DETERMINANTS OF COMPLIANCE TO PRESCRIBED ANTIHYPERTENSIVE THERAPY AMONG ADULT HYPERTENSIVE PATIENTS IN KILIFI COUNTY KENYA

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JULY, 2022

DECLARATION

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

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We confirm that the work reported in this thesis has been carried out by the candidate under our supervision as University Supervisors.

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DEDICATION

This research work is dedicated to my dear wife, Mercy, my sister Nancy and Okubo's family for their endless support and encouragement.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ACE	Angiotensin-converting enzyme inhibitors
AHA:	American Heart Association
ARB	Angiotensin II Receptor Blocker's
BP:	Blood pressure
CCB	Calcium Channel blockers
CDC:	Centre for Disease Control
CVD:	Cardiovascular Diseases
DBP:	Diastolic blood pressure
DHIS:	District Health Information system
HBM:	Health Belief Model
HCW:	Health Care Worker
HPT/HTN:	Hypertension
ISH:	International Society of Hypertension
KII:	Key informant interview
LMIC:	Low and Middle-Income Countries
MOH:	Ministry of Health
NCD:	Non-Communicable Diseases
SAP:	Systemic Arterial Pressure
SBP:	Systolic Blood pressure
SPSS:	Statistical Package for Social Sciences
SSA:	Sub Sahara Africa
WHO:	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Cardiovascular diseases (CVD): Diseases that affect the heart or blood vessels, making them narrow or block, leading to heart attack, angina (chest pain). Other heart conditions that affect heart valves, muscles, and rhythm are also type of heart disease (AHA, 2017)

Disability Adjusted Life Years:A measure of overall disease burden, expressed as the sum of years of life lost (YLL) due to premature death in population and years of life lost due to disability (YLD) or early death. I.e., DALY=YLL+YLD. (W.H.O 2015)

Health Seeking Behaviour: Any action carried out by a person who perceives herself/himself to be unwell or sick to get a proper cure (Musinguzi *et al*., 2018)

Hypertension: High arterial blood pressure indicated by a systolic blood pressure of 140mmHg or more or diastolic blood pressure of 90mmHg or more or on antihypertensive medications in adults 18 years and above (MOH, 2018)

Lifestyle modification:Eradicating old habits/behaviour that affects health and adapting new habits/behaviour change that improves health (W.H.O, 2017)

Medical Compliance:The degree to which a hypertensive patient therapy (medications and or lifestyles modifications) taking behaviour agrees with recommendations of a healthcare provider of dosing frequency and timing (Adidja *et al.,* 2018)

Medical Non-Compliance:The degree to which hypertensive patient therapy (medications and or lifestyles changes) taking behaviour

doesn't concur with health provider's medical advice (Bilal *et al.*, 2015)

Therapy: Treatment of diseases or disorders by some remedial, rehabilitating, or curative process

ABSTRACT

Hypertension/ High Blood Pressure is a condition that presents with elevated BP. Globally the overall prevalence of high BP is estimated to be 31%. Non-compliance to antihypertensive therapy is both public health and medical problem worldwide. Compliance to prescribed antihypertensive therapy is key in avoiding hypertension complications. This study aimed to evaluate the determinants of compliance to prescribed antihypertensive therapy among adults with hypertension condition in Kilifi County. A facility-based cross-sectional study was undertaken in four public health facilities in Kilifi County. Two hundred and thirteen patients were recruited in this study. Data was collected using a pretested questionnaire and analysed using Statistical Package for Social Sciences (SPSS) version 23. Chi-square test was utilized in establishing the associations between compliance to antihypertensive therapy and variables while logistic regression was adopted to determine independent risk factors of compliance. Compliance to antihypertensive therapy was recorded in 31(14.6%) of the hypertensive patients. A statistically significant association was established between compliance to antihypertensive therapy and patients' knowledge ($p<0.001$); age ($p=0.024$); education level ($p=0.05$); income ($p=0.013$); duration on treatment ($p=0.005$); cost ($p=0.029$); health care provider advises ($p=0.009$); consistency of therapy ($p=0.002$); availability of medicines ($p=0.021$); and health facility distance ($p=0.013$). Independent risk factors for compliance to antihypertensive therapy were duration on treatment (OR=0.383; 95% CI 0.151-0.972); Knowledge on hypertension (OR= 2.715; 95% CI 1.598-4.615); Consistency of therapy (OR= 0.452; 95% CI 0.282-0.726); and cost of medication (OR =2.682; 95% CI 1.134-6.345). Prescribed anti-hypertensive therapy compliance among patients was low. This could be attributed to factors such as social-demographic, patient, and health service-related in nature as demonstrated in this study. Prompt public health interventions that are patient-community centred are required to improve the compliance to antihypertensive therapy.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Hypertension (HTN), or High Blood Pressure (HBP), is a cardiovascular disease (CVD) characterized by raised arterial systolic BP of 140mmHg or more and diastolic of BP of 90 mmHg or more or, also taking antihypertensive therapy in subjects aged 18 and above (MOH, 2018). It is the main reason for coronary artery disease, ischaemic stroke, cardiovascular diseases, kidney failure, and retinopathies, whose consequences are significant infirmity and death globally (Agbor, 2018; WHO, 2019). In the world, it placed 3rd as a method of reduction in disability-adjusted life (DALY), and about 9.4 million premature mortalities occur each year due to hypertension (Sheppard-Law *et al.*, 2018). Of the mortalities, 50%, 55%, and 55% are because of ischemic stroke, ischemic heart condition, and other CVDs, respectively (Van Kleef & Spiering, 2017). The prevalence of HTN worldwide has increased to about 1.13 billion (31%) adults, two-thirds from in low middle income country (LMIC) (Mohamed *et al.*, 2018; W.H.O, 2019). There is a possibility that, by the end of the year 2025, 1.56 billion people worldwide will have hypertension condition (Cappucio, 2016).

An estimated 30 per cent male and 30 per cent of female adults are hypertensive in Brazil. More so, there is a high medical care burden due to hospital admission of patients with HTN related complications (Maano & Elina, 2017). Similarly, in Korea, 25 per cent of adults are hypertensive, making HTN a top common disease (Kim & Yu, 2017). Disease advancement and increase in HTN related complications mostly are a result of noncompliance to HTN medications. The recommended medications are Thiazide diuretic such as hydrochlorothiazide (HCTZ), Beta

Blockers (BB) such as Atenolol, Calcium Channel blockers (CCB) such as Amlodipine, Angiotensin-converting enzyme inhibitors (ACEI) such as Captopril, Angiotensin II receptor blocker (ARB) such as Losartan, Central acting agents such as Methyldopa, Alpha1 receptor blockers e, g prazosin, Vasodilators such as hydralazine, Potassium Sparing diuretics such as Amiloride (MOH, 2018). According to WHO, compliance with long-term medications for chronic conditions such as HTN is approximately 50percent and is lesser LMIC such as Kenya. In the UK, a study by Patel (2017) revealed noncompliance with HTN medicines of up to 41.6 per cent, whereas a similar study in the Czech Republic was 31.5 per cent.

Hypertension burden is highest in Sub Sahara Africa (SSA), with a prevalence of 27 per cent compared to other WHO regions (WHO, 2019). While in advanced countries burden of hypertension has dropped, in SSA, studies show escalating rates (Mohammed *et al.*, 2018). This has been ascribed to a rise in urbanization, the elderly population, westernization, dietary modifications, plus a slothful lifestyle (Girma, 2014; Sheppard-Law *et al*., 2018)). There is a substantial rise in medication noncompliance in Ghana and Nigeria, ranging from 17percent to 93percent, making it a challenge to compare the extent and predictors associated with medication noncompliance in both countries (Bello, 2017).

In Kenya, a national stepwise survey (2015) discovered HTN prevalence of about 24 per cent. Studies have established that early diagnosis, creating awareness, appropriate management, and control of HTN lessen disease and death due to HTN associated complications (Sodovsuren *et al*., 2018). However, the benefits of antihypertensive therapy are not achieved because a large section of patients does not conform to the prescription (Maano & Elina, 2017).

In haemodialysis patients, noncompliance with HTN medication has been the main obstacle in controlling BP (Sang *et al*., 2017). Disparately, a study by Namusonge (2018) established antihypertensive compliance to be as low as 3% to 7% among chronic kidney disease patients on dialysis. Stringent compliance to treatment regimes, lifestyle behaviour change, and consistent medical follow-up is vital in achieving optimum BP control (Kuria *et al.,* 2018). An optimal Bp is central in averting cardiovascular complications, hence improving health. (Agbor, 2018)

Poor compliance to antihypertensive therapy has been allied to the complex relationship of patient, patient-healthcare provider, healthcare system, and socioeconomic factors (Gelaw, 2014; Girma, 2014). This study, therefore, sought to establish factors that impact compliance to antihypertensive therapy among adult hypertensive patients in Kilifi County.

1.2 Statement of the Problem

In the last twenty years, the burden of hypertension and its related complications has escalated in Kenya (MOH, 2018). Approximately 100,000 thousand people succumb each year due to hypertension-related complications (Mbugua, 2018). According to the Kenya National Stepwise survey (2015), 18 per cent of adult populations are hypertensive; males bear the biggest brunt than females, with a prevalence of 25.1 per cent and 23.8 per cent, respectively. The study also establishes that 90 per cent of adult hypertensive patients in Kenya weren't on medication. More so, 22.3 per cent of those identified with hypertension were on treatment, while only 4.6 per cent of those on treatment, the BP were well controlled. Mohammed *et al.* (2018) discovered low treatment and low control levels of high BP, which has been ascribed to factors such as noncompliance to antihypertensive therapy.

In Kilifi County, 128,527 patients were on follow-up for hypertension, which equated to 43.2% rise in the cases (DHIS 2, 2019). The increased burden of hypertension and related complications in this county is compounded with other challenges such as poverty. The poverty index level in Kilifi County is about 46.4%, higher than the national level of 36.1% (KNBS, 2018). The Ministry of health policy for hypertension management is strict conformity to treatment schedule to achieve maximum drug effectiveness and BP control (MOH, 2018). In Malindi Sub County in Kilifi County, DHIS 2(2019) reported that 33,648 cases were on follow-up for hypertension in various health facilities. More so, the data revealed that about 21,856 (35.1%) of the total patients on follow-up had controlled blood pressure in the same period. Noncompliance with antihypertensive therapy is a significant contributor to uncontrolled Bp (Kazaure *et al*., 2017). Moreover, it has been attributed to an increase in CVD complications, progression of disease severity, high medical costs; compromise the quality of life, reducing productivity, and causing disability and avertable mortalities (Van kleef & Spiering, 2017).

Nonetheless, because of the effects of noncompliance to antihypertensive therapy and paucity of local literature, this study, therefore, seeks to address the knowledge gap on burden and determinants of compliance to antihypertensive therapy among adults' hypertensive patients in Kilifi County.

1.3 Justification of the Study

The WHO Global Non-Communicable Disease (NCD) Action plan for hypertension aims to reduce hypertension by 25% by 2025(WHO, 2016). Prescribed antihypertensive medicines and recommended healthy lifestyle behaviours are the mainstays of management and control of high Bp. Different reported studies have

revealed the advantages of complying with these treatments on improved health status. Therefore, complying with this treatment is of utmost importance in attaining optimal Bp and averts CVD problems such as ischemic cardiac disease, stroke, renal failure, retinopathies, and mortalities, consequently improve quality of life & reduce medical costs. Improving prescribed antihypertensive therapy compliance is vital in ameliorating adverse health outcomes in hypertensive patients. Also, understanding the predictors of compliance to antihypertensive therapy in adult patients in Kilifi County is critical in guiding policymakers to develop effective interventions early. Therefore, these studies assess the determinants and prevalence of compliance to antihypertensive therapy among adult hypertensive patients in Kilifi County. This data will assist in planning for effective strategies on management and control of HTN, which will improve compliance and improve health outcomes and increase the productivity of people.

1.4 Research Questions

i. What proportion of adult hypertensive patients are compliant to prescribed antihypertensive therapy in Kilifi County?
ii. What are the social-demographic characteristics of adult hypertensive patients in Kilifi County?
iii. What is the level of knowledge on hypertension among adult hypertensive patients in Kilifi County?
iv. Which health service-related factors influence compliance to prescribed antihypertensive therapy among adult hypertensive patients in Kilifi County?

1.5 Null Hypothesis

H01: There is no significant relationship between social-demographic factors and compliance to prescribed antihypertensive therapy

H02: There is no significant relationship between level of knowledge on hypertension and compliance to prescribed antihypertensive therapy.

H03: There is no significant relationship between health service-related factors and compliance to prescribed antihypertensive therapy

1.6 Objectives of the Study

1.6.1 Broad Objective

The broad objective of this study was to establish the determinants of compliance to antihypertensive therapy among adult hypertensive patients in Kilifi County.

1.6.2 Specific Objectives

The study-specific objectives were:

i. To determine the proportion of patient's compliant to prescribed antihypertensive therapy among adult hypertensive patients in Kilifi County, Kenya
ii. To establish socio-demographic factors that influence compliance to prescribed antihypertensive therapy among adult hypertensive patients in Kilifi County, Kenya
iii. To assess the level of knowledge on hypertension among adult hypertensive patients in Kilifi County, Kenya

iv. To determine health service-related factors that influence compliance to prescribed antihypertensive therapy among adult hypertensive patients in Kilifi County, Kenya

1.7 Significance of the Study

The outcome of this study will be helpful to healthcare providers, health facilities, and policymakers to comprehend factors associated with compliance to high BP therapy. This will enable them to improve the management of HTN, which are both pharmacologically and lifestyle modification interventions. Kilifi County Government will benefit from the knowledge created, design, and tailor strategies to improve compliance and reduce morbidity and mortality from HTN related complications. It will help other researchers interested in the related field since no specific report has been published in Kilifi County on this study. Finally, this study will guide the policymakers in developing policies and guidelines on improving HTN management and awareness.

1.8 Limitation and Delimitation

1.8.1 Limitation of the Study

The information by the respondents was not precise because of recall bias. Respondents tend to overestimate the compliance level since it was not possible to substantiate. However, the research assistants were trained on face-to-face interviews and filling a questionnaire to address this gap.

1.8.2 Delimitations of the Study

The study was limited to selected public health facilities in medical outpatient clinics in Kilifi County. Therefore, the scope was limited and hence affected the general

representation of the study. However, the study took place in a major referral hospital (level 4) and health centres where a large number of patients are treated; hence good representation

1.9 Theoretical Framework

1.9.1 Health Belief Model (HBM)

The HBM was established and by Rosen lock (1966) and Berker, 1974). It helps appreciate the operation and consumption of health care services and envisage response from health matters and health-seeking behaviour. It describes how an individual can behave in a situation of health problems and why certain info is not efficient in influencing the behaviours in health-seeking. The model has six variables, which describe the actions in illness. These are:

Perceived susceptibility of High Bp; this indicates a person's assessment of the threat of acquiring HBP. A person's belief that hypertension is individually important; will compel him/her to take a vital step to avert the condition. Such as exercising, reduce alcohol consumption; stop cigarette smoking, among others.

Perceived severity; is an individual belief of the gravity of HBP and its adverse effects on health. It can cause stroke, heart attack, kidney let-down, or even death.

Perceived benefits of hypertension therapy; this states the importance of action taking such as benefits of not cigarette smoking, reduce sedentary lifestyle, compliance to drugs and avoid alcohol abuse to prevent HTN and its complications, reduce medical costs and improve quality of life

Perceived barriers to complying with hypertension therapy: Is a personal assessment of factors propelling the acceptance of the expected conduct. The factors

may be financial, physical, and psychological demands. The patient may believe drugs are expensive (barrier) but realize without them, he/she might not be able to work and hence makes some effort to procure them.

Cues to Action: These are actions or experiences (personal and bodily symptoms of HTN or environmental) that inspire an individual to take the necessary actions after trusting that they can do so, such as conform to prescription, among others.

Self-efficacy: Self-confidence in one's capability to take necessary health action such as conforming to medication therapy, following up on HTN medical clinic, improving lifestyle activities, etc.

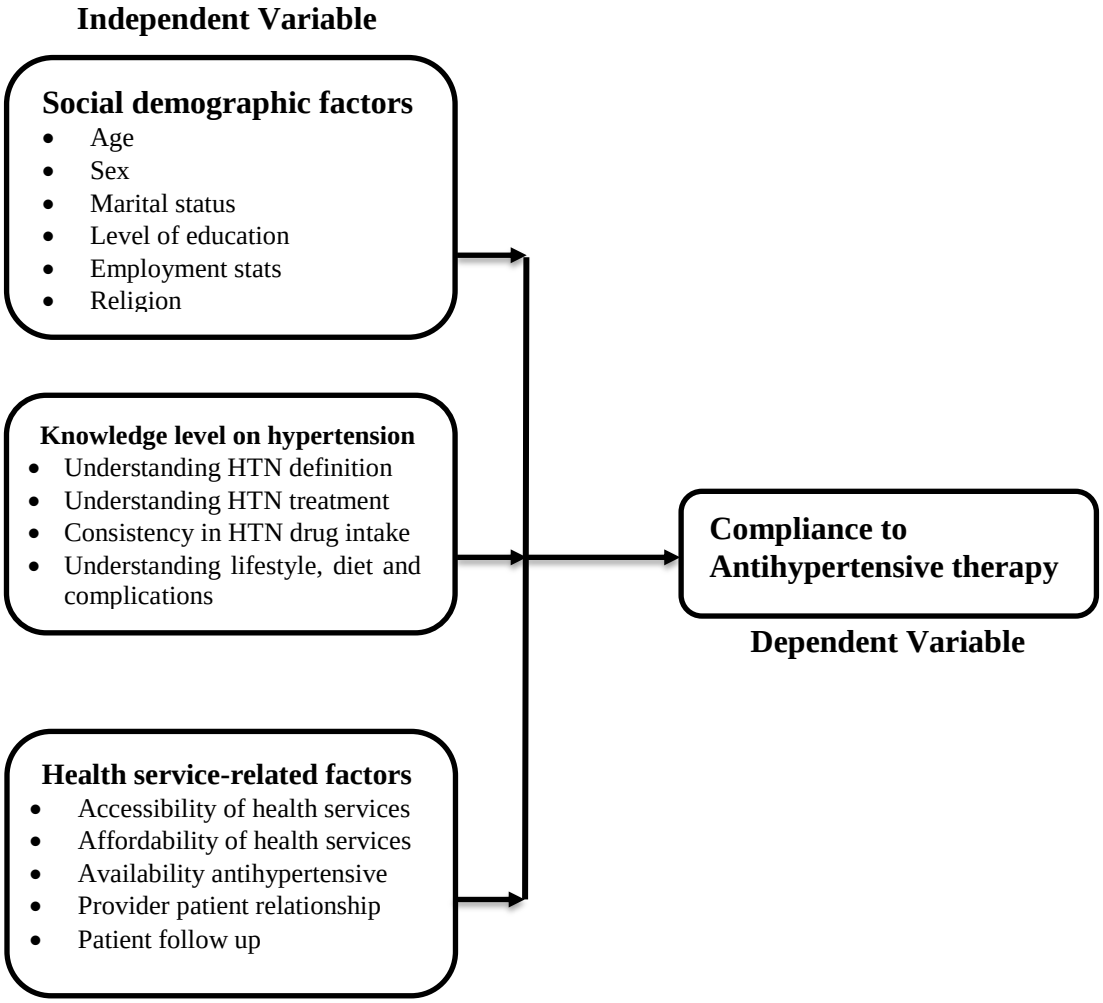

Figure 1.1: Conceptual Framework

Source: Conceptual Framework adapted and modified from Literature review.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Hypertension (HTN)/ high blood pressure (HBP) is characterized by high systolic BP (140mmHg or more) and diastolic BP (90mmHg or more) also using antihypertensive as reported (MOH, 2018: WHO,2019). WHO describes HTN as continuous blood pressure with extreme force against arterial walls as it flows in the human body system.

