no 0718356644.**

This project has been approved by the KNH/UoN Ethical Review Committee. The committee ensures protection of volunteers in research. If you have questions about your role as a participant in any study, please contact the secretary, KNH/UoN Ethics

Review Committee, P.O. BOX 20723Code 00202 Tel. 725272-9 Email. Uonknh-erc@uonbi.ac.ke

Participants' statement of consent

I have had a chance to ask questions and the questions have been answered fully. I have fully understood the study. If I have further questions about the study, I am free to ask the investigators listed above. By signing this form, I confirm that I have voluntarily chosen to take part in this study and that I can withdraw anytime without losing any health care benefits

Participants   Name/Thumbprint   mark……………………………
Signature…………..............

Date………………………………….Contact……………………………………

Principal
investigator………………………................Signature……………………………..

Date……………………..

Appendix II: Consent Document (Swahili Version)

FOMU YA IDHINI

Mhojiwa mpendwa,

Tafadhali soma na uelewe kabla ya kusaini hati hapa chini.

Madaya Utafiti: Mambo yanayohusiana na kudhibitishinikizo la damu (BP) miongoni mwa wagonjwa washinikizo la damu wanaofuati liwakatikakliniki (MOPC) ya Hospitali ya Rufaa ya Thika.

Mtafiti:

Jina langu ni Gladys Monyenye Magara na mimi ni mwanafunzi wa MSC katika Chuo Kikuu cha Kilimo na Teknolojiacha Jomo Kenyatta (JKUAT). Ninafanya utafiti ili kuchunguza mambo yanayohusiana na kudhibiti BP miongoni mwawagonj mwawashinikizo la damu katikaHospitaliya MOPC Thika, ngaziya 5. Udhibitiwashinikizo la damu ni mojawapoya mambo muhimuzaidiyanayotajwawakatiwaudhibitiwashinikizo la damumiongonimwa mambo menginekama vile sifazakibinafsiambazo ni pamoja na umri, jinsia, uzito, uwepowamagonjwamawili au zaidisugupamojakwawakatimmoja (comorbidities) na mapato. Mifanoyasababuzakitaasisi ni sera, miongozoyamatibabu, na eneokwenyehospitaliambapo MOPC inapatikana. Zaidi, haliyamatibabu ni kamaainazamatibabudhidiyashinikizo la damu, uzingatiajiwamatibabu, kipindichamatumiziyadawa,naainayatiba na dawa.

Tafadhalijisikiehurukuulizamaswalitunapoendelea. Kablayakuamuakujiungaau la, tafadhalikumbukakwambauamuziwakujiunga na utafiti ni kwahiari. Ikiwaunaamuakutojiunga na utafitihuu, huwezikupotezafaida zozote. Ikiwabaadayakujiunga na utafitiunabadilishamawazoyakokuhusukushirikikatikautafitihuo, nitawaulizakusainifomuinayoonyeshakujiondoakutokakwenyeutafitiilimaelezoyaliyo kusanywakwakoyasitumike bila ruhusayako.

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Utaratibuwautafiti

Ikiwa unakidhi vigezo vya kuingizwa kwenye utafiti na kuweka sahihi kwenye fomu hii ya idhini, utapewa orodha ya maswali yenye usimamiaji kibinafsi unaojitegemea ambayo ina sehemu za: **A**-Ili kukusanya sifa za idadi ya watu yamhojiwakamaumri, jinsia, mapato, uwepo wa magonjwa mawili sugu kwa wakati mmoja (comorbidity), BM; **B**- sababu za kitaasisi kama vile sera, miongozo na eneo la MOPC, na **C** –aina zamatibabu, uzingatiaji, kipindi cha matumizi yadawa, aina ya tiba na dawa.

Wakati wa utafiti habari zote zitahifadhiwa binafsi kwa siri na uchunguzi mkuu.

Faida

Hutafaidika kutokana na utafiti huuisipokuwakuwamakini na mwangalifuwakatiunapotoataarifa na ikiwaunatakahabarizaidiunawezakuwasiliana na aliyetajwahapachini. Ushirikiwakokatikautafitihuuunawezakuchangiakatikausimamizi bora washinikizo la damu. Hakunagharamayoyotekushiriutafitihuu. Huwezipiakupatafedha zozote kwakushirikikatikautafitihuu.