Table 2.1: Classification of Blood Pressure in adults

Blood pressure category	Systolic mmHg	Diastolic mmHg
Optimal	<120	< 80
Normal	120-129	80-84
High normal	130-139	85-89
Grade 1 HTN(Mild)	140-159	90-99
Grade 2 HTN(Moderate)	160-179	100-109
Grade 3 HTN (severe)	≥180	≥110
Isolated systolic HTN	≥140	>90

Source: - Adapted from ESH/ISH guidelines

High BP affects about 40 per cent of the adult populace worldwide, making it a primary public health problem (Awino *et al.*, 2016). Additionally, hypertension accounts for about 9.4 million deaths annually, with SSA having the highest prevalence rate of 27 per cent in the region (WHO, 2019). Similarly, in Kenya, about 25percent of patients hospitalized have NCDs, HTN included, and 13 per cent of deaths are because of CVD (MOH, 2015).

Hypertension is categorized as essential /primary and secondary (Awino *et al.*, 2016). The main modifiable risk aspect for CVDs is primary HTN. It accounts for over 95 per cent of all HTN cases, and it has no discernible aetiology, but attributed

to genetic aspects, obesity, slothful lifestyle (poor diet, physical idleness, high alcohol consumption, tobacco ingestion, high sodium intake, stress, and aging (MOH, 2016)

Secondary HTN accounts for 5 per cent of the rise in BP cases. The aetiology is known, such as underlying medical condition: kidney diseases, disorders of the endocrine system, drugs like steroids and oral contraceptives (MOH, 2018)

2.2 Hypertension Evaluation, diagnosis, and Management

This entails BP measurement, clinical history, physical assessment, assessment of CVD risk, Lab investigations, and further tests when needed (Whelton *etal.*, 2018). HTN diagnosis is made correctly by using a syphgnomometer device. The BP readings can be measured in the clinic/office or out of the office (ambulatory). The average of 2 or more DBP readings on at least two consequent visits is high or equal to 90mmHg, or multiple SBP normal measurements on two or more successive visits is more or equal to 140 mmHg. (MOH, 2018). Required investigations for hypertensive patients are Urine dip stick for blood, Fasting Blood glucose, Serum urea, electrolytes, creatinine, 12 Lead Electrocardiograph (ECG) for detecting atrial fibrillation, Cardiomegaly and Ischaemic heart disease, Carotid ultrasound, Renal function tests, and Liver function tests.

2.3 Healthy Lifestyle modification/non-pharmacologic treatment

Healthy lifestyle behaviours are recommended for all patients with or without High BP and irrespective of treatment (Whelton *etal*.,2018). According to WHO, hypertension is preventable by implementing lifestyle changes at early stages. Healthy lifestyle modification selections can be related to reducing high BP and preventing CVD complications and absolute mortality. It is the first-line treatment

for high blood pressure. Healthy lifestyle adoption reduces the dose and number of antihypertensive drugs required.

2.3.1 Healthy Lifestyle Behaviour

Limit alcohol use; Research has shown, too much alcohol is associated with high BP, the prevalence of high BP cardiovascular risk (Roerecke *et al*., 2017). The advised limit for alcohol drink daily is two standard drinks (10g alcohol/standard drink) and 1.5 for men and women, respectively.

Avoid tobacco use. Encourage referral cessation programs for smoking; Tobacco smoking is the main risk aspect for heart diseases and ischaemic stroke.

Physical exercise; Adults should practice physical activity for 30mins daily. Regular aerobic and resistance activity are of help in the prevention and treatment of hypertension (Casonatto *et al*., 2016)

Healthy diet consumption; Consisting of fresh fruits, vegetables, polysaturated fats, and a balanced diet. Vegetable high in nitrates is known to reduce BP.

Limit sodium consumption by decreasing the amount of salt added to food. There is significant evidence of salt consumption and elevated BP.

Limit consumption of food with high saturated fats

Regular check-up of BP often BP has no symptoms

Prevent and treat other medical conditions such as Diabetes. Approx. 60% of individual with D.M has hypertension (WHO, 2016; MOH, 2016)

2.3.2 Pharmacological management

It is difficult to control high Bp with lifestyle modification alone. An antihypertensive drug is used to complement lifestyle modification. Approximately 50-70% of hypertensive patients will not achieve optimal BP target with monotherapy, hence duo therapy (at least two different antihypertensive from different classes are needed to control BP (MOH, 2018). Table 2.2 below shows some antihypertensive drugs.

Table 2.2: Antihypertensive medicines and their common characteristics

SN	Class	Examples	Common side effects
1	Thiazide diuretic	hydrochlorothiazide (HCTZ)	Hypokalaemia, rash, Hyperuricaemia, Hyperglycaemia
2	Thiazide like diuretic	Indapamide	
3	ACE inhibitor	Captopril, Enalapril	Cough (ACEI), Hyperkalaemia
4	Beta-Blockers	Atenolol, carvedilol	Decreased sexual function, reduced exercise tolerance
5	ARB	Losartan, Valsartan	Anaemia, cough, headache
6	Long-acting CCB	Nifedipine, Amlodipine	Peripheral-oedema, Hypotension, sleep disturbance
7	Central acting agents	Methyldopa	Weight gain, peripheral oedema, headache
ACE= Angiotensin-converting enzyme inhibitors= Angiotensin II Receptor Blocker's= Calcium Channel blockers			

Source: MOH (2018)

Some of the factors considered when prescribing antihypertensive agents are patients' age, comorbidities or end-organ failure, the possibility of drug interaction, the implication of compliance, cost of the agent, and sometimes patients preferred choice.

2.4 Antihypertensive therapy and compliance

Noncompliance with antihypertensive therapy is a global burden and is the major problem for effective hypertension management. Equally good compliance with

antihypertensive medication improves HTN management and averts cardiovascular complications such as heart failure, cerebral vascular accidents, aneurysm, and coronary heart disease (Adidja *et al.*, 2018). According to Peacock & Krousel-wood (2017), adults who comply with medications for chronic conditions such as HTN are about 50% globally.

By definition, compliance is the degree to which a patient's behaviour taking on therapy (drugs, diet, and lifestyle modification) agrees with health provider recommendations (WHO). On the contrary, noncompliance is the level by which hypertensive patient actions do not agree with medical/health prescription (Bilal *et a. l.*, 2015). Noncompliance to antihypertensive therapy affects about 10-80% of the patients and is its key contributor to uncontrolled BP (Tomaszewsk *et al*., 2014). A systemic and meta-analysis review study by Abegaz *et al.* (2017) revealed noncompliance of 45.2% among respondents. In a similar study by Tibebu & Mengistu (2017) involving 404 participants, 33.2% of respondents were non-compliant with the therapy. The cause of noncompliance is multifactorial and includes causes such as patient-related, drug therapy, social-economic status, health system, and the disease.

2.5 Social, demographic, and cultural factors affecting the compliance of antihypertensive therapy

Social factors influence health outcomes both positively and undesirably. It increases the patient compliance to the prescribed treatment and their insight of the quality of life, enabling better access and utilization of health services (Danushka & Delgahagoda, 2018). The delivery of care from practical, un-dimensional, and emotional perceptions has a more significant influence on patient's compliance with

therapy (Chand, 2017). This is from studies conducted in western populace's cultural matters, religion alignment, and the apparent importance of social support may have differed from the Kenyan population.

Ethnicity also is another factor contributing to patient noncompliance with hypertension therapy. In India, the Chinese and Malay are two times than the Indians to comply with medicine. Since Malay and English is the communal language used in the Indian clinics, the language barrier could be the main factor of noncompliance and inadequate understanding of the condition and treatment among this population (Sodovsuren *et al*., 2018). However, the Maly and Chines cultures are much different from the Mijikenda, the populous tribes in Kilifi County. Therefore, the findings from India cannot be generalized or applied in Kilifi County.

According to a study by Hawrami & Abdulla (2016), a young person showed poor compliance (5.2%) with medications than older people (50.8%). Furthermore, the noncompliance rate was high in illiterate (28.2%) than those who were more than secondary level (9.2%). A study in Indian clinics showed that the language barrier could significantly contribute to noncompliance and insufficient knowledge of the illness and treatment in this population (Sodovsure *et al.,* 2018).

Culture is understood through analysing values displayed in people's behaviours based on assumptions and beliefs of its associates (Kara kaya *et al.,* 2016). This has contributed to different cultural and religious theories that have affected social care and medicine compliance (Risenga, 2017). The major faiths are Christianity, Islam, and Buddhism, which have a powerful depiction. There is a close relationship between faith and race. Religion can empower an individual to attach to society and a higher force, leading to psychological firmness. There is increasing interest in the

association between health and religion (Danushka & Delgahagoda, 2018). A study done in Uganda showed medication adherence was linked to religious activities. Patients who had higher faith notches have better compliance to antiretroviral therapy

2.6 Compliance level to hypertension medications

According to a study by Sumatra (2015), noncompliance with antihypertensive medication is regular in Egypt. It found that out of 149 high BP patients, forty-two per cent of them were non-compliant. Non-compliance is taking prescribed high BP medications, which is less than eighty per cent. In another finding by D'Albini *et al.* (2015), in Ghana, a study performed on serum and urine specimens from 1348 hypertensive patients established a complete and partial noncompliance range of 27% and 20% and from 12% to 14 % separately in the two countries. The compliance rate was low among younger male patients and those taking more than one high bp medication or prescribed diuretics (Ghembaza *et al*., 2014). The studies were carried out in Egypt and Ghana, respectively.

A study was done in Nigeria; of 185 patients admitted for surgery, 51 had a high BP or high BP history. The findings showed that 8 had stopped the medication, giving a prevalence of noncompliance of 31%. This study illustrates another aspect of poor compliance (Mateti *et al*., 2018). However, it is worth noting that compliance also varies according to incentive and the ability to pay for care.

2.7 Knowledge level and compliance to antihypertensive therapy

Improving knowledge on the high BP or treatment regimens leads to better compliance with therapy. Good knowledge of HTN and health awareness and

medications has been related to better compliance with medication treatment in numerous studies. It's known that strengthening patients' knowledge of their condition and the drugs prescribed leads to better compliance (Tziomalos, 2013). Involving patients in their treatments by informing them often empowers them to be extra careful about their wellbeing. This can be realized by further patient counselling and strengthening the health care provider-patient relationship. A lot of achievement is possible in primary health care by training and mobilizing the HCW (Karakaya, 2016). A study by Ruowen & Yu (2018) displays a vital relationship between high BP patients' education and hypertension control. The more advanced in education level, the better compliance proportion among high BP patients. Equally, a study by CHPSNE established lower control rates of hypertension among persons with lower education. Kara kaya (2016) disclosed reasonable magnitudes of knowledge on hypertension among participants. The dissimilarity might be because of the large proportion of ignorant respondents living in villages. According to Tocci *et al*. (2018), general knowledge performance in high BP patients was not good.

Additionally, uncontrolled high BP rates were significantly small. The lowest scores were found to question the importance of systolic versus diastolic BP, high blood pressure having no symptoms, and being an inevitable part of aging. This recommends that thorough knowledge about illness is needed, and education alone may not serve (Kamba & Wei, 2016).

Factors related to knowledge cuts were male gender, having uncontrolled BP, and ethnicity. Having formal education was not associated with knowledge among these hypertensive patients. This proposes that precise knowledge about illness is needed, and education alone may not be sufficient (Kamba & Wei, 2016).

Lack of correct information, knowledge and inappropriate understanding among high BP patients is unknown to rural sites. This has been extensively stated in urban environments and developed countries (Nybo & Skov, 2016). Studies conducted in Iran revealed poor knowledge, low levels of management, and control of hypertension. In Isfahan healthy cardiac program, comprehensive self-care programs strengthen knowledge, attitude, and treatment among patients with high BP. Another study by Tsega *et al.* (2015) stated treatment and control of hypertension as 33.35 and 35.10 percent.

According to Tocci *et al*. (2018), less than seventy 75% of patients taking hypertension medications stop taking them six months after commencement. This is related to an increased risk of cardio cerebral vascular complications, hospital admissions, and increased costs. A study by Síma & Slanar (2019) in European cardiac patients showed that knowledge about optimum BP among high BP patients is unsatisfactory. A similar study in the USA concluded that setting a BP target may encourage HTN self-management in high-risk patients. This plainly shows that apart from lack of proper health education, there seems to be a lack of knowledge transfer by HCWs to high patients and necessitates investigation. The role of HCWs has been evaluated in numerous studies in relation to the lack of knowledge and practice of treating hypertension (Mangileva, 2016).

Another finding by Kjeldsen & Os (2014) demonstrated that older patients have less knowledge of medicine. There is a significant affiliation between education and knowledge. Having education improves knowledge on hypertension among HTN patients. Poor knowledge on hypertension is related to old age, low levels of

education, and low income (Hegedüs & Kozel, 2014). However, the study didn't recommend such as education materials, screening, and reliability of health team.

2.8 Health service-related factors influencing compliance to antihypertensive therapy

Research carried out by Sodovsuren *et al.* (2018), a poor health care system can also affect a patient's compliance. If an HCW has poor communication skills, the patient may not fully understand how to follow the doctor's orders correctly or understand how vital the prescribed medical plan is. All doctors should work to have a strong doctor-patient relationship and educate their patients. Patient displeasure with the HCW, lack of good relationship between the doctor and the patient, long waiting periods to get appointments amplifies the risk of disobedience (Ghembaza *et al*., 2014). Patients are non-compliant on their own because of a lack of awareness of the nature of illness and its treatment, because of the inadequacy of the health service, or because the HCW is not aware of the need for long-term treatment (D'Albini *et al*., 2015).

Patient displeasure with the healthcare provider, poor HCW-patient affiliation, extended waiting periods to get scheduled appointments increase the danger of non-compliance. Multiple drug therapy and multiple frequencies of dosing also increase the risk of non-compliance. The absence of a patient-friendly, flexible health care system has also been identified as the primary reason for non-compliance (Ghembaza *et al.*, 2014).

Noncompliance has been linked to poor understanding of the disease, seeming health improvement, deteriorating health, general dissatisfaction with medications, and worry over side effects. Many patients stopped taking medicines to lessen side effects are practical (Danushka & Delgahagoda, 2018). The majority of symptomless patients who do not feel

sick may encourage noncompliance. Side effects may be improper in an asymptomatic illness. The number of drug doses prescribed may also impact compliance, with a decrease in compliance as the regime becomes more multifaceted (Ruowen & Yu, 2018). However, only these alone cannot provide a full description of patients' choices and behaviour. The current study seeks to add more insights on the factors on non-compliance

2.9 Summary of Literature review and Research Gaps

From the literature, Ruowen & Yu (2018) urges that uncontrolled BP led to severe effects, including increased morbidity and mortality rates and leading to a significant increase in health care burden. Compliance with medication is an important feature that can have a consequence on blood pressure control. Danushka & Delgahagoda (2018) observed that even a slight improvement in compliance could significantly show good progress in blood pressure control. Its positive BP result in patients' mortality, morbidity, and medical care costs to the nation. He observes that tailor-made strategies and programs ought to be planned accordingly to correct the existing state. However, from the reviewed literature above, the studies did not explain non-compliance and how to be followed to improve compliance. Thus, the current study aims at filling this gap by giving recommendations.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Research Design

This study was conducted in the health facilities for a period of four months. Across-sectional analytical study design was undertaken between march 2020 and June 2020. Both quantitative and qualitative approaches were used to assess determinants of compliance to antihypertensive therapy among adult hypertensive patients. This design was chosen because the study intended to analyse hypertensive patient's proportion of compliance, social demographics, knowledge, and health service-related factors at a single point in time. Furthermore, it is an efficient and cost-effective design.

3.2 Study Variables

3.2.1 Independent Variables

The independent variables were socio-demographic factors such as gender, age, income, level of education, and religion. Variables related to medical characteristics such as blood pressure level, duration since hypertension was diagnosed, and Kinds of hypertensive drugs. Variables on knowledge level on the treatment of HTN, drug compliance, lifestyle modification, and complications. Another variable was health service-related factors such as drug availability, affordability, HCW-patient relationship, and access to health facilities.

3.2.2 Dependent variable

The dependent variable was compliance with antihypertensive therapy. Patients were considered compliant if they completed more than 80% of prescribed therapy.

3.3 Location of study

This study was conducted in selected public health facilities in Kilifi County, which included Malindi Sub County Hospital & 3 health centres in Malindi Sub County. Malindi is situated 120 km northeast of Mombasa. Malindi Sub County Hospital is in shella ward, and it is a tier 3/level 4 facility. Level 4 hospitals offer a wide range of health care services and are adequately equipped with diverse cadres of medical professionals. It is the only referral hospital in this region receiving referred patients as far as Tana River County. Here, hypertensive patients get various health services, including diagnostics, treatment, and health education, followed by specialized clinics. The three health centres included Muyeye, Gongoni, and Marereni Health Canters. These facilities have high workloads from patients who seek health services regularly. Malindi Sub County is a cosmopolitan place with several Kenyan communities represented, although dominated by Mijikenda, which gives a better depiction of people's knowledge and beliefs.

3.4 Study Population

This study targeted adult hypertensive patients, both male and female above age 18, with confirmed diagnosis of HTN and on follow-up for treatment in medical outpatient clinics.

Key Informant Interview participants were selected health care providers in these selected health facilities. They included nurses, clinical officers, medical officers, pharmacists, and nutritionists.

3.4.1 Inclusion criteria

Adult hypertensive patients who were 18 years old diagnosed with hypertension and follow-up treatment for more than six months, because various studies conducted on medications compliance showed period of more than six months as adequate time to assess compliance. More so key informants who had worked for more than one year in medical outpatient clinics were included in the study after consenting.

3.4.2 Exclusion criteria

Critically ill hypertensive patients who could not comprehend, and patients who declined to consent were excluded.

3.5 Sampling Technique and sample size

3.5.1 Sampling Technique

The study was conducted in four (4) selected public health facilities within Kilifi County. Purposive sampling was deployed in the selection of Kilifi County one of the counties that has recorded increased hypertension cases and related complications recently according to District Health Information System 2(DHIS2) of 2019.Simple random sampling was employed in selecting Malindi Sub- County and health centres in the sub county. The estimated number of hypertensive patients was 401 in a month in the four health facilities (DHIS 2,

2019). The total sample of 216 was proportionally allocated to the four health facilities as shown in Table 3.1. Systematic random sampling was used to select consenting participants. Medical workers were chosen purposively basing on their knowledge and experience in managing hypertensive patients in medical outpatient clinics. These respondents were Nurses, Clinical officers, Nutritionist Medical officers, and Pharmacists

3.5.2 Sample size determination

The sample size was determined by applying the formula for cross-sectional studies for estimating sample size by Cochran's (1977) formula**:** $\boldsymbol{n} = \frac{Z^2 p(1-p)}{d^2}$

Where:

n =denotes the expected sample size (since the target population is above 10,000),

Z= standard normal deviate at a 95% confidence interval that corresponds to a 1.96 confidence level.

P= denotes the proportion of the compliance to antihypertensive therapy (In this case, p=50%, because the prevalence of compliance to antihypertensive therapy in Malindi Sub County was unknown.

q= (1-p), 1-0.5=0.5

d=is the desired level of precision (acceptable degree of error). It was assumed at 5%. Therefore**:** $\boldsymbol{n} = \frac{1.96 \times 1.96.0.5(1-0.5)}{0.05 \times 0.05} = \mathbf{384}$

Since the estimated total population (N) was below 10,000, on average, **401** hypertensive clients receive health care service in these selected facilities monthly (DHIS 2, 2019). The sample size was revised by formula: $\boldsymbol{nf} = \frac{n}{1+\frac{n-1}{N}}$

Where:

n f= is desired sample size (where the population is below 10,000),

n= desired sample size (when population is above 10,000)

N=approximation of population **(**population of hypertensive clients)

Therefore; $\boldsymbol{nf} = \frac{384}{1+\frac{384-1}{401}}$ = **196**

The required sample size for the study was **196**. To cover for non-responsive proportion, the sample size was positively adjusted by 10% (Mesa, 2016). Therefore, it came to **216** respondents. **10** respondents were interviewed for key informant interviews.4 from Malindi sub-county hospital and two from each health Centre.

3.5.3 Sample Frame

In this study, four selected public health facilities were used as the sampling frame. Table 3.1 below demonstrates the study population (hypertensive patients) visa vies the health facilities and the sample chosen using probability proportionate to size.

Table 3.1: Sample Frame

	Name of Health Facility	**Average Number of adult hypertensive patients attending medical outpatient clinics**	**No. of adult hypertensive patients Sampled**
1	Malindi Sub County Hospital	128	69
2	Muyeye Health Centre	96	52
3	Gongoni Health Centre	91	49
4	Marereni Health Centre	86	46
	TOTAL	**401**	**216**

Source: DHIS 2, 2019

3.6 Research instruments

Structured pretested questionnaires were used for data collection, following the objectives of this research. It is comprised of four parts (1, 2, 3, and 4). Part 1 consisted of 13 questions associated with demographics characteristics and general clinical information of the respondent. Part 2 comprised of 8 questions associated with medication adherence behaviour. These were adapted from validated 8item Mo risky Medical Adherence scale (Plakas *et al.,* 2016) and 5 Likert scale questions on recommended lifestyle modification. Part 3 comprised 30 questions related to knowledge on hypertension adapted and modified from the hypertension Knowledge level Scale (HKLS). (Jankowska *et al.*, 2016). Part 4 comprised of 12 questions that dealt with respondents' health service-related factors.

Blood Pressure was measured by use a digital BP machine. Two BP readings were taken at an interval of 5minutes apart while the patient was seated. The average was calculated and entered into the tool. The researcher administered key informant interviews tool was used for health care providers.

3.7 Pre-testing of Instruments

The pretesting of research tools was carried out in Ngao sub-county Hospital Tana River County. This involved 10 % (23 participants) of study sample patients and health care providers to test significance, completeness, and simplicity of data collection. This helped the final questionnaire and KII be refined in terms of the content, structure, and clarity to increase the sample rate. The researcher assistants administered this tool.

3.7.1 Validity of Research Instruments

Validity is how accurate the assertions and proposals made in a research study are (Salimi & Ferguson, 2017). Well-designed research tools were used. The clarity of the items and language level was checked to ensure construct validity. This was done using English and Kiswahili structured questionnaires. The accuracy of the research tool was checked by pretesting. Face validity was ensured by subjecting the questionnaire and KII to my university supervisors for review.

3.7.2 Reliability of Research Instruments

Reliability is the level to which equal consistent outcomes are achieved by measurement (Bolarinmwa, 2015). This was done during the pretesting to guarantee the reliability and consistency of the questionnaire. Enumerators were selected and trained for one day for them to understand the questions and content. Twenty-two participants were pre-tested by the test re-test method. The questionnaires were administered to the same respondents with a different timeline of one week apart. The correlation coefficient was determined on 2 sets of outcomes, and the correlation coefficient of 0.81 (Cronbach Alpha Score) was satisfactory.

3.8 Data Collection Technique

Data collection was based on exit interviews. The process was preceded by recruitment and training of 4 enumerators on the objectives of the research and data collection. These research assistants were the nurses, pharmacists, and clinicians available for the data collection period and also the principal researcher. We administered the structured pre-tested questionnaire through one-face interviews after successful recruitment of respondents

3.9 Data Analysis

At the end of field work, quantitative data was cleaned, edited, coded, and processed using the Statistical Package for Social Sciences (SPSS) software version 23. Descriptive statistics were used to summarize data such as frequencies by use, graphs, pie charts, and frequency tables. The relationship between selected variables was tested using the chi-square test. Questionnaires generated both qualitative and quantitative data. Qualitative data were organized and analysed thematically based on the objective of the study. Logistic regression was used to predict outcome variables. The data was then summarized, findings discussed, conclusions are drawn, recommendations for the study, and further research suggested.

3.10 Logistical and Ethical considerations

Prior to data collection, approval to do the study was obtained from Graduate School Kenyatta University and Kenyatta University Ethics and Review Committee (KUERC) gave clearance. Permission to visit study sites was obtained from National Commission for Science Technology and Innovation (NACOSTI) and Kilifi County Government allowed data collection from selected public health facilities in the county. Participants were briefed on the objectives and procedures of the study. Participation was through informed consent, while adhering to the principles of confidentiality and anonymity throughout the entire period

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter highlights the findings on the determinants of compliance to antihypertensive therapy in Kilifi County. This is based on the data collected from the respondents.

4.1.1 Return Rate

The study targeted 216 hypertensive participants and medical workers from 1 level 4 hospital and 3 level three health facilities within Kilifi County. Out of which, 213 hypertensive patients were interviewed. All 10 healthcare workers were interviewed hence achieved a return rate of 98.7%. According to Mugenda (2003), a return rate of 70% and above is considered appropriate. This summarized in table 4.1

Table 4.1: Return Rate

	Name of Health Facility	Target Sample	Respondents	Return Rate
1	Malindi Sub County Hospital	69	68	31.4
2	Muyeye Health Centre	52	52	24
3	Gongoni Health Centre	49	48	22
4	Marereni Health Centre	46	45	21.3
	TOTAL	**216**	**213**	**98.7**

4.2 Social Demographics characteristics of hypertensive patients

Table 4.2 below shows that majority 98(46%) of the patients were above 59years with a high proportion being women 137(64.3%). Similarly majority 139 (65.3%)

were married and Christians constituted the majority 179 (84.0%). slightly over a half 124(58.2%) had formal education and self-employed 92(43.2%). The majority, 139 (65.3%) of the patients, were low-income earners with an estimated monthly income of less than Kshs 5,000

Table 4.2: Social Demographics features of hypertensive patients (N=213)

Variable	Categories	Frequency	Percentage
Age groups	18-28	9	4.2
	29-38	13	6.1
	39-48	28	13.1
	49-58	65	30.5
	>59years	98	`46.0
Gender	Male	76	35.7
	Female	137	64.3
Marital Status	Married	139	65.3
	Single	12	5.6
	Separated/Divorced	14	6.6
	Widowed	48	22.5
Religion	Muslim	28	13.1
	Christian	179	84.0
	Others	6	2.8
Highest level of Education	No formal education	89	41.8
	Primary	85	39.9
	Secondary	31	14.6
	Tertiary	8	3.8
Occupation	Student	2	0.9
	Employed	45	21.1
	Self Employed	92	43.2
	Unemployed	74	34.7
Income (Kshs)	Low income (<5000)	139	65.3
	Lower middle income (5000-10000)	35	16.4
	Upper middle income (11000-20000)	28	13.1
	High income (≥20,000)	11	5.2

Kshs=Kenya Shillings

4.3 Antihypertensive compliance levels

4.3.1 Proportion of Antihypertensive medication compliance

The study desired to find out the proportion of patients who were compliant with antihypertensive medication.

Figure 4.1 depicts that 67(31.5%) of the respondents were compliant with medications while the majority, 146(68.5%), were non-compliant to medication.

The eight questions Mo risky Medication Adherence scale was used to determine the compliance level.

Yes" response was given 0 points, and the "No "response was given as 1 point. The points were added, and scores ranked as 1-compliance (6-8pts,>80%), 0-Non-compliance (≤5). The compliance rate to medications was then computed, as shown in figure 4.1 below.

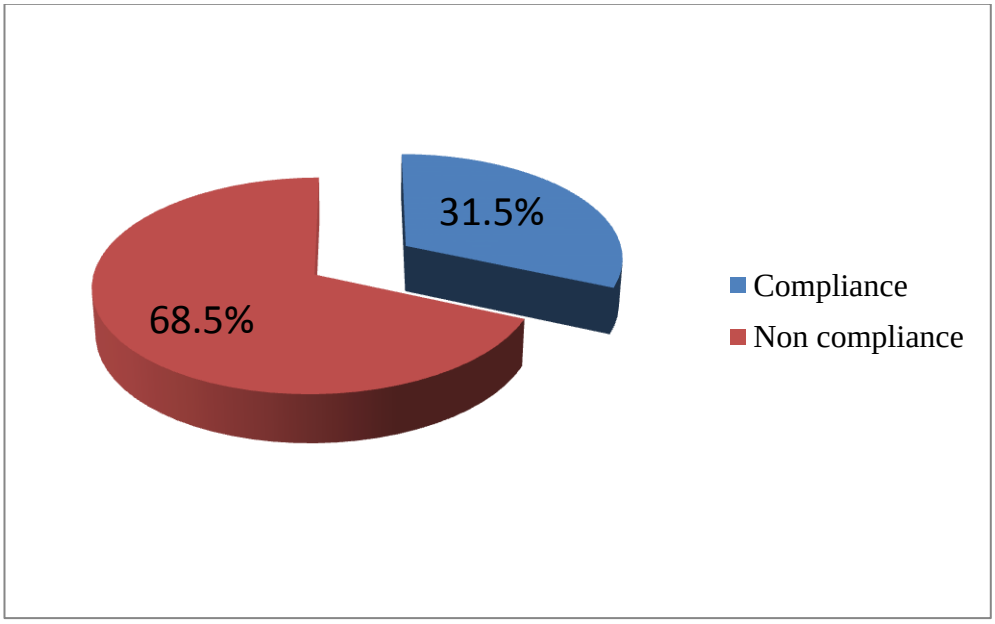

Figure 4.1: Proportion of Antihypertensive medication compliance (N=213)

4.3.2 Mo risky Medication Adherence Scale (MMAS-8questions) responses

Table 4.3 illustrates that 103(48.4%) of the respondents sometimes forgot to take their high BP medications, while 101(47.4%) sometimes missed taking their drugs for reasons other than forgetting. The majority of the respondents, 195(91.5%), have never discontinued their high BP medication without telling their health care provider. However, 164 (77.0%) sometimes forgot to carry along their high BP medications, while 149 (70.0%) took their high BP drugs a day before this study. Slightly more than a quarter 57(26.8%) sometimes felt like stopping taking their medications because their BP was under control. In comparison, 111(52.1%) felt under pressure sticking to the treatment plan, and 149 (70.0%) had difficulty remembering to take their high BP medications.

Table 4.3: Mo risky Medication Adherence Scale (MMAS-8questions) responses (N=213)

Questions	**Yes(noncompliance)**	**No(compliance)**
	N (%)	**N (%)**
1. Forgot to take high BP medications	103(48.4)	110(51.6)
2. Any other reason for missing their daily high BP medications other than forgetting	101(47.4)	112(52.6)
3. If side effects of high BP drugs made him/her stopped the medications	18(8.5)	195(91.5)
4. Forgot to carry along high BP medications when traveling	164(77.0)	49(23.0)
5. If took his/her high BP medications the day before this study	64(30.0)	149(70.0)
6. Felt like discontinuing high BP medications because the BP was controlled	57(26.8)	156(73.2)
7.Felt under pressure in sticking to treatment schedule because of its inconveniency	111(52.1)	102(47.9)
8. Had difficulty in remembering to take high BP medication	149(70.0)	64(30)

4.3.3 Compliance to recommended Healthy Lifestyle Modifications

Figure 4.2 below demonstrates that 43(20.2%) of the respondents were compliant to recommended lifestyle modifications, while the majority, 170(79.8%), were non-compliant.

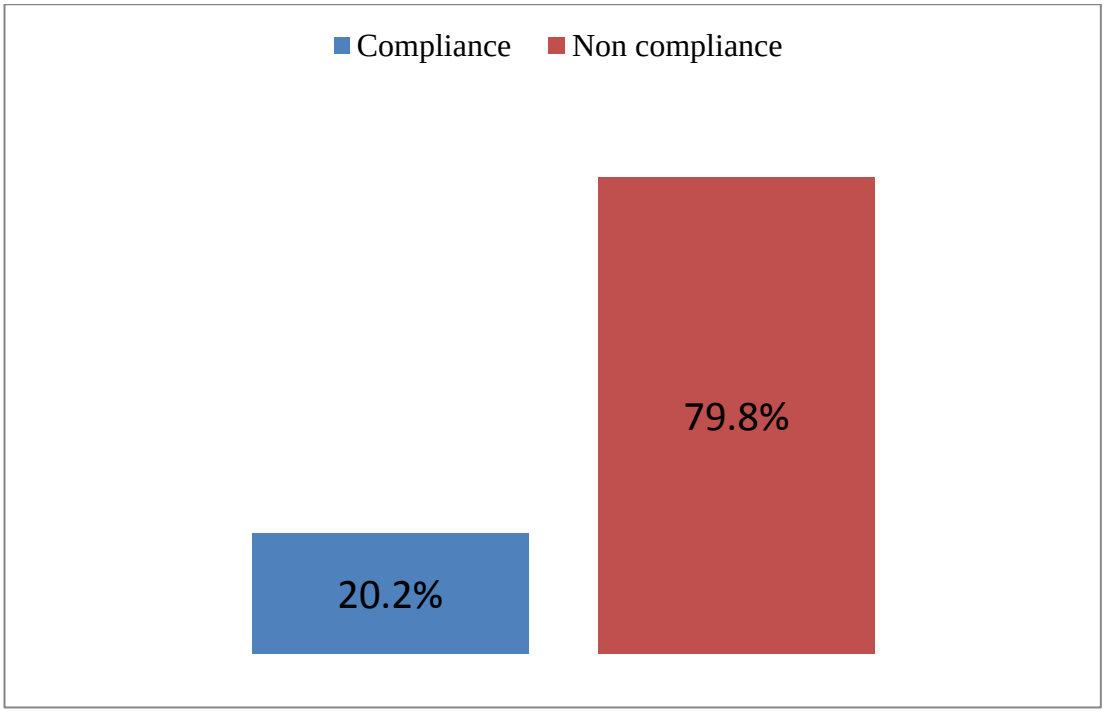

Figure 4.2: Proportion of Compliance to recommended healthy Lifestyle Modifications (N=213)

Table 4.4 below depicts compliance to recommended healthy lifestyle changes. It was assessed by answering 5likert scale questions which were then categorized into Yes and No. These were on salty food intake, fruits/vegetable consumption, tobacco smoking, alcohol intake, and physical activities as summarized

The Majority of patients, 199(93.4%), consumed salty food, while 14(6.6%) never ate salty food. However, 210(98.6%) ate fruits and vegetables while 3(1.4%) never ate fruits and vegetables and 204(95.8 %%) never took alcohol. The Majority of patients, 205(96.2%), never smoked a cigarette, while 165(77.5%) did physical exercise.

Table 4.4: Compliance to recommended Lifestyle Modifications Responses (N=213)

Status lifestyle modification	**YES** N (**%**)	**NO** N (**%**)
Salty food	199(93.4)	14(6.6)
Fruits and vegetables	210(98.6)	3(1.4)
Alcohol	9(4.2)	204(95.8)
Smoke	8(3.8)	205(96.2)
Physical exercise	165(77.5)	48(22.5)

Table 4.5 below illustrates compliance to recommended lifestyle modification which was computed by ranking the 5likert scale questions. The maximum score for each question was 4 points. Those who scored 4(1) points were categorized as compliance, and those who scored 3(0) points and below were noncompliant.

Out of the 213 respondents, 14(6.6%) did not consume salt in their diet, while 13(6.1%) consumed fruits & vegetables. The majority, 204 (95.8%), did not consume alcohol, and 205(96.2%) didn't smoke cigarettes, while 31(14.6%) of the respondents did sufficient physical activity. However, those patients that displayed compliance to all recommended lifestyle modifications parameters were 43(20.2%).

Table 4.5: Compliance to recommended Lifestyle Modification indicators (N=213)

Variable	Noncompliance N (%)	Compliance N (%)
Reduced Salt intake	199 (93.4)	14 (6.6)
Regular intake of Fruits and vegetables	200 (93.9)	13 (6.1)
No Alcohol intake	9 (4.2)	204 (95.8)
No Smoking	8 (3.8)	205 (96.2)
Regular Physical exercise	182 (85.4)	31 (14.6)
LIFESTYLE MODIFICATION	**170 (79.8)**	**43 (20.2)**

4.3.4 Proportion of compliance to antihypertensive therapy (Both Medications and Lifestyle Behaviours)

Antihypertensive therapy (both high BP medications and recommended lifestyle modification) is vital in preventing and controlling high BP. It was calculated by summing up eight questions MMAS (8points) and 5 Likert scale questions for recommended lifestyle modifications (20 points). The maximum score for compliance to antihypertensive therapy was 28 points (100%). Those who scored more than 80 %(≥22points) were considered compliant, while 79% and below (≤21 points) were considered noncompliant for both high BP medicines and recommended lifestyle modifications.

As illustrated in figure 4.3 below, 31(14.6%) of the respondents displayed compliance to antihypertensive therapy (both medication and recommended lifestyle modifications), while the majority, 182(85.4%), did not.