Hatari

Kunahatarindogoyauvunjajiwasiriiwapohabarizilizokusanywaziwe na umuhimukatikamchakatowausimamiziwashinikizo la damu na zinawezakuishiakatikamikonoyawafanyakaziwenginewaAfya. Hatahivyo, hakunamadhara au maadharayamwiliyatakayotokeakwakowakatiunashirikikatikautafitihuu.

Usiri

Tutadumishausiri. Majina na idadizamsimbozitatumikakutambuawashiriki, hatizawashiriki na ripotizautafiti.

Rekodizotezautafitizitadumishwakatikaeneolililohifadhiwa.

Washirikiwatahakikishiwausirikwambamajinayaohayatatokeakwenyeripotiyoyote.

Je, iwaponinamaswali?

Ikiwaunamaswalizaidi au wasiwasijuuyakushirikikatikautafitihuu, tafadhalipigasimuyamchunguzimkuukwanambarihii: 0718356644.

Mradihuuumekubaliwa na KamatiyaUkaguziwaMaadili KNH / UoN. Kamatihioinahakikishaulinziwawanaojitoleakatikautafiti. Iwapounamaswalikuhusujukumulakokamamshirikikatikautafitiwowote, tafadhaliwasiliana na Katibu, KamatiyaUhakikiwaMaadiliya KNH / UoN, P.O. BOX 20723Code 00202 Simu. 725272-9 Baruapepe. <u>Uonknh-erc@uonbi.ac.ke</u>

Taarifayawashirikiwaidhini

Nimepewanafasiyakuulizamaswalinamaswaliyamejibiwakikamilifu. Nimeielewakikamilifuutafitihuu. Iwaponinamaswali Zaidi kuhusuutafitihuu, ninauhuruwakuulizawachunguziwaliotajwahapoawali. Kwa kusainifomuhiininahakikishiakuwanimejitoleakwahiarikushirikikatikautafitihuunakw ambaninawezakujiondoawakatiwowotebilakupotezafaidazozotezakiafya.

Jina la washiriki / Alamayakitambulisho................................ Saini..........................

Tarehe... Nambariyasimu..

Mtafitimkuu... Saini..................................

Tarehe……………………..

Appendix III: Respondent's Questionnaire

Date: _____ Outpatient Number_____ Form

Number_____

A	Sociodemographic and economic factors
1	Age: 18 – 25 years ☐ 26-35 years ☐ 36-45 years ☐ 46-55 years ☐ 56-65 years ☐ >65 years ☐
2	Gender: ☐ Male ☐ Female
3	Religion: ☐ Christian ☐ Muslim ☐ other (specify)_____
4	Marital status: ☐ Married ☐ Separated/Divorced ☐ Single ☐ widowed
5	Education level: ☐ Non formal ☐ Primary School ☐ Secondary school ☐ Post-Secondary
6	Work status: ☐ Formal employment ☐ Informal employment
7	Monthly Respondents income in Kenyan shillings…………………………………… Family monthly income: in Kenyan shillings _____
8	Is there another family member (parent) with hypertension ☐ Yes ☐ No
9	If yes to Q9, how many others…………………..
10	Who bears the cost of your antihypertensive? ☐ Free of charge ☐ NHIF contribution ☐ Out

	of pocket
11	Do you always find the prescribed drugs in the hospital pharmacy? ☐ Yes ☐ No
C	**Life style factors**
12	Have you ever smoked cigarette ? ☐ Yes ☐ No If your answer to question 13 is yes, How many cigarettes do you smoke per day?
13	Have you ever used alcohol? ☐ Yes ☐ No
14	Are you physically active for more than thirty minutes per day? ☐ Yes ☐ No
15	Do you use 50grams salt in diet per day? ☐ Yes ☐ No

Appendix IV: Data collection form

Medical Record Review

Outpatient number:		Participant Code: _____/394		
A	**SECTION A**			
1.	**Concurrence condition**			
	☐ Stroke ☐ Hyperlipidemia ☐ Heart failure ☐ Diabetes ☐ Myocardial infarction ☐ Chronic kidney disease ☐ Other (Specify) _____			
2.	**Weight**			
		Date	BP reading (mmHg)	
	Visit 1			
	Visit 2 (Last previous)			
	Visit 3 (Latest)			
3.	**BP readings**	Date	BP reading (mmHg)	
	Visit 1			
	Visit 2 (Last previous)			
	Visit 3 (Latest)			
B	**Treatment regimen**			
4	Last previous		Prescribed on current visit	
	Drug	Dose and frequency	Drug	Dose and frequency
	☐ Hydrochlorothiazide ☐ Nifedipine		☐ Hydrochlorothiazide ☐ Nifedipine	