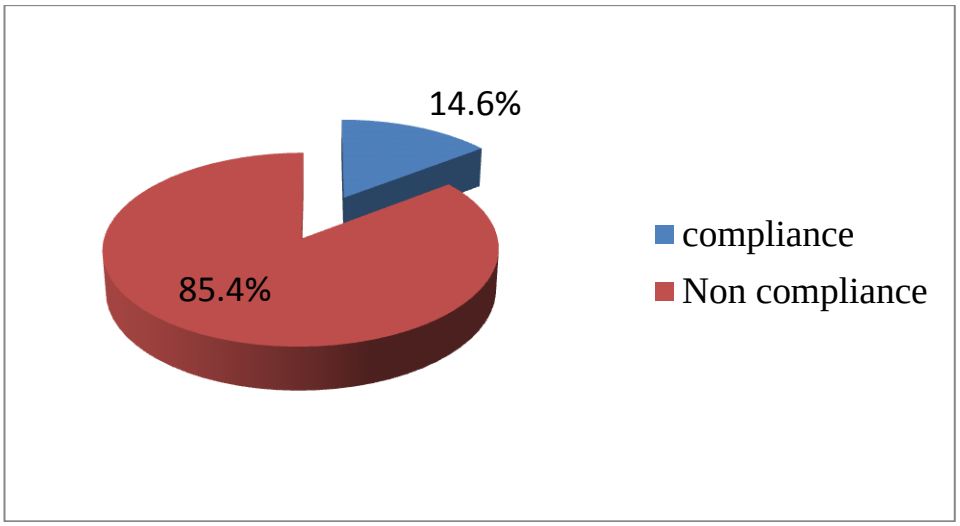

Figure 4.3: Proportion of compliance to Antihypertensive therapy (N=213)

4.4 General Clinical features of the patients

4.4.1 Blood Pressure categories of the patients

The study intended to find out the proportion of respondents with blood pressure who were controlled. This was measured by Systolic & diastolic BP of equal to or below 140mmHg and 90mmHg, respectively

As illustrated in figure 4.4 below, less than half, 62(29%) of the respondents had Controlled BP (<140/90mmHg), while the majority 151(70.9%) had uncontrolled blood pressure (>140/90mmHg)

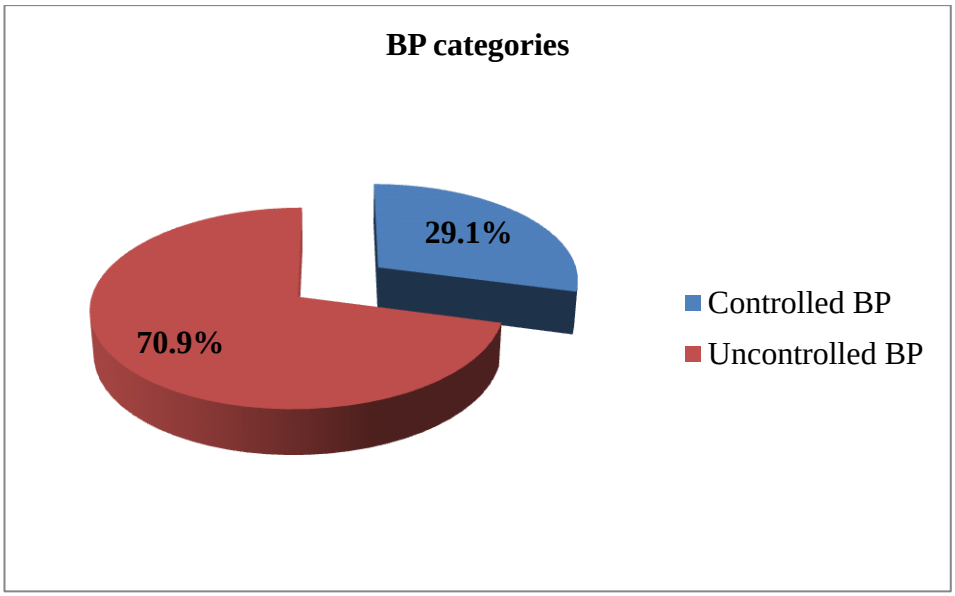

Figure 4.4: Blood pressure categories among respondents (N=213)

4.4.2 Duration of hypertension Treatment

The study intended to find out the duration of treatment the respondent has been on hypertension medication.

Table 4.6 below demonstrates that most patients, 173(81.2%), were on treatment for hypertension for more than one year, while 40(18.8%) were on treatment for less than a year.

Table 4.6: Duration of hypertension Treatment (N=213)

Period	Frequency	Per cent
6months – 1year	40	18.8
More than 1year	173	81.2
Total	**213**	**100**

4.4.3 Kinds (class(es) of hypertension medications taken by respondents

Table 4.7 shows that the majority of patients, 138(64.8%), used two (duo therapy) kinds of BP drugs, while 70(32.9%) used more than two kinds and 5(2.3%) used only one kind.

Table 4.7: Class (es) of Blood Pressure medications prescribed (N=213)

BP medication	Frequency	Percentage
One (Monotherapy)	5	2.3
Two (Duo therapy)	138	64.8
More than two	70	32.9
Total	**213**	**100.0**

4.4.4 Prescribed antihypertensive class (es)

Table 4.8 demonstrates that thiazides diuretics were the most 82(38.5%) prescribed class of hypertension agents, while central acting agent 3(1.4%) was less prescribed.

Table 4.8: Prescribed antihypertensive class (es)

	Class	Frequency	Percentage
1	Thiazide diuretic	82	38.5
2	ACE inhibitor	58	27.2
3	Long acting CCB	36	16.9
4	ARB	15	7.0
5	Beta Blockers	19	8.9
6	Central acting agents	3	1.4
	Total	**213**	**100.0**

ACE=Angiotensin Converting Enzymes; CCB=Calcium Channel Blockers; ARB=Angiotensin receptor Blocker

4.4.4 Other chronic medical conditions (comorbidities) affecting respondents

The patients were asked if they took any other lifetime medications in addition to high BP drugs. The majority of respondents, 161(78.4%), had no comorbidities, while 46(21.6%) had comorbidities. This is demonstrated in figure 4.5 below

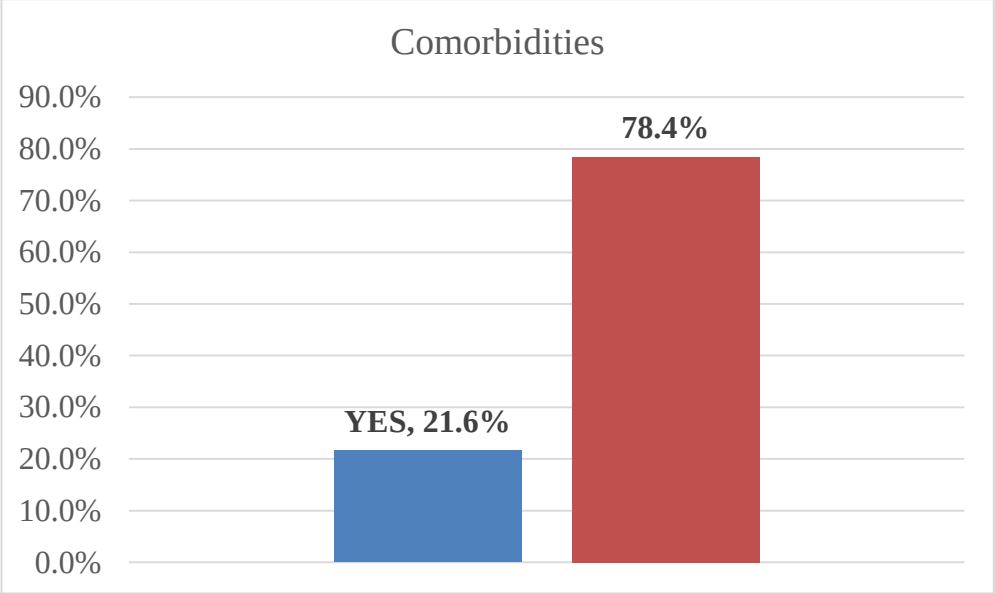

Figure 4.5: Co morbidities (N=213)

The most prevalent comorbidity was diabetes mellitus accounting for 27(12.7%), as shown in figure 4.6 below.

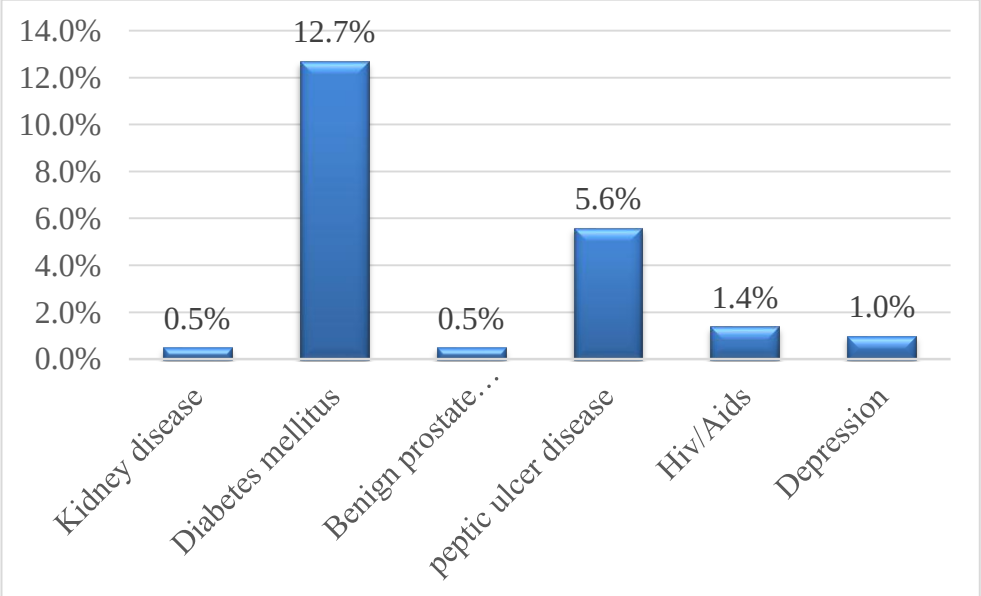

Figure 4.6: Specific comorbidities

4.4.5 Alternative medicine other than High BP medications

The respondents were asked if they ever took alternative medicine (herbal supplements) to treat high BP. The majority, 193(91%) of the respondents, had never used alternative medicine, while 20(9%) had used as shown in figure 4.7.

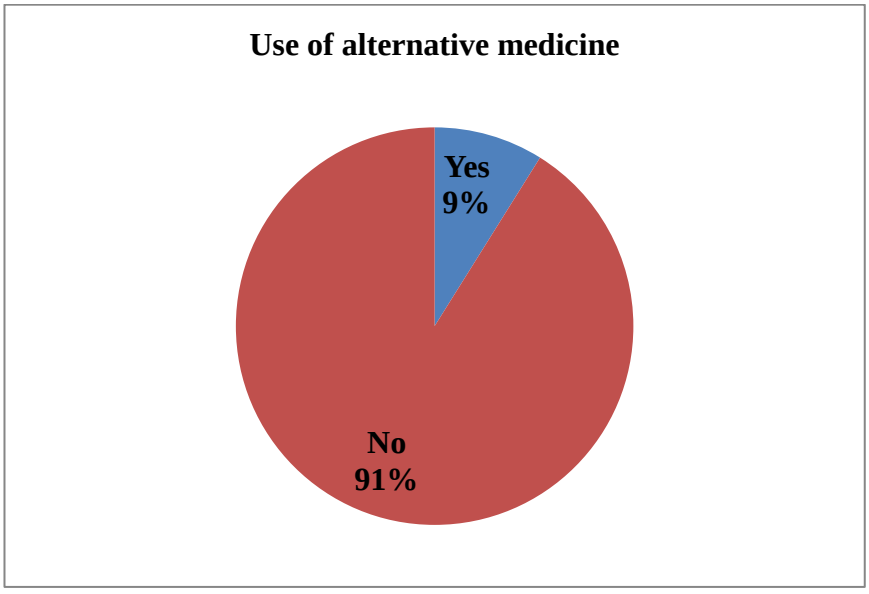

Figure 4.7: Use of alternative medicine (N=213)

4.5 Respondents Level of Knowledge on Hypertension

The hypertension knowledge level (HKLS) questionnaire assessed Respondents' knowledge, which had 30 questions, as demonstrated in table 4.9 below.

The majority, 132(87.3%) of patients, did not know the values above which BP is described as high, while 158(74.2%) didn't know that high BP usually doesn't present with signs and symptoms, and 159(74.6%) were unable to tell the side effects of the high BP medications. However, the majority, 194(91.1%), understood well that stress could cause high blood pressure, while 160(75.1%) knew individuals with

high BP must not smoke, and 200(93.9%) agreed that high BP drugs must be taken every day and 151(70.9%) knew high BP could cause a stroke if not controlled.

Table 4.9: Level of Knowledge constructs responses (N=213)

Knowledge of high BP	Yes N (%)	No N (%)
1 Values of High BP	27(12.7)	186(87.3)
2.The normal Values	29(13.6)	184(86.4)
3. High BP is also termed as hypertension	156(73.2)	57(26.8)
4. The elderly are at greatest risk of high BP	125(58.7)	88(41.3)
5. Stress can cause High BP	194(91.1)	19(8.9)
6. High Bp is not caused by witchcraft	100(46.9)	113(53.1)
7. High BP has no signs and symptoms	55(25.8)	158(74.2)
8. Both men and women have no equal chance of developing High BP	62(29.1)	151(70.9)
9. Drugs alone can't control High BP	103(48.4)	110(51.6)
10. Hypertension drugs can't be stopped	129(60.6)	84(39.4)
11. Hypertension is not treatable	120(56.3)	93(43.7)
12. The dosages of high BP medications	133(62.4)	80(37.6)
13. The side effects of high BP medications	54(25.4)	159(74.6)
14. High BP drugs must be taken every day	200(93.9)	13(6.1)
15.High BP drugs must be taken even when they don't feel ill	108(50.7)	105(49.3)
16.Hypertension drugs must be taken throughout life	166(77.9)	47(22.1)
17. Frying is not the best cooking method	106(49.8)	107(50.2)
18. Boiling is the best cooking method	154(72.3)	59(27.7)
19.Adding salt in foods isn't good	114(53.5)	99(46.5)
20.fruits / vegetables are healthy	171(80.3)	42(19.7)
21. Red meat is not the best type of meat	99(46.5)	114(53.5)
22.White meat is the best type of meat	136(63)	77(37)
23. smoking is not recommended	160(75.1)	53(24.9)
24.Alcoholic drinks is not recommended	119(55.9)	94(44.1)
25. Regular physical activity is healthy	194(91.1)	19(8.9)
26. High BP can cause strokes	151(70.9)	62(29.1)
27.High BP can cause heart diseases	127(59.6)	86(40.4)
28.High BP can cause early death	150(70.4)	63(29.6)
29.High BP can cause renal failure	103(48.4)	110(51.6)
30. High BP can cause visual disturbances	149(70.0)	64(30)

These questions (table 4.8) above were used to compute the level of knowledge per respondent. The respondents were considered knowledgeable if they responded correctly to the 30 questions and were given a score of 1(Yes-correct answers) and 0 (No-incorrect answers). The maximum score was 30 points (100%).

These scores were then summed up, categorized, and converted into percentages according to modified bloom's cut-off point (80-100% -Good), (60-79%-Average), and less than 60% poor knowledge. The denominator was 30 questions. Those who scored 24-30 points (80%-100%) good knowledge, 18-23 points (60-79%) average knowledge, and ≤17 points (60% and below) poor knowledge. As shown in Table 4.10 below, majority 103(48.4 %), close to a half of the respondents had poor knowledge of high BP. In comparison, 46(21.6%) of the patients had sufficient knowledge of hypertension, and 64(30%) had average knowledge.

Table 4.10: Hypertension Knowledge level scale (HKLS) (N=213)

Level of knowledge		**Frequency**	**Percentage**
1	Poor Knowledge	103	48.4
2	Average Knowledge	64	30.0
3	Good Knowledge	46	21.6
	Total	**213**	**100.0**

Figure 4.8 below demonstrates that the hypertension knowledge score is symmetric. This means that patients with a high score on knowledge and those with a low score are more or less the same.

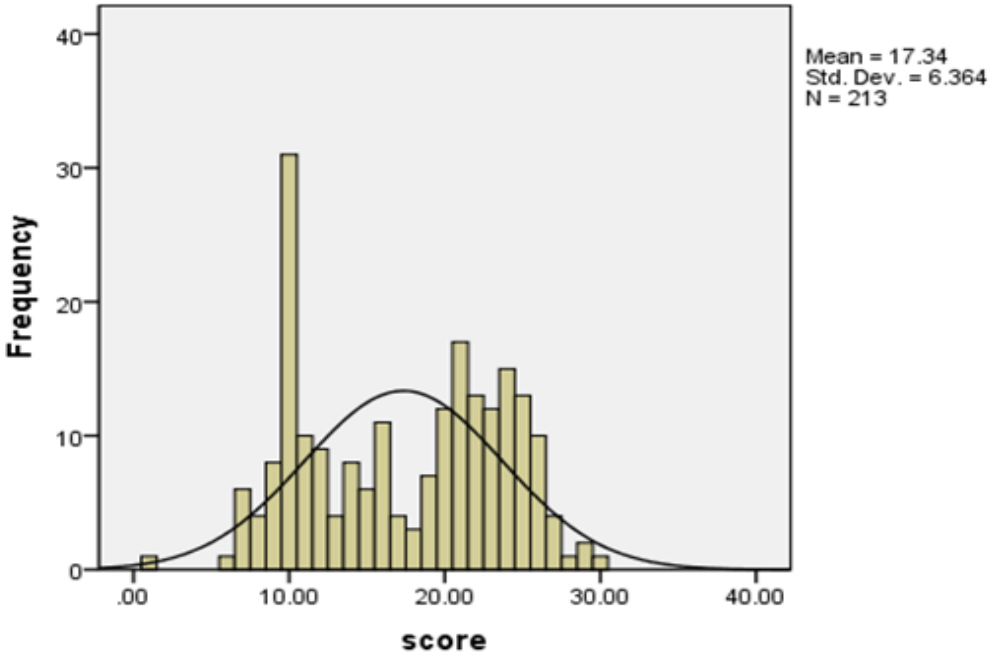

Figure 4.8: Hypertension Knowledge Score (N=213)

4.6 Health service-related factors among the respondents

The study sought to understand health service-related factors and how they influence compliance to antihypertensive therapy.

4.6.1 High Blood pressure clinic appointments

Table 4.11 below reveals majority of 112(52.6%) of the respondents never missed their scheduled high BP clinic appointments, while 101(47.4%) missed clinic appointments.

Table 4.11: High Blood pressure clinic appointments(N=213)

Appointments	Frequency	Percentage
Never missed	112	52.6
Missed	101	47.4
Total	**213**	**100.0**

4.6.2 Reasons for missing High BP clinic appointments

The majority, 74(34.7%) of patients, did not have enough funds (money), while 62(29.1%) had no time to came for a refill, 26(12.2%) forgot, and 51(23.9%) assumed they were cured. This is shown in table 4.12 below.

Table 4.12: Reasons for missing High BP clinic appointments

Reasons for missing High BP clinic appointments	Frequency	Percentage
Insufficient funds (Money)	62	34.7
Time constrains	74	29.1
Forgetfulness	26	12.2
Assumption of being cured	51	23.9
Total	**213**	**100.0**

4.6.3 Healthcare advice on the importance of taking High BP therapy

The study sought to understand whether health care providers attending to patients provided clear advice on the importance of taking therapy (medication & lifestyle changes) after being diagnosed and issued with High BP drugs.

Table 4.13 below demonstrates that the majority, 116(54.5%) of the patients, indicated that health care providers attending to them provided very clear advice on the importance of taking drugs & lifestyle changes. Among the respondents, 82(38.5%) the advice was provided but was not clear, while15 (7.0%) according to them the advice was never provided.

Table 4.13: Healthcare advice on the importance of taking High BP therapy

Healthcare advice	Frequency	Percentage
Very clearly	116	54.5
Not clearly	82	38.5
Never	15	7.0
Total	**213**	**100.0**

4.6.4 Healthcare follows up on consistency therapy

Table 4.14 demonstrates that most 193(90.6%) of the patients were asked all the time during revisits of their consistency in therapy taking, while 20(9.4%) of the respondents were never asked by the health care worker.

Table 4.14: Healthcare follows up on consistency therapy

	Frequency	**Percentage**
NO	20	9.4
YES	193	90.6
Total	**213**	**100**

4.6.5 Refill of High BP drugs

Table 4.15 displays that most 138(64.8%) of the patients never left the hospital before obtaining high BP drugs, while 75(35.2%) left the hospital without obtaining their High BP drugs.

Table 4.15: Refill of high BP drugs

Leaving the hospital with drugs	**Frequency**	**Percentage**
NO	138	64.8
YES	75	35.2
Total	**213**	**100.0**

4.6.6 Availability of high BP drugs

Figure 4.9 below illustrate that the majority, 157(74%) of patients failed to take high BP drugs because they were unavailable in the hospital, while 56(26%) have never/ failed to take High BP drugs because they were unavailable in the hospital.

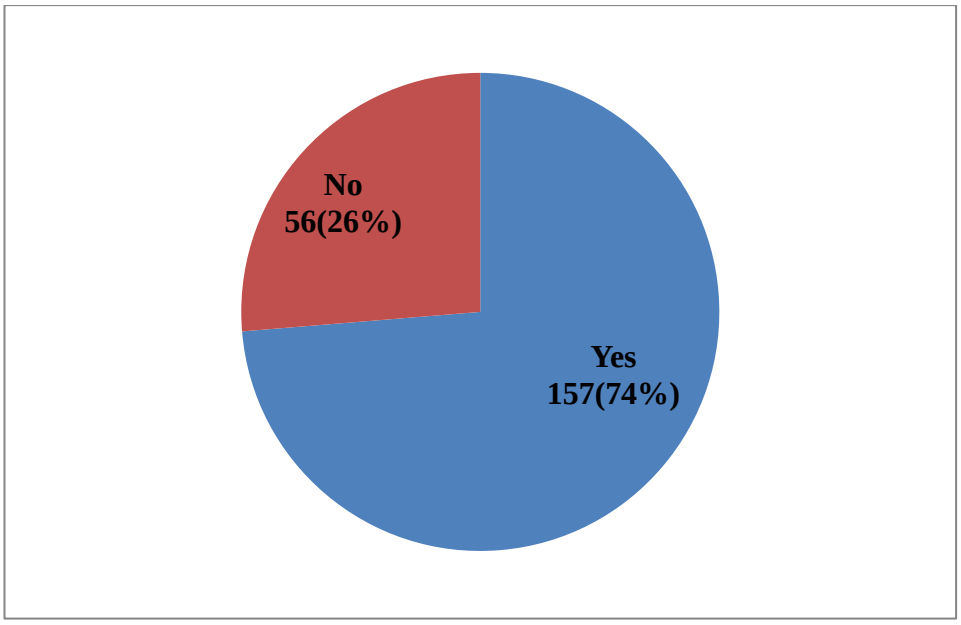

Figure 4.9: Availability of high BP drugs

4.6.7 Cost of High BP medication

Figure 4.10 shows that the majority, 124(58%) of the patients once failed to take High BP medicines because of the cost of those drugs, while only 89(42%) indicated that at no time they failed to take High BP drugs because of the cost of those drugs

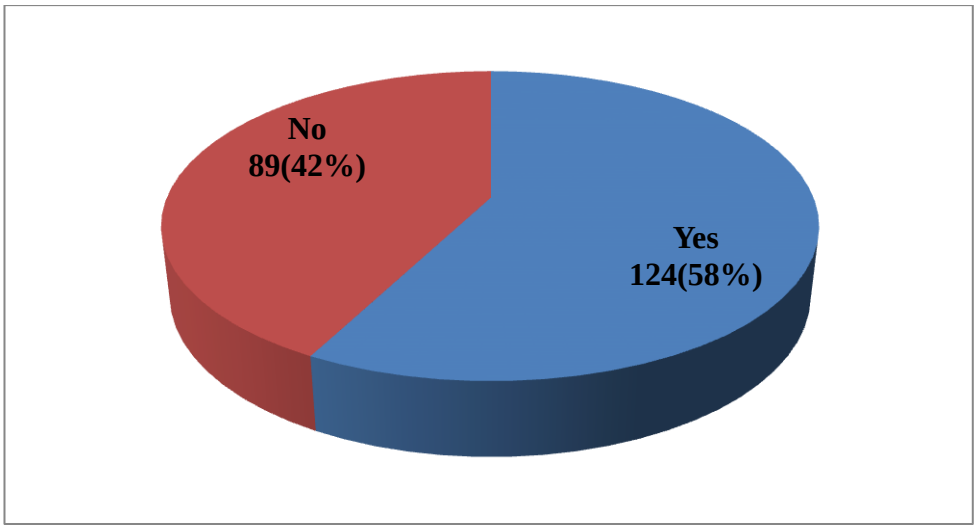

Figure 4.10: Cost of high BP medicines

4.6.8 Side effects of high BP drugs

The study sought to understand if a time High BP patient failed to take High BP drugs because of the side effect of those drugs. The results are shown in figure 4.10 below. The majority, 172(80.8%) of the patients, have never failed to take High BP drugs because of their side effect, while only 41(19.2%) at one time failed to take High BP drugs because of the side effects of those drugs

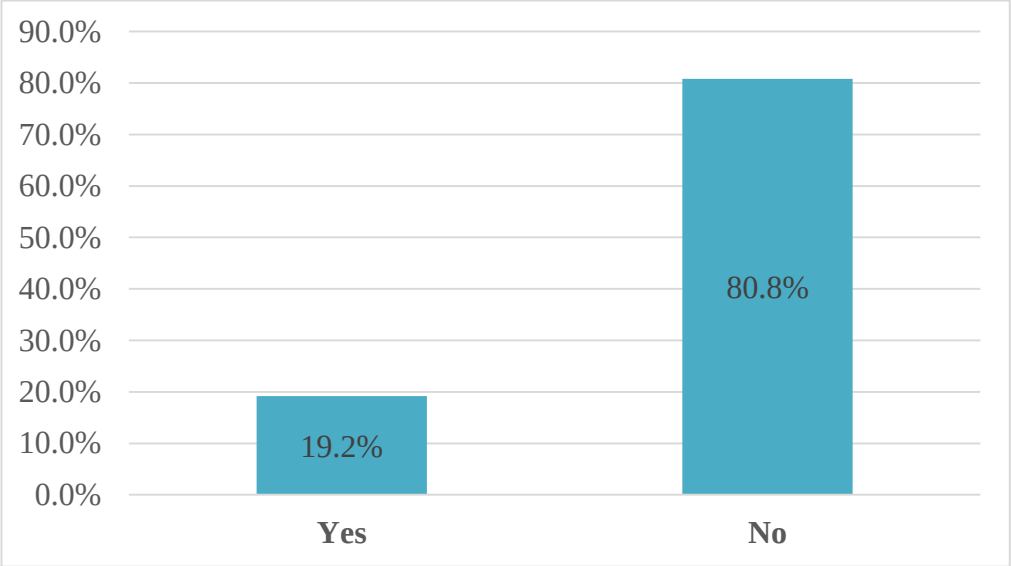

Figure 4.11: side effects of High BP drugs

4.6.9 Distance from home to the health facility

The study sought to understand if a High BP patient failed to take High BP medication because of the distance from home to the health facility. The results are displayed in figure 4.12 below

The majority, 115(54%) of the patients have never failed to take High BP drugs because of the distance from their home to the hospital, while only 98(46%) of the High BP at one time failed to take High BP drugs because of the distance from their home to the hospital.

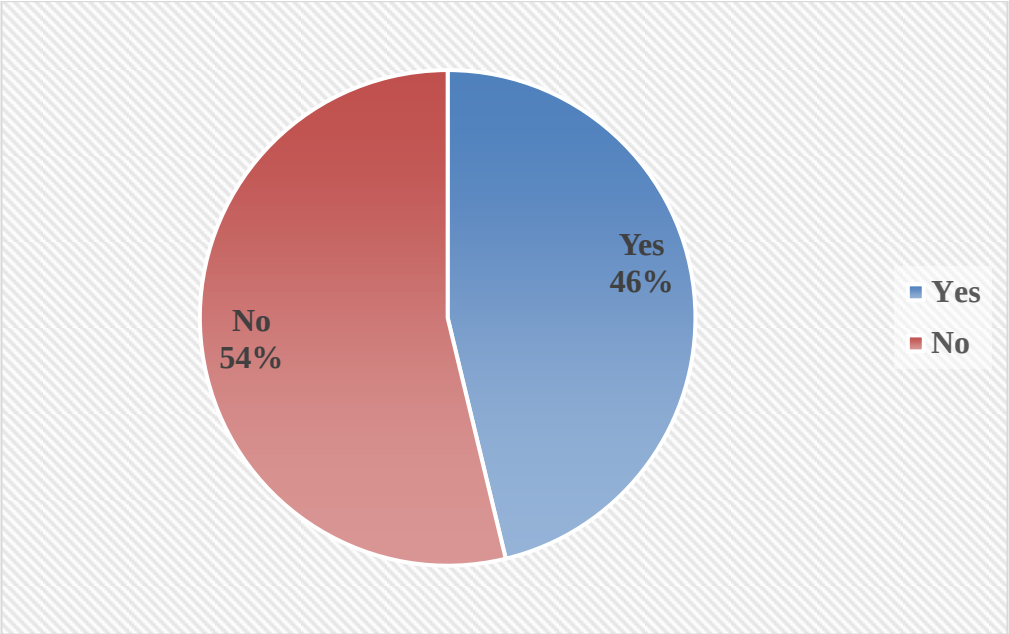

Figure 4.12: Distance from home and health facility

4.7 Healthcare providers Interview schedule

4.7.1 Health care providers duties and experience in service

The study sought to establish healthcare workers' work experience and duties chosen to contribute to the study.

Table 4.16 below shows that the majority 5 (50%) of healthcare workers had worked at medical outpatient clinics for less than 5years, while 3(30%) had worked for 6years to 10 years and 2(20%) worked for over ten years.

Management of hypertension necessitates skills that are acquired over some time. Furthermore, it enables HCW to detect and deal with hypertension complications. This study found 50% of HCW had worked in medical outpatient hence had sufficient experience in management and control of hypertension

Table 4.16: HealthCare workers work experience (N=10)

Period in years	Frequency	Percentage
1-5	5	50.0
6-10	3	30.0
More than 10	2	20.0
Total	**10**	**100.0**

4.7.2 Patient compliance status to antihypertensive therapy

The study sought to know from the HCW whether hypertensive patients comply with the medication's prescription, healthy lifestyle behaviours, scheduled HTN medical follow-up clinics, and any records or data on compliance to antihypertensive therapy. The majority of 9(90%) have never seen any reported compliance rate in the facilities. The findings revealed that patients did not comply with medications according to health care providers

4.7.3 Reasons for compliance to antihypertensive therapy by Health care workers

The HCW were asked what might affect their patient's compliance to antihypertensive therapy. Table 4.17 below shows, the majority4(40%) of health care providers cited lack of funds to purchase drugs and do medical investigations, Lack of awareness 3(30%), a long distance from the facility 2(20%), cultural believes that hypertension complications are associated with witchcraft 1(10%).

Table 4.17: Reasons for compliance by health provider (N=10)

Reasons for noncompliance	Frequency	Percentage
Cost (Funds)	4	40.0
Lack of awareness	3	30.0
Distance from health facility	2	20.0
Social Cultural believes	1	10.0
Total	**10**	**100.0**

4.7.4 Measures to address compliance to antihypertensive therapy

The study sought to establish if any measures are in place to improve compliance to antihypertensive therapy in the facility.

The majority, 7 (70%) of health care providers, said very little has been put in place to address the issue.

Health facilities and most stakeholders focus on HIV/Aids and other programs. However, most felt and recommended that providing counselling services, reaching, outreaches, and waiving patients would improve compliance to antihypertensive therapy. Good and comprehensive counselling involves giving information on hypertension: aetiology and risk factors, healthy lifestyle behaviours, its complications, side effects of the medicines. More so, the importance of therapy compliance and the negative effects of poor compliance. It is important to appreciate risk factors that affect compliance so that to strengthen efforts of controlling. Furthermore, enlighten on dangers of poor compliance to treatment such as; precipitating factors to uncontrolled BP, including overweight, family history, alcohol consumption, tobacco smoking, aging, sedentary lifestyle, added salt in the diet, and a fatty diet.

4.7.5 Social-cultural factors affecting patient's compliance

The study sought to understand from the HCW what social and cultural factors may affect antihypertensive therapy compliance.

Table 4.18 below shows that the majority4 (40%) of healthcare providers cited lack of education, Myths 3(30%), Poverty 2(20%), Age (elderly), 1(10 %.)

Table 4.18: Social-cultural factors affecting patient's compliance (N=10)

Social Cultural factors	Frequency	Percent
Lack of education	4	40.0
Myths /Believes	3	30.0
Poverty	2	20.0
Age (Elderly)	1	10.0
Total	**10**	**100**

4.7.6 Health service-related factors affecting compliance

The study intended to find out some of the health-service-related factors that affect the patient's compliance to hypertension medications.

Table 4.19 below demonstrates the majority5 (50%) of health care providers cited unavailability of drugs, Cost of medications3 (30%), a long distance from the facility 1(10%), lack of proper counselling 1(10%).

Table 4.19: Health service-related factors affecting compliance (N=10)

Health service-related factors	Frequency	Per cent
Unavailability of hypertension medicine	5	50.0
Cost	3	30.0
Distance from health facility	1	10.0
Lack of proper counselling	1	10.0
Total	**10**	**100**

4.7.7 Challenges at the medical outpatient clinics

The study sought to determine the challenges that health care provides face at the medical outpatient clinics.

Table 4.20 demonstrates that4 (40%) of healthcare workers cited stock-outs of medicine for hypertension. In comparison, 4(40%) of them stated that high patient turns out, 1(10 %) cited patients' ignorance of hypertension, and 1(10%) said insufficient knowledge on hypertension by the patients.

Table 4.20: Challenges at medical outpatient clinics (N=10)

Challenges	Frequency	per cent
Hypertension Medicine stock outs	4	40.0
The high patient turns out	4	40.0
Patients' ignorance	1	10.0
Insufficient patient knowledge on high BP	1	10.0
Total	**10**	**100.0**

4.8 Association between compliance to antihypertensive therapy and selected factors

The study sought to test the Hypothesis: Ho; Compliance to antihypertensive therapy among adult hypertensive patients is not influenced by social demographics factors,

level of Knowledge, and health service-related factors. Using a bivariate chi-square, Pearson Correlation, the following was obtained.

4.8.1 Association between Social demographics factors and compliance to antihypertensive therapy

The study intended to test the Hypothesis Ho: There is no significant affiliation between social demographics and compliance with antihypertensive therapy among adult hypertensive patients.

Table, 4.21 (chi-square tests) results from the study found significant association between compliance to antihypertensive therapy and age (x^2=11.229, p=0.024), Education level (x^2=7.672, p=0.05) and income (x^2=10.820, p=0.013). Optimal compliance to antihypertensive therapy was observed among the younger age group (18-28 years) old, those with formal education, and those with high income (>Khs. 20,000). No relationship was observed between gender, marital status, religion, and occupation (p>0.05).

Table 4.21: The association between social demographics factors and compliance to antihypertensive therapy (N=213)

Variables	Compliance status		Totals N	X^2	P-Value
	Non-compliance N (%)	Compliance N (%)			
Age (Years)				**11.229**	**0.024***
18-28	5(55.6)	4(44.4)	9		
29-38	11(84.6)	2(15.4)	13		
39-48	21(75.0)	7(25.0)	28		
49-58	56(86.2)	9(13.8)	65		
> 59	89(90.8)	9(9.2)	98		
Gender				**0.618**	**0.277**

Male	63(82.9)	13(17.1)	76		
Female	119(86.9)	18(13.1)	137		
Marital Status					
Married	114(82.0)	25(18.0)	139		
Single	11(91.7)	1(8.3)	12	**4.735**	**0.192**
Separated/Divorced	14(100)	0(0.00)	14		
Widowed	43(89.6)	5(10.4)	48		
Religion					
Muslim	24(85.7)	4(14.3)	28		
Christian	152(84.9)	27(15.1)	179	**1.064**	**0.587**
Others	6(100)	0(0.0)	6		
Education Level				**7.672**	**0.04***
No Formal Education	83(93.3)	6(6.7)	89		
Primary	68(80.0)	17(20.0)	85		
Secondary	25(2.1)	6(7.8)	31		
Tertiary	6(85.4)	2(14.6)	8		
Occupation				**3.478**	**0.324**
Student	2(100.0)	0(0.0)	2		
Employed	35(77.8)	10(22.2)	45		
Self-Employed	82(89.1)	10(10.9)	92		
Unemployed	63(85.1)	11(14.9)	74		
Income (Monthly Earnings Kshs)				**10.820**	**0.013***
Low income (<5,000)	123(88.5)	16(11.5)	139		
Low middle income (5,000-10,000)	31(88.6)	4(11.4)	35		
Upper middle income (11,000-20000)	22(78.6)	6(21.4)	28		
High income (>20000)	6(54.5)	5(45.5)	11		

*Statistically significant, Kshs=Kenya shilling

4.8.2 Association between BP control and compliance to antihypertensive therapy

The study sought to test the Hypothesis Ho: There is no significant relationship between blood pressure control and compliance to antihypertensive therapy among adult hypertensive patients.

The results are illustrated in Table 4.22 below. There was no significant affiliation between BP control and compliance to antihypertensive therapy ($p>0.05$).

Table 4.22: The association between Blood pressure control and compliance to antihypertensive therapy

Variables	Compliance Status		Totals N=213	X^2	p Value
	Noncompliance N (%)	Compliance N (%)			
BP Control					
Controlled<140/90mmHg	53(85.5)	9(14.5)	62	**0.000**	**1.000**
Uncontrolled>140/90mmHg	129(85.4)	22(14.6)	151		

MmHg=millimetre of mercury, X^2=chi-square

4.8.3 Association between duration of treatment of high BP, class (es) of high BP medicines, comorbidities, alternative medicine, and antihypertensive therapy compliance

The study intended to test the Hypothesis Ho: There is no significant relationship between duration of treatment of high BP, Class (es) of high BP medicines, comorbidities, alternative medicine and compliance to antihypertensive therapy among adult hypertensive patients.