	☐ Enalapril			☐ Enalapril		
	☐ Atenolol			☐ Atenolol		
	☐ Methyldopa			☐ Methyldopa		
	☐ Other (specify)			☐ Other (specify)		
5	Medications/s for concurrent conditions					
	Drug			Dose and frequency		

Appendix V: Respondent Questionnaire (Swahili version)

Maswalikwamshiriki

Terehe: _____ Nambayakliniki_____

Nambayafomu_____

A   Kliniki, Jamii-Uchumi

1   Umri (Miaka)   18 – 25 ☐   26-35 ☐   36-45 ☐

46-55 ☐   56-65 ☐   >65 ☐

2   Jinsia

☐Mume   ☐Mke

3   Dini:

☐Mkristu   ☐ Muslim   ☐Zingine
_____

4   Hali yandoa:

☐Ndoa   ☐Talaka/Kujitenga   ☐Moja   ☐Mjane

5   Kiwango cha elimu:

☐Hakuna   ☐Shule ya msingi   ☐Sekondari   ☐Baada   ya
sekondari

6   Kazi:

☐Kazii siyo rasmi   ☐Kazirasmi

7   Mapato ya mshiriki (Kenyan shillings)……………………………………

Mapato ya familia(Kenyan shillings)_____

8   Je, kunaye mwengine katika familia yenu (mzaziwo au nduguyo) aliyenashinikizo la damu? ☐Ndio   ☐ La

9   Kama ni ndio Q 2.1, Ni wangapi?………………...

10 Nanianalipiamadawayako?

    ☐Bure   ☐Mchangowa   NHIF

    ☐Najilipiakutokamfukoni

11 Je, ni kawaidakupatadawazotehapahospitaliniambazodaktariamekuandikia?

    • Ndio
    • La

C   Muundowamaisha

12 Unavutasigara?   ☐Ndio   ☐La

    Kama jibulakonindionamba 12 Unavutangapikwasiku?

13 Unatumiapombe?   ☐Ndio   ☐La

14 Wewehufanyamazoeziyakimwilikwadakikathelatinikilasiku? ☐Ndio☐La

    Na kamajibulakonindio 14 Tajahayomazoezihapachini

    ....

15 Unawekachumvikwachakula?☐Ndio   ☐La

    Kama jibulako ni ndiotajaainayachumviunatumia na kiwangochake

    ………………………………………………………………………………….

Asantekwakushiriki.

Appendix VI: Key Informants Interview

Interview Date/Start time/End time:

Designation/Profession: ....

Name of rapporteur:

Code ..../18

Gender M [   ]   F [   ]

Age in years: 20-30 [   ]   31-40 [   ]   41-50 [   ]   Above 50 years [ ]

1. What are the factors you consider when prescribing antihypertensive medications for the hypertensive patients in this facility? Probe for Period of follow-up. Patient distance form hospital.

   _____
   _____
   _____

2. Which international or national hypertension management guidelines are available in the health facility? Ask and note the evidence

   _____
   _____

3. What is the general profile of the hypertensive patients taking antihypertensive medications? Adherence? Characteristics

   _____
   _____
   _____

4. How do you regard patients' knowledge about hypertension management?

_____

_____

_____

5. In your own opinion is there any link between individual, clinical management and institutional factors and uncontrolled hypertension? If Yes, which ones? If no, what then leads to uncontrolled hypertension? Describe this linkage or lack of which.

6. Are antihypertensive drugs always available in the hospital pharmacy?

Thank you for your cooperation

Appendix VII: Focus Group Discussion Guide for Male and Female

Instructions

The Focus group discussions (FGDs) will mainly be conducted for the purposes of opening up the study and also for bringing consensus or divergence on issues at the community level. The FGDs will be constituted to cater for gender dynamics. The groups will consist of males separate and female separate with between 8 – 10 discussants and conducted by a moderator and a note taker.

Themes

These themes below will guide methodology and not the questions that will be asked per se. Every question will be broken down further into a set of more straightforward questions.

Beginning the discussion

Good morning and welcome to this discussion.

My name is_____ and my colleagues name is _____; [*Introducing the study*]. We shall treat your response with utmost confidence during processing and analysis. The discussions will take us between 45 minutes and 1 hour 30 minutes. However, please feel free to give as many details as you can. Do you have any question or any comment at this stage? May you allow me if you are happy to proceed with the interview?

Housekeeping: [Moderator]

Socio-demographic characteristics of FGD participants

#	Start time	End time	Venue of the interview

Gender group: [ ] Men Only   [ ] Women Only   [ ] Mixed

How old are you?

What is your marital status?

What is your highest level of education attained?

What is your religion?

What is your occupation?

What is your level of income?

Understanding Community Knowledge and Perception of Hypertension

As we start, I would like us to talk about how men and women in this community understand high blood pressure and how they perceive its effects. *Probe for: beliefs about awareness, beliefs about treatment and control of high blood pressure, costs of hypertension, how they are treated by other community members/family.*

Understanding experiences of individuals with Hypertension

I would us to think of our experiences with hypertension and more so within this area. What is the life like for some with hypertension in this area? *Individually, can you tell me the duration you have had hypertension and how has your life been ever? What are the changes in your life occasioned by this illness?*

Understanding the Lifestyle and health behaviours of Hypertension Patients

How would describe the life of an individual with high blood pressure? *Probe for: Diet, tobacco use and alcohol consumption, fruit and vegetable intake, salt intake, physical activity, influence of urban lifestyle.*

Understanding of Enabling and treatment factors

Now lets us look at issues associated with your treatment and how that has been for you. Please tell me how your experience has been in accessing and using drugs that

you need*? Where were you getting the drugs? What were the costs of the drugs? The types of drugs used for treatment, adherence level, follow-ups for check-up from health care providers? What kind of support people receive in managing hypertension? What kind of messages do you receive from the clinicians? Are they sufficiently meeting your needs?*

Any other comment about our discussion?

We have come to end of our discussion.

Thank you for participating

Appendix VIII: Observation Checklist

Tick present/absent as observed and appropriate

Guidelines and availability of drugs	Present	Absent
Hypertension guidelines printed and available in the consultation room		
Hydrochlorothiazide Present at the Pharmacy		
Methyldopa Present at the Pharmacy		
Enalapril Present at the Pharmacy		
Nifedipine Present at the Pharmacy		
Atenolol Present at the Pharmacy		