The results are presented in Table 4.23. A statistically significant relationship was observed between the duration of high BP treatment and compliance to

antihypertensive therapy (X^2=9.448, p=0.005). Optimal compliance to antihypertensive therapy was observed among patients who were on treatment for high BP for 6months to 1 year. No relationship was observed between Class (es) of high BP medicines, comorbidities, and alternative medicine (p>0.05).

Table 4.23: Association between duration of treatment of high BP, kind of high BP medicines, comorbidities, alternative medicine and compliance to antihypertensive therapy

Variables	Compliance Status		Totals N=213	X^2	p Value
	Noncompliance N (%)	Compliance N (%)			
Duration of HBP				**9.448**	**0.005***
6months -1year	28(70.0)	12(30.0)	40		
More than 1year	154(89.0)	19(11.0)	173		
Kind of HBP drugs				**2.103**	**0.365**
One	5(100)	0(0.0)	5		
Two	120(87.0)	18(13.0)	138		
More than two	57(81.4)	13(18.6)	70		
Other Chronic Medical Conditions				**5.275**	**.627**
Yes	38(82.6)	8(17.4)	46		
No	144(86.3)	23(13.7)	167		
Alternative medicine				**0.272**	**1**
Yes	17	2	19		
No	165	29	194		

*Statistically significant=High Blood Pressure, $X^{2=}$ chi-square

4.8.4 Association between the knowledge on hypertension and Compliance to antihypertensive therapy

The study sought to test the Hypothesis Ho: There is no significant relationship between the level of knowledge on high BP and compliance to antihypertensive therapy among adult hypertensive patients.

The results are presented in the table 4.24 below. The study found significant association between compliance to antihypertensive therapy and question on high value of BP (x^2=25.658, p=0.000); normal value of BP (x^2=20.428,p=.000);elevated

BP also hypertension (x^2=13.871,P=.001);high BP caused by witchcraft(x^2=12.226,p=.002); high BP presents with signs and symptoms (x^2=9.892,p= .007); possible side effects of high BP medications(x^2=13.524,p=.001) ,high BP medication only taken when felt ill(x^2=4.213,p=.040);frying is best cooking method (x^2=11.335,p=.003);boiling is best cooking method (x^2=6.007,p=.050);Red meat is the best type of meat (x^2=14.051 ,p=.001); alcoholic beverages can be taken (x^2=7.941,p=.019),and High BP can cause strokes(x^2=6.893 ,p=.032).

Better compliance to antihypertensive therapy was observed among hypertensive patients, who knew high BP values, among those who didn't know normal values high BP. Among those who didn't know that elevated blood pressure is also called hypertension.

Better compliance to antihypertensive was observed among those who understood that witchcraft doesn't cause hypertension, among those who knew high BP usually doesn't present with signs and symptoms, those who knew the side effects of high blood pressure medicines, and those who understood that frying is not the best cooking method. At the same time, boiling is a good cooking method for hypertensive patients. Last but not least, is that high compliance was shown among those who knew red meat and alcoholic drinks are not good for health for hypertensive patients and among those who understood high BP could cause a stroke if left untreated.

Table 4.24: Knowledge questions on High BP and compliance to antihypertensive therapy (N=213)

Variable	Compliance Status		Totals	X^2	p-Value
	Noncompliance N (%)	Compliance N (%)	N		
	182(85.4)	31(14.6)			
High BP Values					
No	164(88.2)	22(11.8)	186		
Yes	18(66.7)	9(33.3)	27	8.768	**0.003**
Normal BP values					
No	160 (87.0)	24(13.0)	184		
Yes	22(75.9)	7(24.1)	29	2.480	**0.115**
High BP is hypertension					
No	44(77.2)	13(22.8)	57		
Yes	138(88.5)	18(11.5)	156	4.263	**0.039***
Elderly is at risk					
No	78(90.7)	8(9.3)	86		
Yes	102(81.6)	23(18.4)	125	3.364	**0.067**
Stress is a cause					
No	14(73.3)	5(26.7)	19		
Yes	168(86.6)	26(13.4)	194	2.321	**0.128**
witchcraft is not a cause					
No	105(93.8)	7(6.3)	112		
Yes	77(77.0)	23(23.0)	100	12.201	**000***
HTN has no signs and symptoms					
No	142(89.9)	16(10.1)	158		
Yes	40(72.7)	15(27.3)	55	9.645	**.002***

Men and women have no equal chance of high BP					
No	133(88.1)	18(11.9)	151		
Yes	49(79.0)	13(21.0)	62	2.893	**0.089**
Drugs alone can control high BP					
No	95(86.4)	15(13.6)	110		
Yes	87(84.5)	16(15.5)	103	0.154	**0.695**
Drugs can be stopped					
No	74(88.1)	10(11.9	84		
Yes	108(83.7)	21(16.3)	129	0.783	0.376
High BP is treatable					
No	80(87.0)	12(13.0)	92		
Yes	101(84.2)	19(15.8)	120	0.325	0.569
Understand the dosages of the drugs					
No	71(88.8)	9(11.3)	80		
Yes	111(83.5)	22(16.5)	133	1.125	0.289
Understood the side effects					
No	142(89.3)	17(10.7)	159		
Yes	40(74.1)	14(25.9)	54	7.523	**0.006***
Drugs must be taken every day					
No	11(84.6)	2(15.4)	13	.008	0.930
Yes	171(85.5)	29(14.5)	200		
Drugs must be					

taken when ill only					
No	95(90.5)	10(9.5)	105	4.213	**.040***
Yes	87(80.6)	21(19.4)	108		
HTN drugs must be taken throughout					
No	42(89.4)	5(10.6)	47		
Yes	140(84.3)	26(15.7)	166	0.744	0.389
Fried food is good					
No	100(93.5)	7(6.5)	107		
Yes	82(77.4)	24(22.6)	106	11.098	**.001***
Boiled food is good					
No	56(94.9)	3(5.1)	59		
Yes	126(81.8)	28(18.2)	154	5.884	**0.015***
Added salt in foods is not advisable					
No	90(90.9)	9(9.1)	99		
Yes	92(80.7)	22(19.3)	114	5.793	.055
Eating fruits/vegetables is advisable					
No	37(88.1)	5(11.9)	42		
Yes	145(84.8)	26(15.2)	171	0.295	**0.587**
Red meat is good					
No	107(93.9)	7(6.1)	114		
Yes	75(75.8)	24(24.2)	99	**13.962**	**.000***
White meat is good					

No	71(92.2)	6(7.8)	77		
Yes	111(81.6)	25(18.4)	136	4.434	0.035*
Smoking is not advisable					
No	46(86.8)	7(13.2)	53		
Yes	136(85.0)	24(15.0)	160	0.103	0.748
Alcoholic drinks are not recommended					
No	87(92.6)	7(7.4)	94		
Yes	95(79.8)	24(20.2)	119	6.834	**0.009***
Physical exercise is advisable					
No	18(94.7)	1(5.3)	19		
Yes	164(84.5)	30(15.5)	194	1.448	0.229
High BP can cause strokes					
No	59(95.2)	3(4.8)	62		
Yes	123(81.5)	28(18.5)	151	6.638	**.010***
High BP can cause heart diseases					
No	79(91.9)	7(8.1)	86		
Yes	103(81.1)	24(18.9)	127	4.772	**0.029***
High BP can cause untimely death					
No	57(90.5)	6(9.5)	63		
Yes	125(83.3)	25(16.7)	150	1.820	0.177
High BP can cause renal failure					

No	94(85.5)	16((14.5)	110		
Yes	88(85.4)	15(14.6)	103	0.000	0.997
High BP can cause visual disturbances					
No	58(93.5)	4(6.5)	62		
Yes	123(82.6)	26(17.4)	149	4.342	**0.037***

*Statistically significant, HBP =High Blood pressure

As demonstrated in table 4.23 above, the level of knowledge was computed and categorized into poor knowledge, average and good knowledge according to modified blooms cut-off point. The association between compliance to antihypertensive therapy and the level of knowledge was then analysed, as illustrated in table 4.24.

The study results reported a significant association between level of knowledge (x^2=16.090, p=0.00) and compliance to antihypertensive therapy. Better compliance was observed among patients who had good knowledge of high blood pressure, as revealed in table 4.25 below.

Table 4.25: Association between Level of knowledge on hypertension and compliance to antihypertensive therapy (N=213)

Level of Knowledge	Compliance status		Totals N	X^2	p-Value
	Non-compliance N (%)	Compliance N (%)			
Poor knowledge	95(92.2)	8(7.8)	103	**16.090**	**< 0.0001***
Average knowledge	56(87.5)	8(12.5)	64		
Good knowledge	31(64.7)	15(32.6)	46		

*Statistically significant, X^2=chi-square

4.8.5 The association between health service-related factors and compliance to antihypertensive therapy

Table 4.26 (chi-square tests) results found a significant association between compliance to antihypertensive therapy and advice from healthcare worker on the importance of antihypertensive therapy (x^2=9.329, p=0.009); Health care follows up on consistency of taking therapy (x^2=14.414, p=0.002); Refill of high BP medications (x^2=79.753, 0.021); Cost of high BP medication (x^2=5.38, p=0.029) and distance from home and health facility (x^2=6.233, p=0.018).

Better compliance to antihypertensive therapy was observed among those who have never failed to take high BP medicines due to cost, who have never failed to take high BP medicines due to distance from home to the health facility.

Better compliance was also seen among those who sometimes leave hospitals without a refill of drugs, those who never receive health care follow-up on the consistency of therapy, and finally, among those who have never received advice from healthcare workers on the importance of antihypertensive therapy as depicted in table 4.25 below.

Table 4.26: Health service-related factors and compliance to antihypertensive therapy (N=213)

Variables	Compliance		Totals N	X^2	p-Value
	Non-compliance N (%)	Compliance N (%)			
High BP Clinic Appointments					
Never missed	91(81.3)	21(18.8)	112	**4.955**	**0.175**
missed	91(90.1)	10(9.9)	101		
Advice on the importance of therapy by HCW					
Very Clearly	99(85.3)	17(14.7)	116	**9.329**	**0.009***
Not Clearly	74(90.2)	8(9.8)	82		
Never	9(60.0)	6(40.0)	15		
Health care Follow up on consistency of therapy				**14.414**	**0.002***
No	15(75)	5(25)	20		
Yes	167(86.5)	26(13.5)	193		
Leaving the hospital with HBP drugs (Refill)					
No	125(90.6)	13(9.4)	138	**9.753**	**0.021***
Yes	57(76)	18(24)	75		
Availability of HBP drugs					
No	45(80.4)	11(19.6)	56		
Yes	137(87.3)	20(20.7)	157	**1.582**	**0.208**
The cost of HBP medication				**5.389**	**0.029***
Yes	111(90.2)	12(9.8)	123		

No	71(78.9)	19(21.1)	90		
Side effects of HBP drugs					
Yes	34(82.9)	7(17.1)	41		
No	148(86.0)	24(14.0)	172	**0.259**	**0.611**
Health facility Distance					
Yes	91(91.9)	8(8.1)	99		
No	91(79.8)	23(20.2)	114	**6.233**	**0.013***

*Statistically significant, HBP=high blood pressure

4.8.6 Association between Medication compliance, Compliance to recommended Lifestyle Modification, and compliance to Antihypertensive Therapy Compliance with various factors

Table 4.27 Crammer's V test of correlation presents the extent or degree of associations among various factors. It depicts that marital status; High BP clinic appointments, and level of knowledge have weak associations with high BP medicine adherence (MMAS), while Health care follow-up and leaving hospitals with drugs (refill) show strong associations of high BP medicine compliance compared to other factors.

Marital status, High BP medication, medical clinic appointments, Health care provider advice on the importance of antihypertensive therapy, availability of high BP medicines, level of Knowledge all shows weak association with recommended Lifestyle Modification compliance.

Age, levels of Income, health care provider advice on the importance of antihypertensive therapy, health care provider follow-up, leaving the hospital with high BP medicine(refill) has a weak association with compliance to Antihypertensive

therapy with a level of knowledge having strong association compared to other factors as shown in table 4.27 below.

Table 4.27: Cramer's V test of correlation between Medication compliance, Compliance to recommended Lifestyle Modification and compliance to Antihypertensive Therapy Compliance with various factors

Factors	**MMAS compliance**		**Lifestyle modification**		**Antihypertensive therapy compliance**	
	Cramer's V	Appr sig	Cramer's V	Appr.sig	Cramer's V	Appr.sig
Demographics						
Age	.120	.549	.150	.307	.230	.024
Marital	.220	.016	.259	.003	.149	.192
Religion	.114	.251	.028	.920	.071	.587
Education level	.109	.470	.025	.988	.190	.053
Occupation	.241	.006	.182	.071	.128	.324
Income	.074	.763	.159	.146	.225	.013
General Medical Information						
Kind of BP medication	.034	.883	.323	.000	.097	.365
Comorbidities	.145	.812	.188	.483	.160	.711
Health Service Related						
BP clinic appointments	.245	.005	.318	.000	.153	.175
Advice on the importance therapy	.216	.007	.158	.070	.209	.009
Health care follow-up	.402	.000	.059	.865	.260	.002
Leaving hospitals with drugs	.354	.000	.101	.540	.214	.021
Availability of high BP medicines	.060	.381	.284	.000	.086	.208
Knowledge						
Level of Knowledge	.241	.002	.161	.062	.275	.000
BP=Blood Pressure, MMAS=MO risky Medicine Adherence Scale						

Table 4.28 below (F test) illustrates a weak negative association between duration of treatment of high BP and medicine compliance, while high BP medicines cost and distance from health facility has a weak positive correlation with recommended Lifestyle Modification compliance. A failure to take high BP medicine due to the drug side effects has a weak negative correlation with recommended Lifestyle Modification compliance. Failure to take high BP medicines due to cost and distance from health facility has a weak positive correlation with antihypertensive therapy compliance. In contrast, duration treatment of high BP has a weak negative relationship with compliance to antihypertensive therapy.

Table 4.28: Phi (f) test of correlation between medication compliance, compliance to recommended Lifestyle Modification and compliance to Antihypertensive Therapy and Various factors

Factor	**MMAS Compliance**		**Lifestyle Modification compliance**		**Antihypertensive Therapy Compliance**	
	Phi	Approx. Sig	Phi	Approx. Sig	Phi	Approx. Sig
Gender	-.065	.341	.008	.903	-.054	.432
BP control	-.100	.144	.039	.569	.001	.992
Duration of High BP treatment	-.114	.095	.002	.974	-.211	.002
Alternative medicine	-.036	.596	.116	.089	.036	.602
High BP medicine cost	.055	.422	.399	.000	.159	.020
High BP drugs side effects	.049	.478	-.318	.000	-.035	.611
Distance from health facility	.104	.128	.375	.000	.171	.013

BP=Blood Pressure, MMAS=Mo risky Medicine Adherence Scale

4.9 Independent predictors for compliance to antihypertensive therapy

Table 4.29 demonstrates independent predictors for compliance to antihypertensive therapy, which was arrived at by binary logistic regression among variables statistically significant. These were duration of treatment of high BP among the respondents (OR=0.383; 95% CI :0.151-0.972; p<0.043), Knowledge on High BP (OR=2.715;95%CI: 1.598-4.615; p<0.001), Healthcare provider follows up on consistency of therapy (OR= 0.452 ;95%CI: 0.282-0.726; p<0.001) and failure of the respondent to take High BP medications due to cost (OR=2.682;95%CI: 1.134-6.345; p=0.025). Respondents who had hypertension for >1year were found to be 0.383 times less likely to be compliant to antihypertensive therapy, while who those who had knowledge on BP were 2.715 times more likely to be compliant. However, those who did not receive healthcare follow-up on the consistency of therapy were 0.45 times less likely to be compliant, and those who didn't fail to take HBP medicines due to cost were 2.68 times more likely to be compliant.

Table 4.29: Multivariate logistic regression analysis for independent factors for compliance to antihypertensive therapy

Variables	**B (coefficients)**	**df**	**p-value**	**odds ratio**	**95% C. I.**	
					Lower	**Upper**
Duration of treatment of Hypertension	-.960	1	0.043	**0.383**	0.151	0.972
Knowledge of Hypertension	.999	1	<0.0001	**2.715**	1.598	4.615
Healthcare follow up on	-.794	1	0.001	**0.452**	0.282	0.726

consistency of therapy						
Cost of medication	.986	1	0.025	**2.682**	1.134	6.345

BP= Blood Pressure, *p-value < 0.05 is significant

CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

Compliance with antihypertensive therapy (medications& lifestyle change) is vital in achieving optimum BP. Poor compliance to therapy is a cause for uncontrolled high BP, severe complications, and a waste of healthcare resources (Getenet *et al*., 2019). In this study, the determinants of compliance to antihypertensive therapy were assumed to be social demographics, hypertensive patients' level of knowledge, and health service-related factors.

5.2 Discussion

5.2.1 Compliance to antihypertensive therapy

Hypertension management and control is a major challenge that necessitates attention to pharmacological and behaviour change. According to WHO, poor compliance to treatment is the primary cause of uncontrolled BP. Good compliance has proved to reduce complications and improve individual health status. In this study, MOrisky Medication Adherence Scale 8 items were used to establish compliance with medication. Morisky Medication Adherence Scale is a validated and consistent tool that has been acknowledged and used universally.

This current study discovered that 67 (31.5%) of the patients were found to comply with hypertension medications. This demonstrates that medication compliance needs to be looked into and improved among hypertensive patients in Kilifi County. These findings are lower than other studies done in India (77%), the USA (77%), and UK (88%). This tells us that compliance to high BP medicines is much higher in

developed countries, probably due to better health services, disease awareness, and social-economic differences. Additionally, the rate is lower than studies done in Ethiopia (66.8%) (Tibebu *et al.*, 2017) (, South Africa (54.6%) (Rampamba *et al*., 2018), and Nigeria (67.2%) (Mekonnen *et al*., 2017). This might be because of social-demographic characteristics and perhaps the difference in sample size and challenges in health service in Africa. A similar study done in Pakistan revealed a medication compliance rate of 31.8% (Bilal *et al*., 2015).