Appendix IX: Study Area Map
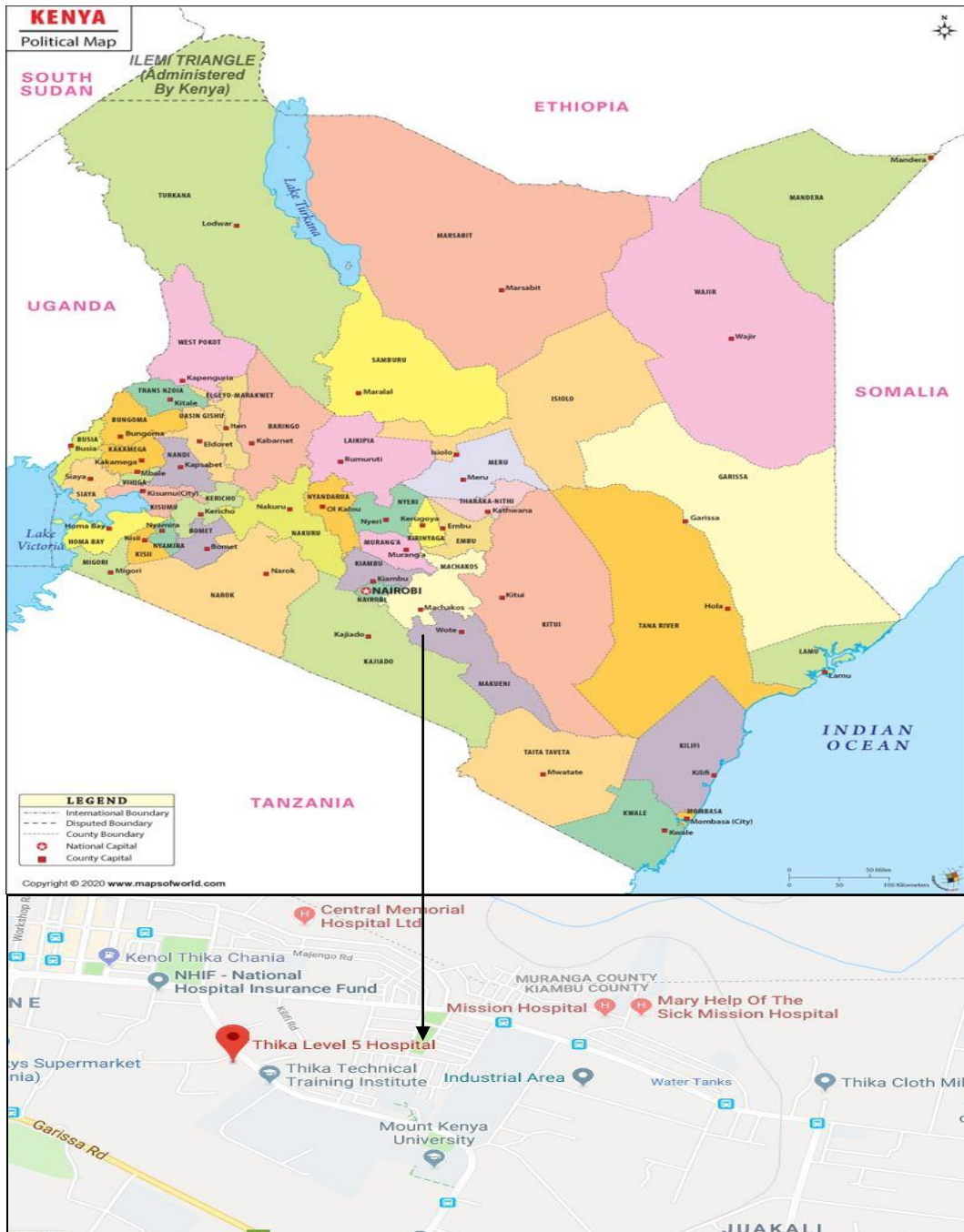
Ref: NatGeo (2018)

Appendix X: Regional Hypertension Prevalence in Kenya
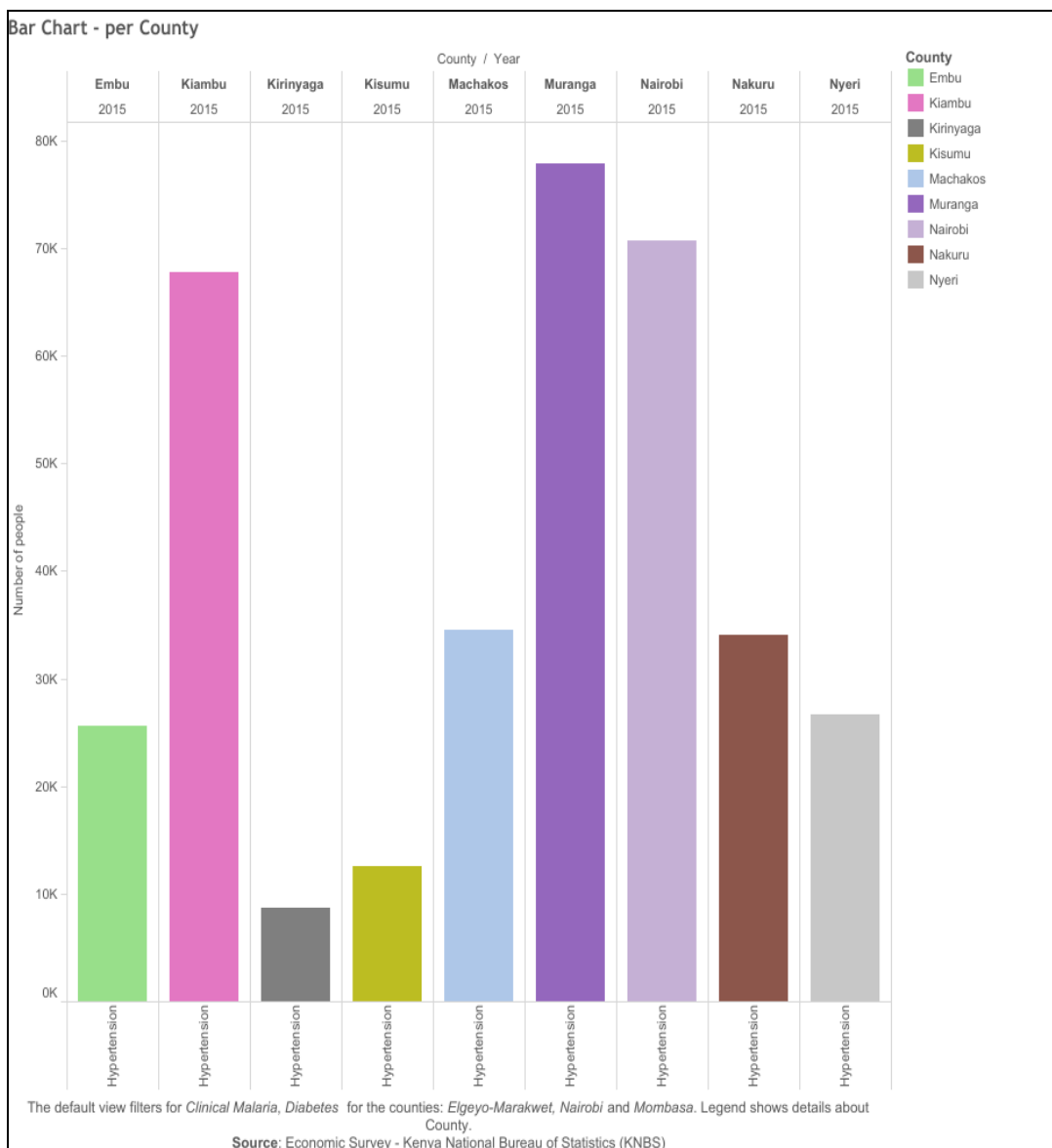
Source: (KNBS, 2016)