This study confirmed that compliance to healthy lifestyle modification practice was 20.2%. This is comparable with another study done in Ethiopia where participants had a compliance rate of 23% (Tibebu *et al*., 2017), and finding by (Alefan *et al*., 2019) also established 23%. In this study, among the healthy lifestyle modifications,14.6% of respondents practiced regular physical exercise for 30min per day for three days in a week, which is less than 16.1% & 89% physically active patients in previous findings in Ethiopia (Buda *et al*.,2017) and India (Durai & Muthuthandavan,2015) respectively. Furthermore, 6.6% did not use added table salt in food, while 6.1% used fruits and vegetables regularly. This low compliance rate to healthy lifestyle behaviours' might be attributed to poor patient-health provider relationship, lack of family and friend's assistance (Ale fan *et al*., 2019)

This study established a compliance rate (14.6%) to both hypertensive medications and healthy lifestyle behaviours. This result is similar to a local finding by Gichobi *et al*. (2015) done in a referral hospital in Kerugoya (15.4%). Equally, a study by Ghobian *et al*. (2016) reported a lower percentage of compliance, 12.3%. However, the compliance rates in this present study were much lower than the study findings reported in advanced nations, LMIC, and china (Schulz *et al.*, 2016; Pan *et al*.,

2019). In other results reported globally, the compliance rate ranged between 53.4%-91 % (Ahmed, 2015). This dissimilarity in compliance rates could be attributed to diverse social, economic, and cultural characteristics, medical care costs, and better health care services in these countries

In this study, it established that factors such as cost of medication, the social-economic status of the patient (most unemployed 37.4% and the majority (65%) are low-income earners (<Kshs 5000) a month, age (most were elderly (46%), poor knowledge on high BP (48.4%), a patient attitude like forgetfulness (48.4%) and health service delivery factors such as provider-patient relationship and distance from health facility played a significant role in noncompliance to antihypertensive therapy. Similarly, according to most of the key informants in this present study, most hypertensive patients did not comply with medications. These could be because of financial constraints, poverty, lack of awareness, and ignorance. This study revealed that 48.4% of patients forgot to take their prescribed high BP medications making forgetfulness a major contributor to noncompliance. This is consistent with a study in Ghana (Jambedu, 2016). Therefore, Kilifi County hypertensive patients were somehow not compliant to high Bp medicines as demonstrated in the current study. Addressing issues that influence antihypertensive therapy compliance has a positive effect in averting and controlling High BP and hence decreases the burden of the disease (Mortality, morbidity, and cost)

5.2.2 Social demographics characteristics of the respondents

In this study, adult hypertensive patients seeking health services in Kilifi County health facilities were mostly those above 39 years (89.6%). This shows that the onset of high BP in the Kenyan populace is about forty years. Consequently, the majority,

43.3 %, were more than 59 years old. Advance in age is a significant risk factor for blood pressure control (Elbur, 2015). Studies have established the increased prevalence of cardio-cerebrovascular problems among patients with essential high BP aged above 60 years (Sigh *et al*., 2015). However, from various studies, it has been established that the condition affects a much younger age group.

In other international studies, patients' age was positively significant with compliance score (Khayyat *et al*., 2019). This study showed a significant relationship between compliance to antihypertensive therapy and age (p=0.024). Patients between the age of 18-28 years old were more likely to be compliant than older patients. It was noted that as age increases, compliance to antihypertensive therapy decreases. These results are similar to a study conducted in Mumbai, India (Shah *et al.,* 2018; Getenet *et al*., 2019). According to various studies comparable with this finding, younger patients demonstrated good compliance to medical treatment (Teshome *et al.*,2017). This is because younger people can pay for their medication often. After all, they are working. However, others were of the contrast that young age is a cause of poor compliance to antihypertensive therapy (Al-Rah *et al*., 2015; Tibebu *et al*., 2017). This might be because of fear of medication side effects and the asymptomatic nature of high BP in the early stages.

In contrast, some studies found optimal compliance among older hypertensive patients (Khayyat *et al*., 2017). The hypertensive patients of more than 40 years but not more than 60 and 65 were more compliant younger age patients (Jankowska-Polanska *et al*., 2017). The compliance to antihypertensive treatment might be because the elderly patients mostly have comorbidities and so see themselves as very sick hence take their therapies sincerely.

In the present study majority of hypertensive patients were mostly female, 137(64.3%). This is comparable to the findings of another study in India (Amrita Sarkar *et al*., 2017). The predominance of the female may be because 43% of the patients fitted in the age group of more than 59 years, signifying postmenopausal women in the study.

In this study, most patients, 124(58.3%), had formal education, which means most respondents knew how to read and write. A significant association was demonstrated between patient's education and compliance to antihypertensive therapy (p=0.005). This study confirms the findings of previous studies in South Africa (Rampammba *et al*., 2018; Nielsen *et al*., 2017), which established medication compliance is associated with a patient's level of education. This is because formal education promotes patient awareness and understanding of high BP therapy instructions (Boima *et al*., 2015). Those patients with higher education levels may better understand the condition and aim to control the BP (Boima *et al*., 2015). A contrary study by (Arshia *et al.*, 2015) revealed noncompliance was higher for the educated. This means that hypertension management needs teamwork of all health personnel in educating the public.

A significant association was established between patients' monthly income and compliance to antihypertensive therapy (p=0.013). High-income earners (>Kshs 20,000) per month were more compliant than the lower, lower-middle, and upper-middle-income earners. An increase in patient income would somehow improve compliance to the therapy. A similar study in Iraq revealed that average social-economic status was associated with better compliance (Samin *et al*., 2015).

In Kilifi County health facilities, high BP medicines are offered free in level 3 and on a cost-sharing basis at level 4. However, due to frequent stock-outs of these medicines and late supply or non-supply, patients procure the drugs from private chemist/pharmacy at higher prices. Low-income earners would bear the brunt of high costs and hence impact negatively on their compliance. Most of the key informant reported that ignorance, poverty, and belief in herbal medications were significant factors in non-compliance, although the findings in this study did not reveal any association with alternative medicine

5.2.3 General Medical information of the respondents

In this study, patients with less duration (< 1 year) on hypertension treatment reported better compliance than patients with a longer duration on treatment (> 1 year) (p=0.005). This might be because of the perceived severity of high BP if medications are not taken promptly and hence persuade the patient to comply with recommended high BP treatment to avert severe complications (Tarkang *et al*., 2015). In these current study, duration of treatment of hypertension reduces antihypertensive therapy compliance by 0.383 times. As already known, an extended period on medicines doesn't automatically explain better compliance or good BP control (Rampamba *et al*., 2018). On the contrary, other studies found that patients who were on antihypertensive for a longer period showed better compliance than those who had it for less. This is because the extended duration of the condition helps the patient admit the diseased state, become knowledgeable about their health condition, and manage the disease appropriately (Gowada *et al*., 2019). The majority of the patients had uncontrolled>140/90mmHg 151(71%). This finding is equivalent to earlier studies in Africa, where the rate of BP control was very low (<10%)

(Lulebo *et al.*, 2015). This poor control may be due to insufficient knowledge, unavailability of hypertension drugs, among others. In this study, a low rate of BP control could clarify the prevalence of high BP-related complications reported by DHIS in Kilifi County. The majority of respondents used two hypertensive medications 138(64.8%), and 21.5% had comorbidities, with the majority being Diabetes mellitus. This correlates with a study by Mackuart & Kane (2019). The presence of comorbidity was significant but inversely associated with antihypertensive therapy compliance.

5.2.4 Level of knowledge of Hypertensive patients on High BP and compliance

Sufficient knowledge about high BP and its management and control is a critical part of successful management (Grime *et al*., 2014). This current study establishes poor knowledge (48.4%) on hypertension condition. Insufficient knowledge or low awareness and the asymptomatic nature of high BP are the main patient-related challenge (Rajesh & Vedathan, 2016). These current study findings are similar to knowledge levels observed in previous studies in Congo and Cameroon (Lulebo *et al*., 2015; Akoko *et al*., 2016). It reported that 32.6 % had poor, 53.4% had average, and 14.0% had adequate knowledge. Stress is the main risk factor for hypertension, as supported by a study done in Zimbabwe where 70.6% of hypertensive patients cited it as a high BP cause. In this study, stroke was mentioned as the main complication, contrary to a study done in Pakistan where heart complication was cited.

This present study revealed a statistically significant relationship between knowledge about high blood pressure treatment and compliance to antihypertensive therapy ($p<0.0001$). The result is comparable to studies done in Ethiopia and Pakistan. The

30 HKLS was used to measure knowledge on HTN as adopted from Jowasanka *et al.* (2019). This study revealed that the majority 103(48.4 %), close to a half of the patients, had insufficient knowledge on high BP. Of those with good knowledge, 15(36.65%) were more compliant than those with average and poor knowledge. Knowledge of High BP, treatment, prevention, and control was established to be positively associated with the compliance actions of patients. Knowledge increases antihypertensive therapy compliance by2.715 times and is essential for proper high BP control. However, in this present study, 103(48.4%) of patients showed poor knowledge.

In contrast, a parallel study was done in Ethiopia, Debre Tabor, Gondar, china, and Malaysia revealed that patients with sufficient knowledge of their condition and treatment had improved compliance in relation to those who did not (Ambaw *et al.*,2017; Getenet *et al.*,2019; Teshome *et al.*,2017). The probable description might be that knowledgeable hypertensive patients would understand well the significance of controlling high BP and would be more compliant with the therapy. However, in contrast, a study done in Pakistan and Quetta revealed a contrary association between compliance and knowledge (Akok *et al.,* 2017). Most of the key informants in this present study cited one of the challenges: high BP patients stopped taking their medication without the doctors' advice due to lack of knowledge.

5.2.5 Health service-related factors influencing respondents' compliance

The nature and quality of the affiliation, between the HCW and the patient, communication style, and the patient-centeredness of treatment choices all impact compliance (Burnier & Egan, 2019). Patients who contribute to decisions making on

their treatment are more compliant than patients who don't involve in themselves (Roumie *et al*., 2015).

This present study revealed a substantial affiliation between compliance to antihypertensive therapy and health care follow-up on the consistency of therapy (p=0.002). Patients who received health care follow-up were .548 less likely to be compliant. A similar study by Kumar (2014) found that regular medical follow-ups of patients were found to be important. Good patient –healthcare worker association builds a constructive attitude to therapy, trust the health facility and HCW and hence improve compliance (Mekonnen *et al*., 2018). A similar finding by Rahmatthulla *et al*. (2014) revealed that HTN patients who get extensive counselling from HCW regarding their condition management showed improved compliance to medications. More so, a study in India established improved compliance after broad education of the condition by HCW (Lavanya *et al*., 2015)

This study established an important association between distance from home and health facilities (p=0.003). In the current study, compliance was better among those who never failed to take hypertension drugs due to distance. In Ethiopia, a similar study found improved compliance as the distance to health facilities decreased. This displays that access to health institutions is a significant factor affecting compliance to therapy. This agrees with a key informant, a medical officer, who reported long-distance distance from health facilities would influence compliance to therapy by the patients.

In this study, a significant association between compliance to antihypertensive therapy and cost of hypertensive medicine (p=0.025). This is inconsistent with a study by (Baker 2019) which showed that noncompliance was among those who paid

out of pocket for medications. Most (58%) of the patients in this study failed once to take the prescribed drugs and tests because of the high cost. Binary logistic regression revealed that patients who did not fail to take drugs due to medication costs were 2.682 times more likely to be compliant with antihypertensive therapy. This is equivalent to a study conducted in Ethiopia (Mekonnen *et al*., 2017) and Shanghai (Yue *et al*., 2015). Patients may take their medications often if the cost of the medicines is reasonable or free, and therefore, this improves compliance to therapy.

According to most health providers in these studies, essential medicine, especially for hypertension, was mostly on stock-outs. A Similar study by Vedanthan *et al. (*2016) found that access to essential medicines for hypertension was the most cited challenge that affects compliance. This agrees with the majority (74%) of the patients in this study; most of the hypertension medicine prescribed by the health care provider was out of stock in the health facility pharmacy and hence made them purchase them from the private chemist which is expensive.

There was no significant association between high BP clinic appointments and compliance to therapy (p=>0.005). The majority, 74(34.7%), had no money for health care services, while 62(29.1%) had no time for refills of their high BP medicines in the health facility. This might be because most of patients were elderly. It's common for elderly patients to forget to take their medicine, change scheduled doses, and misuse the medications. This is constant with the study by Jambedu, (2016) which reported forgetfulness as the main factor for patient noncompliance

5.2.6 Summary of the study

Compliance to antihypertensive therapy remains the most significant modifiable factor in managing high BP, a preventable risk factor for cardiovascular complications and mortality. While compliance rate was low (14.6%) and knowledge level on high BP was also low (48.4%). The main obstacles cited by patients were mainly financial restrictions and forgetfulness to take medications or to attend scheduled high BP clinics. The Chi-square test indicated an important association between the patients' age, education, and income to compliance to antihypertensive therapy. In contrast, logistic regression indicated that level of knowledge on high BP, duration on treatment, Cost, and health provider advice were major factors that determined antihypertensive therapy compliance. Further research is recommended on finding and addressing barriers to compliance to therapy. This may lower the medical cost and prevent further decline in life quality-related consequences of high BP.

5.3 Conclusion

Compliance to antihypertensive therapy is central in the treatment and prevention of High BP. This reduces morbidities and mortalities related to high BP.

The objective on the proportion of compliance to antihypertensive therapy. In this present study, it was established that there was a low rate of compliance to antihypertensive therapy, 31(14.6%) among adult hypertensive patients in Kilifi County. Several reasons for poor compliance were observed, such as patient attitudes, social demographic factors, condition-related, and healthcare service-related factors. Independent predictors of compliance were duration of high BP, knowledge on high BP, HCW follow up and cost of high BP drugs

The objective on social demographics and influence on compliance to antihypertensive therapy. This study revealed an important association between compliance to antihypertensive therapy and age, education, and income. Better compliance to therapy was more likely to be observed among the younger age group18-28 years old, those with formal education, and high-income earners (> Khs. 20,000) per month.

The duration of High BP treatment showed a significant relationship with compliance to antihypertensive therapy. Those patients who were on treatment for 6months to 1year 12(30%) were more compliant when compared to those with more than 1-year treatment duration. It was found that patients with High BP for more than one year were .383 times less likely to be compliant with antihypertensive therapy.

The objective on the level of knowledge on high BP and compliance to antihypertensive therapy. The knowledge on hypertension among hypertensive patients was poor in this study. Close to a half 103(48.4%) of the patients with high BP had insufficient knowledge about their condition. At the same time, 46 (21.6%) of the respondents had good knowledge. A significant association between knowledge and compliance to therapy was found. Patients with sufficient knowledge were 2.715 times more probable to be compliant to antihypertensive therapy.

The objective on health service-related factors and compliance to antihypertensive therapy. Advice from healthcare workers on the importance of antihypertensive therapy, health care follow up on consistency of taking, leaving health facility without a refill of High BP medications, Cost of High BP medication, and distance from home to health facility was observed to have a significant association with antihypertensive therapy compliance. Those patients who received health care

follow-up were .548 less likely to be compliant, and those who did not fail to take drugs due to medication cost were 2.682 times more probable to be compliant to antihypertensive therapy.

5.4 Recommendations

This study established the rate of compliance to antihypertensive therapy (i.e., compliance to medications and Lifestyle modification) was much lower (14.6%). Prompt intervention is needed to improve compliance with antihypertensive therapy, which will eventually control high BP.

5.4.1 Recommendations from the study

The first objective was on the proportion of compliance to antihypertensive therapy. The Ministry of Health, County Government of Kilifi, ought to come up with targeted strategies that will ensure the provision of regular health education to all hypertensive patients attending medical outpatient clinics in health facilities within Kilifi County to improve compliance levels

The second objective was objective on social demographics and influence to compliance to antihypertensive therapy. Age was shown to be associated with compliance. Young patients were more complaint compared to other groups according to this study. The health facilities ought to develop interventions tailor-made to accommodate these groups to improve and strengthen their compliance with high BP medications. Such as adherence counselling sessions for the elderly and young patients which agrees with 70% of key informants interviewed.

The majority of patients were low-income earners, elderly and unemployed. Those who earned more showed optimal compliance. Therefore, a community insurance

scheme needs to be introduced for these patients to cover them because of out-of-pocket purchases of drugs when they are out of stock in the health facility.

Education was associated with compliance to antihypertensive therapy. Therefore, there is a need to ensure basic education for all populace because this study revealed patients with formal education had a positive influence on compliance. Formal education to the population is the key to ensuring optimum compliance to treatment

The third objective was on the level of knowledge on high BP. Knowledge of high BP and its treatment was an independent predictor of compliance to antihypertensive therapy. Health facilities managers/personnel and other stakeholders should ensure routine health promotion/education on high BP. Create awareness on high BP risks, treatment options, the importance of medication compliance, recommended lifestyle interventions, and high BP complications. Knowledge has been proofed to improve compliance of medication, hence should be adopted by the facility in charges as a critical factor of management in high BP condition

The fourth objective was on health service-related factors and influence on compliance to antihypertensive therapy. Health care providers ought to ensure that they regularly advise HTN patients on the significance of compliance to therapy. This is because healthcare provider follows up on the consistency of therapy was an independent predictor of compliance. Good patient –healthcare provider relationship is important. It provides an opportunity for patients to interact, ask questions about their illness, and healthcare workers offer advice about behaviour change to the patient.

The majority of the patients (74%) sometimes have failed to take High BP medicines because they were unavailable in the hospital, which is constant with most key

informant responses. Through Health facilities management, Kilifi County Government should ensure a consistent supply of antihypertensive medicines to avoid patients missing medications, especially those who can't buy from private health facilities.

Most patients cited the cost of high BP medicines as a barrier to compliance (58%). Health facilities, especially level 4 health facilities, should identify needy patients, including the aged, and waive them the cost-sharing fee to ensure constant supply (refill) of antihypertensive medications

5.4.2 Recommendations for further research

I suggest that further studies are done on health facility-related factors in establishing reasons why high BP patients who were advised and followed up on their treatments by HCW do not always comply with the recommendations as expected of them.

Additional studies are suggested to assess other probable factors that influence compliance of high BP medicines that were not assessed in this current study, such as social support and mobile phone technology's usefulness on compliance.

Finally, further studies are recommended on the high-risk groups to poor compliance (the elderly, those with no formal education and with poor knowledge) to explore the effects of interventions

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APPENDICES

Appendix I: Informed Consent Form

Introduction

Hello! My name is John Moss. I am a postgraduate student at Kenyatta University studying for a Master Degree in Public Health. As part of the requirement for fulfilment for my master's degree award, I am conducting a study **on the determinants of compliance to prescribed antihypertensive therapy among adult hypertensive patients in Kilifi County.**

Procedure

Participation in this study will require that I ask you some questions, examine you, and take Bp. I will record the information from you in a questionnaire. You have the right to refuse to participate in this study, and your decision will not change the care you will receive from this hospital today or any other time. Participation in this study is voluntary, and you may refuse to respond to any questions or stop the interview at any time without any consequences to the services you receive from this hospital. You may also ask questions related to the study at any time.

Risks and discomfort

You may refuse to answer any question that may cause embarrassment or any form of discomfort. You may also stop the interview at any time. The interview may add approximately 35 minutes to the time you spend in the hospital receiving health care. There is no physical harm expected from this study; as participants, you will be interviewed, and your blood pressure is taken at some point.

Benefits

Although you may not benefit directly as an individual, you will help us understand the extent of hypertension and compliance with its therapy. This information is

important in improving the control and management of hypertension. More so, it will help in tailoring programs and policies to improve health.

Reward

By agreeing to participate in this study, you will not receive any form of reward

Confidentiality

Confidentiality will be maintained by ensuring that data collection tools will NOT bear names or other particulars for identification. The identity of respondents will not be disclosed or shared with any other person. All the information obtained from the study will be kept safe.

Contact Information

In case you may have questions about this study now or later, you may contact my Supervisors, Dr. H. Kimani, on tel; 0725 552 475 or Dr. I. Mwanzo on tel; 0729 932 026 or myself John Moss (Principal investigator) on tel; 0722 304 955.