Appendix XI: Introductory letter to Thika level 5

COUNTY GOVERNMENT OF KIAMBU
DEPARTMENT OF HEALTH

Tel.Thika 067 21621/2 fax 21778
All correspondence should be addressed to
MED.SUPT.
When replying please quote

THIKA LEVEL 5 HOSPITAL
P.O. BOX 227
THIKA

Ref; NO. MOMS/TKA/ VOL. III (522)

Date: 10th January, 2019

APPROVAL TO CARRY OF RESEARCH

Principle investigator: GLADYS MONYENYE MAGARA

RE: FACTORS ASSOCIATED WITH BLOOD PRESSURE CONTROL AMONG ADULT
**HYPERTENSION PATIENTS ATTENDING MOPC AT THIKA LEVEL 5 HOSPITAL**

Following deliberations by Thika Level 5 hospital research committee, your proposal to carry out

the above research at this facility has been approved. However, you will need to provide us with

licence from NACOSTI before you can commence the data collection.

Take note that you are required to submit a copy of your research findings upon completion of

the study to the hospital. It is also expected that the Ethical consideration and the research

subjects confidentiality will be maintained as you have outlined in your proposal.

Any patient confidential information that you may access during your research should not be used

without consent.

This letter is valid up to 30th June, 2019.

For any queries feel free to contact the committee chair through the Medical Superintendent's

office. Thank you and all the best.

DR. J. WANGECHI
CHAIR TREC
THIKA LEVEL 5 HOSPITAL

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Appendix XII Ethical clearance

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/428

6th December   2018

Gladys Monyenye Magara
Reg. No.HSH311-2911/2016
School of Public Health
J.K.U.A.T

Dear Gladys

RESEARCH PROPOSAL – FACTORS ASSOCIATED WITH BLOOD PRESSURE CONTROL AMONG ADULT HYPERTENSIVE PATIENTS ATTENDING MEDICAL OUTPATIENT CLINIC, THIKA LEVEL 5 HOSPITAL, KENYA (P620/08/2018)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and approved your above research proposal. The approval period is 6th December 2018 – 5th December 2019.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
e) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
g) Submission of an executive summary report within 90 days upon completion of the study.
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

For more details consult the KNH- UoN ERC website http://www.erc.uonbi.ac.ke

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