However, if you have questions about your rights as a study participant, you may contact Kenyatta University Ethical Review Committee Secretariat on chairman.kuerc@ku.ac.ke or tel+254(20)8714388.

Consent

Tell me whether you have accepted to take part in the study?

Yes [ ] No [ ]

Respondent's statement

The above information regarding my participation in the study is clear to me. I have been given a chance to ask questions, and my questions have been answered to my satisfaction. My participation in this study is voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that I will still get the same care and medical treatment whether I decide to leave the study or

not. My decision will not change the care I will receive from the hospital today or get any other hospital time.

Name of Participant……

Signature/Thumbprint……Date……

Investigator statement

I, the undersigned, have explained to the participant how the participant understands the procedures to be followed in the study and the risks and benefits involved.

Name of the interviewer …… John Moss…….

Signature of interviewer……. ……Date……

Appendix II: Questionnaire for adult hypertensive patients

Questionnaire number ……

INSTRUCTIONS

1) Please do not write any name in the questionnaire

2) Write in the spaces provided where no response

3) Tick the responses in the box provided

4) Refusal codes: -888 REFUSED, 999 NOT APPLICABLE

PART 1(A): SOCIAL DEMOGRAPHICS PROFILE

Please tick inside the box

1. What is your age?

1)18-35 years [ ] 2)36-49 years [ ] 3)50-59 years [ ] 4) ≥ 60years [ ]

2. What is your Gender?

1) Male [ ] 2) Female [ ]

3. Marital Status

1) Married [ ] 2) Single [ ] 3) Separated/ Divorced [ ] 4) Widowed [ ]

4. What is your religion?

1) Muslim [ ] 2) Christian [ ] 3) Hindu [ ] 4) Others Specify…

5. What is your highest level of education attained?

1) No formal education [ ]2) Primary [ ]3) Secondary [ ] 4) Tertiary (College/ University) [ ]

6. What is your current occupation?

(1) Student [ ] (2) Employed [ ] (3) Self Employed [ ] (4) Unemployed [ ]

7. On average what is your monthly income?

1) <5,000[ ] 2)5,000-10,000[ ] 3)11,000-20,000[ ] 4) >20,000[ ]

PART 1(b) General Medical Information

1. What is your BP reading today? Systolic BP……Diastolic BP……. (*Measure or check medical record for patient today's BP and tick appropriately below*)

2. 1) Controlled < 140/90mmHg [ ] 2) Uncontrolled ≥140/90mmHg [ ]

3. For how long have you had High BP?

1)6months to 1year [ ] 2) More than one year [ ]

4. How many kinds of High BP medications are you taking currently? (*Check patient's medical records for the High BP drugs)*

1) One [ ] 2) two [ ] 3) More than two [ ]

5. What other medical conditions do you have apart from High BP? Name them

a……..,b……,c ……d……..

6.Have you ever taken alternative medicine (*e.g., herbal, traditional medications, supplements etc.*) instead of High BP drugs?

1) Yes [ ] 2) No [ ]

15. PART 2 (a):-Assessing respondent's compliance status (Mo risky Medication Adherence Scale 8 items (MMAS-8) *Please tick* ✓ *in the boxes*

		Yes=0	No=1
1	Do you sometimes forget to take your High BP medicines?		
2	People sometimes miss taking medication for reasons other than forgetting. In the last 2 weeks, were there any days when you did not take your High BP medications?		
3	Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?		
4	When you travel or leave home, do you sometimes forget to bring along your High BP Medication?		
5	Did you take your high BP medication yesterday***? (if responds Yes tick No)***		
6	When you feel like your High BP is under control, do you sometimes stop taking your medications?		
7	Taking medicine every day is a real inconvenience for some people. Do you ever feel under pressure about sticking to your High BP treatment Plan?		

8	How often do you have difficulty remembering to take your medication? a)All the time[ ] b)Usually[ ] c)Sometime[ ] d) Occasionally[ ] e)Never[ ] ***Note; if response(e)tick =NO) if response is a ,or b ,or c ,or d tick= YES in the box)***		

1 = NO: -Compliant (6-8pts) 0=YES: -Non-Compliant ≤6 pts.

16. PART 2 (b):-Assessing respondent's compliance status-life style modification

(4 is Yes=1, 1-3 is N0 =0

1. How often do you eat salty food?

1) All the time [ ] 2) Usually [ ] 3) Sometime [ ] 4) Never/rarely [ ]

2. How often do you take fruits and vegetables?

1) Never/ rarely [ ] 2) Sometime [ ] 3) Usually [ ] 4) All the time [ ]

3. How often do you take alcohol?

1).All the time [ ] 2) Usually [ ] 3) Sometime [ ] 4) Never/rarely [ ]

4. How often do you smoke tobacco?

1) All the time [ ] 2) Usually [ ] 3) Sometime [ ] 4) Never/ rarely [ ]

5. How often do you do physical exercise? *E.g. running, swimming, walking etc.*

1) Never/ rarely [ ] 2) Sometime [ ] 3) Usually [ ] 4.)All the time [ ]

NOTE: - *4-3 compliant =1, 1-3 Non-compliant=0*

17. PART 3: Respondents Knowledge on Hypertension (HKLS)

***NOTE*: All correct answers tick Yes, ✓ all wrong answers tick NO ✓**

	Yes= 1	**No= 0**	**Don't Know =2**
1. Do you know the values above which blood pressure is described as high*? (Patient to say values)above SBP-* ***140mmhg/ DBP 90mmhg*** *is correct)*			
2.Do you know the values in which blood pressure is described as normal? *(patient to say values)SBP* ***80-120mmHg/DBP 60-80****mmHg is correct)*			

3. Elevated Blood Pressure is also called hypertension(*yes*)			
4. The older a person is, the greater risk of having high blood pressure*? (yes)*			
5.Stress can cause High Blood Pressure(yes)			
6.High Bp is caused by witchcraft*(no)*			
7.Usually, High BP presents with signs and symptoms*? (no)*			
8.Both men and women have an equal chance of developing High blood pressure? (*no)*			
9.Medication alone can control High blood pressure*(no)*			
10. Medication for high blood pressure can be stopped once high BP is controlled (Normal)? (*no*)			
11.High Blood Pressure is a treatable condition*(no)*			
12. Do you know the doses of your High blood pressure medications?			
13. Do you know the possible side effects of your high blood pressure medications?(Name)			
14. Drugs for high blood pressure must be taken every day (*yes*)			
15.Individuals with high blood pressure must take their medication only when they feel ill (*no*)			
16.Individuals with high blood pressure must take their medication throughout their life (*yes*)			
17. The best cooking method for High BP person is frying *(no)*			
18. The best cooking method for High BP person is boiling or grilling (*yes*)			
19.Individuals with high blood pressure can eat salty foods as long as they take their drugs regularly (*no*)			
20.Individuals with high blood pressure must eat fruits and vegetables frequently (*yes*)			
21. Red meat is the best type of meat for individuals with high BP (*no*)			
22.White meat is the best type of meat for individuals with high BP (yes)			
23.High blood pressure individuals must not smoke (*yes*)			
24.Individuals with high blood pressure can drink alcoholic beverages (*no*)			
25. Regular physical activity reduces persons chance of developing high blood pressure?(yes)			
26. High blood pressure can cause strokes if left untreated (*yes*)			
27. High blood pressure can cause heart diseases, such as heart attack if left untreated (*yes*)			
28.) High blood pressure can cause premature death if left untreated (yes)			
29. High blood pressure can cause kidney failure if left untreated (*yes*)			
30. High blood pressure can cause visual disturbances if left untreated (*yes*)			

NOTE: - ≤ 17pts Poor knowledge. =0, 18-23 pts. Average knowledge pts. =1,>24 Good knowledge pts. =2 Total pts. …

21. PART 4:- Respondent's health service-related factors

1. How often do you miss your scheduled High BP clinic appointments?

1) Never/ rarely [ ] 2) Sometime [ ] 3) Usually [ ] 4) All the time [ ]

2. If some time or usually or all the time in (Q1) above, why?

a……,b……c……

3. After being diagnosed & issued with High BP drugs, did the health care provider attending to you gave you a clear advice on the importance of taking those drugs, lifestyle changes, and follow-up clinics?

Very clearly [ ] Not clearly [ ] Never [ ]

4. During your follow-up of high BP medical clinics, how often does the health care provider attending to you ask if you are taking your High BP drugs consistently?

1) Never/ rarely [ ] 2) Sometime [ ] 3) Usually [ ] 4) All the time [ ]

5. How often do you leave this hospital before obtaining your High BP drugs?

1) Never/ rarely [ ] 2) Sometime [ ] 3) Usually [ ] 4) All the time [ ]

6. If *sometimes or usually or all-time in* (Q5) above, what are the reasons for leaving?

a……b……..c……

7. Are there any challenges you face by taking your High BP medications? (*Name them*)

I. ……..

II. ……

III. ……

8. How often have you failed to take High BP drugs because they were unavailable in the hospital pharmacy?

1) Never/ rarely [ ] 2) Sometime [ ] 3) Usually [ ] 4) All the time [ ]

9. Is there a time you failed to take the High BP drugs because of the cost of those drugs?

1) Yes [ ] 2) No [ ]

10. Is there a time you failed to take High BP drugs because of the side effects of those drugs?

1) Yes [ ] 2) No [ ]

11. If yes in (Q10) above give

examples……,……..,…….

12. Is there a time you failed to attend your high BP follow-up clinics and refill High BP drugs because of the distance from home to the hospital?

1) Yes [ ] 2) No [

……THE END……..

Thank you for your time

Appendix III: Key informants interview tool

NUMBER …….

INSTRUCTIONS

- Please do not write any name in the questionnaire
- Write in the spaces provided where no response
- Tick the responses in the brackets provided

1. Your Gender? Male [ ] Female [ ]

2. What is your Occupation Nurse [ ] Clinical officer [ ] Medical Officer [ ]

Nutritionist [ ] other Specify……..

3. How long have you worked in the health service? 1-5 years [ ] 6-10 years [ ]

more than 10years [ ]

4 How long have you worked in a medical outpatient clinic? 0-1 year [ ] more than 1 year [ ]

5. Are the national guidelines on managing cardiovascular diseases/HTN handbook available for reference in the clinic? Yes [ ] No [ ]

6. In your view, do all hypertensive patients comply with High BP medication taking and medical follow-up clinic schedule? Yes [ ] No [ ]

7. If No in (8) above, what reasons have they given for not complying?

i. ……

ii. ……

iii. ……..,

8. In your view, are there any measures put in place to address the above factors?

No [ ] Yes [ ]

9. If yes, which ones?

i. ……

ii. ……

iii. ……

10. In your practice, have you observed any social-cultural factors that have affected the patient's compliance with hypertension medications? Yes [ ] No [ ]

11. If yes, in (12 above) state, which are they?

i. ……

ii. ……

iii. …….

12. In your view, which are some of the health service factors that affect the compliance of antihypertensive medications?

i. ……., iv. ……

ii. …… v. ……

iii. ,…… vi. …….

13. In your own opinion, what do you think about hypertensive patients:-

a. Knowledge on hypertension?.....

……

….

Perception of hypertension?

……

……..

14. From your experience over the years, what do you think needs to be done to improve compliance levels at the clinic?

i. ……..

ii. ……..

iii. ……

15. Hypertension is known as a ‘silent killer’ what do you recommend to be done to improve its awareness and management

i. …….

ii. …….

iii. …….

16. What challenges do you face when dealing with hypertensive patients at the clinic?

i. ……..

ii. …….

iii. …….

20. What are the compliance levels (%) of High Bp drugs recorded in the clinic over the last 3 years if any? …….

21. Hypertensive patients normally miss their doses. What do you think makes them miss or don’t miss their doses?

i. …….

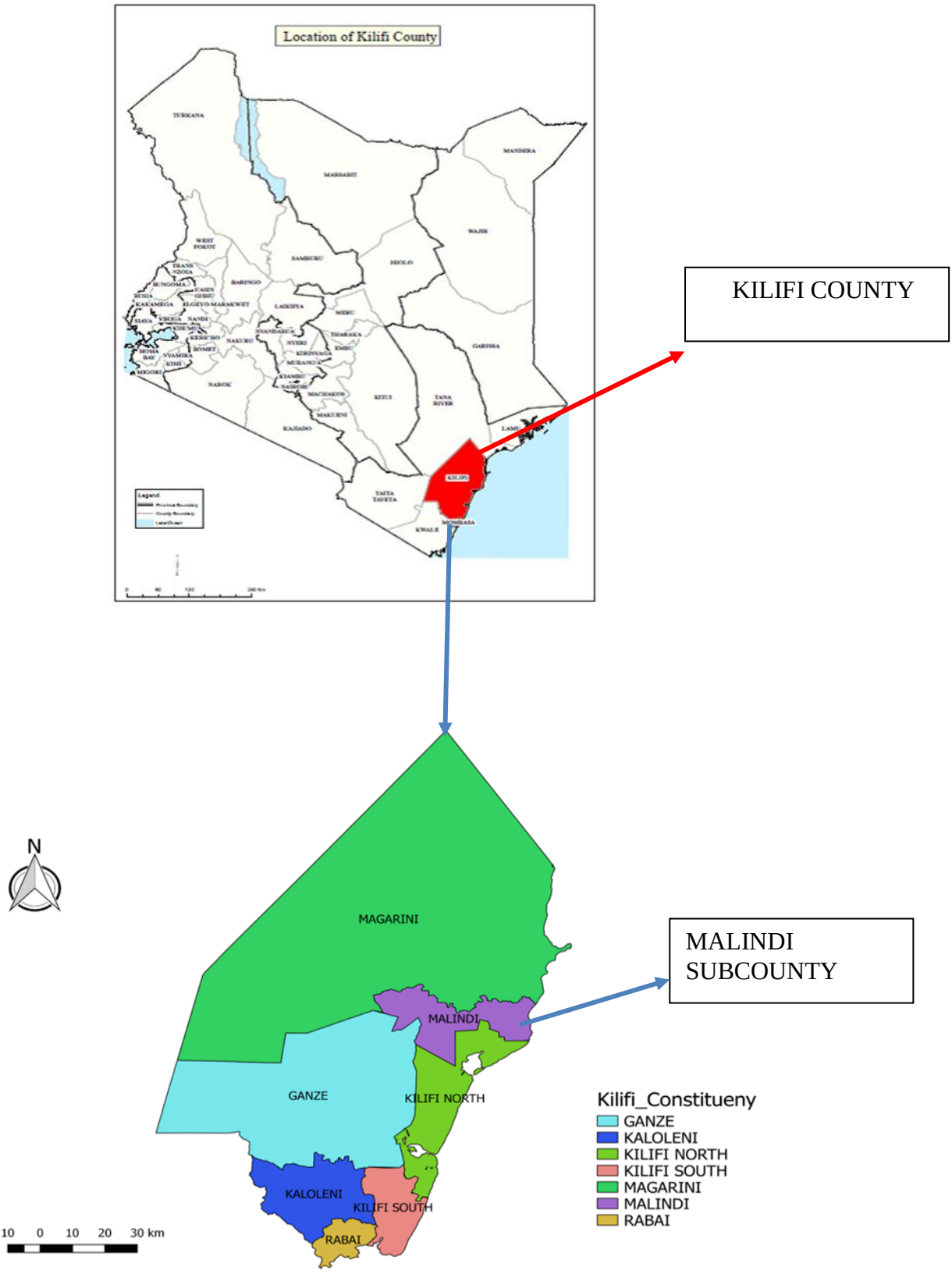
ii. ……

iii. …….

……*END*……

Thank you

Appendix IV: Map of the Study Area



Source: KNBS/IEBC,2017

Appendix V: NACOSTI Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 366371

Date of Issue: 31/March/2020

RESEARCH LICENSE

This is to Certify that Mr., john Titus K mass of Kenyatta University, has been licensed to conduct research in Kilifi on the topic: DETERMINANTS OF COMPLIANCE TO ANTIHYPERTENSIVE THERAPY AMONG ADULTS HYPERTENSIVE PATIENTS IN KILIFI COUNTY KENYA for the period ending : 31/March/2021.

License No: NACOSTI/P/20/4680

366371

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies
5. The License does not give authority to transfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one of completion of the research
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice

National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

Appendix VI: Research Authorization Department of Health Kilifi County

COUNTY GOVERNMENT OF KILIFI

DEPARTMENT OF HEALTH SERVICES

When Replying quote
Email; chmtkilifi@gmail.com
REF: HP/KCHS/VOL.XL/85

P. O. Box 9-80108
Kilifi
Date: 19th March 2020

OFFICE OF THE COUNTY DIRECTOR

John T Moss,
Kenyatta University
Student ID: Q57/38155/2017
P.O Box 43844-00100
Nairobi.

Dear Sir,

RE: DEPARTMENTAL AUTHORIZATION TO CARRY OUT RESEARCH IN KILIFI COUNTY

The Kilifi County Department of Health Services is in receipt of your request to conduct a study titled, **"Determinants of compliance to antihypertensive therapy among adults' hypertensive patients in kilifi county Kenya"** that has received ethical and scientific approval from Kenyatta University Ethics Review Committee
Ref: **PKU/2100/11247.**

The Department is glad to grant you authorization to conduct your study within **Malindi Sub County Hospital, Gongoni, Muyeye and Marereni Health Centres** in line with the approved study protocol and within the expiry date of your ERC approval **March 13th, 2021**. It is required that you engage the Sub County and hospital administration prior to commencing data collection.

Upon completion of the study, you are required to share your study findings, conclusion and recommendations with the County Director, Department of Health Services, Kilifi County.

Sincerely,

COUNTY DIRECTOR OF HEALTH
KILIFI COUNTY
18 MAR 2020
P. O. Box 9 - 80108, KILIFI

pp Dr. David Mulewa
Director of Medical Services -Kilifi County

c.c
- CECM-Health Services
- Chief Officer Public Health
- Chief Officer Medical Services
- Director of Administration
- Director of Public Health

Appendix VII: KU Graduate School Research Approvals

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Internal Memo

FROM: Dean, Graduate School **DATE:** 28th February, 2020

TO: **Mr. John T. K. Moss**
C/o Department of Community Health & Epidemiology
REF: Q57/38155/2017

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting on **26th February, 2020**, approved your Research Proposal for the M.P.H. Degree entitled, **"Determinants of Compliance to Antihypertensive Therapy among Adults Hypertensive Patients in Kilifi County Kenya."**

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation and Ethics Review Committee, Kenyatta University.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking and Progress Report Forms per semester. The forms are available at the University's Website under Graduate School webpage downloads.

KENYATTA UNIVERSITY OFFICE OF DEAN 28 FEB 2020 GRADUATE SCHOOL P.O. Box 43844-00100 NAIROBI

Thank you.

EDWIN OBUNGU
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Community Health & Epidemiology Department
Supervisors:

1. Dr. Harun Kimani
   C/o Department of Community Health & Epidemiology
   Kenyatta University
2. Dr. Isaac Mwanzo
   C/o Department of Community Health & Epidemiology