

**PATIENTS AND SYSTEM RELATED FACTORS ASSOCIATED WITH NON
-ADHERENCE TO ANTIHYPERTENSIVE MEDICATION AMONG
PATIENTS AT CHUKA REFERRAL HOSPITAL, KENYA**

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Requirements for the Award of the Degree of Master of Science in Nursing
(Community Health) of Chuka University**

CHUKA UNIVERSITY

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been presented for an award in any other University or Institution.

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Recommendation

This thesis has been examined, passed and submitted with our approval as the University supervisors.

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DEDICATION

I dedicate this thesis work to my beloved family in appreciation for their love and steady support during my studies.

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ABSTRACT

Non-adherence to hypertensive medication continues to become contributing factor to hypertensive complications like stroke, heart attacks, kidney disease heart failure Non-adherence prevalence to treatment with antihypertensive is not known but it's thought to be on the rise. Associated factors of non-adherence are complex, are both internal and external to the patient but are difficult to extrapolate. Reports from Chuka referral hospital records showed that in 2016 there were 140 patients with hypertensive complications from 560 patients who attended the medical clinic that year. A descriptive study design was adopted to guide the implementation of the study. The population comprised of 575 people among them doctors, pharmacists, nurses, record officers and hypertension patients. The respondents were identified through simple random sampling for patients and a sample size of 81 was achieved, and census sampling for health care workers to include doctors, pharmacist, record officers and nurses and a sample size of 10 health care workers was also achieved. Data was collected between the month of April and May 2019. Questionnaire were used as data collection tools for the patients while the interview schedule was conducted to health care providers through an interview guide. Inferential and descriptive statistics were used for data analysis, aided by SPSS version 25. The study revealed a significant negative correlation ($r_{pb} = -0.23$, $p < 0.05$) between age and non-adherence, significant positive correlation with monthly income($r_{pb} = 0.24$), $p = 0.04$), non-significant relationship between non-adherence and marital status($r_{pb} = -0.13$), $p = 0.25$ and patients' level of education($r_{pb} = -0.06$), $p = 0.57$. 64% of the patients stated that they had missed medication. The overall model of patient related factors were found to be significant ($p < 0.05$) and these included ,cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and sociocultural factors. However, it's only age ($p = 0.01$), religious beliefs ($p = 0.04$), and cost of medication ($p < .05$) that were individually, significant predictors to non-adherence. The overall model of health system related factors were found to be significant ($p < 0.05$) and this included; quality of health service, physician patient relationship, stock out, health education, and availability of medicine,($p = 0.012$) Hypertension medication nonadherence is a major problem at Chuka level five hospital. This was due to lack of funds, time, forgetfulness and patient thinking that they had healed thus continuous follow ups to improve adherence, positive reinforcement to increase motivation in order to address forgetfulness, and supply of constant and subsidized hypertensive drugs to the hospital is necessary to prevent patients from missing the drug. There is need for a continuous supply of hypertension to the hospital to prevent patients from missing the drugs especially those who cannot afford to purchase them from private chemists. There is need to reduce out of pocket payment through establishment and strengthening of the community health insurance scheme. The study recommends that the hospital should set aside some resources for making patients' follow ups especially those treated and left to go home, discussions be made with patients on severity of non-adherence and importance of adherence, use of positive reinforcement to increase motivation and mechanism to be put in place to subsidize the cost of medication.

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LIST OF ABBREVIATIONS AND ACRONYMS

APHRC	African Population and Health Research Center
ASH	American Society of Health
BP	Blood pressure
CAD	Coronary Arterial Disease
CERAG	Clinical Effectiveness Research Agenda Group
COM-B	Capability, Opportunity and Motivation (COM) B behavior
CVD	Cardiovascular Diseases
GFR	Glomerular Filtration Rate
HPT	High blood pressure
HCP	Health Care Provider
HF	Heart Failure
HTN	Hypertension
JNC	Joint national committee
LVH	Left Ventricular Hypertrophy
MmHg	Millimeter of mercury
MOMS	Ministry of medical services
MSc	Masters of Science
NACOSTI	National Commission for Science Technology and Innovation
NCD	Non-communicable diseases
SPSS	Statistical Package for Social Sciences
TDF	Theoretical Domain Framework
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Hypertensive medication non-adherence continues to become the common cause of hypertensive complications like heart attacks, heart failure, stroke and other complications (WHO, 2013). One way of managing hypertension (HPT) to an optimal blood pressure control level is by use of antihypertensive medication. The success of antihypertensive drugs is well recognized and has been measured in terms of reduction of overall relative risk of cardiovascular disease and other hypertensive complications like stroke and as well as lower healthcare costs (Dragomir *et al.*, 2010). Hypertension condition has remained to be known as the main common reason of cardiovascular-related morbidity and deaths globally (Crim *et al.*, 2012). The definite prevalence of non-adherence to hypertensive medication is unknown. The available data propose that poor adherence could be more common than complete adherence to antihypertensive medication (Hendriks *et al.*, 2012, Mazzaglia *et al.*, 2013)

Poor hypertension control results mostly due to non-adherence to medications. Approximately 45-81 percent of patients worldwide with HPT have poor blood pressure control (Persell, 2011). Despite the widespread availability of antihypertensive medications, national hypertensive guidelines for detecting and treatment, and regular interactions with the system in health, a significant number of detected hypertensive adult's remain with poor controlled blood pressure (Panjabi *et al.*, 2013). This may be due to non-adherence to medication, diet and lifestyle causes, interfering medications, or underlying diseases.

Compliance to hypertension drugs is a key factor to avoiding poor controlled hypertension and the possibilities of developing complications linked to hypertension for example renal failure, heart attacks, strokes and eye complications which are dangerous and can lead to sudden death (Desimioni *et al.*, 2013, Brinker *et al.*, 2014). Additionally, patients with unrecognized non-adherence most often go through numerous further investigative tests which are invasive and more costly some times, and in expert centers to detect reasons of their poor response to antihypertensive treatment. Additionally, patients who do not adhere to antihypertensive therapy fail to

achieve the confirmed benefits of BP lowering therapy and continue to be at high risk of cardiovascular complications (Perreault *et al.*, 2012, Corrao *et al.*, 2011).

Antihypertensive medication non-adherence is a possible causative factor to the event of hypertensive complications. A number of analyses have revealed that in developed countries, not adhering to long term therapeutics including HPT therapy in the population, has high prevalence (Arshia *et al.*, 2010). Mathenge *et al.*, (2010) revealed that only 29% of patients under treatment had their BP contained in the recommended levels of < 140/90 mmHg. Non-adherence to hypertensive medication in many hospitals is characterized by failure to refill the regimen, failing to honor appointments, patients stopping medication when they felt better or due to the side effects. Several approaches have been tried to explore the drugs taking behavior and the traditional methods like clinical reports, pill counts, and patients reported measures and prescription refills were examined. Studies identified income, age, gender and education as demographic factors leading to hypertensive medication non adherence (Bruce *et al.*, 2015). Such demographic investigation are essential, but they have a tendency to limit comprehension of the multifaceted set of influences that in collaboration or on their own effect non-compliance in regards to termination of taking medication or omitting dosages (McMullen *et al.*, 2015).

Studies involving anti-hypertensives have been conducted in developed countries (Cho & Kim, 2014) and very few in developing countries and it has been found that medication non-adherence is multifactorial (Arshia *et al.*, 2010). A study by Mathenge demonstrated that the associated factor to non-adherence surrounds patients and health care systems (Mathenge *et al.*, 2010). The WHO acknowledged that inadequacies and complexity with healthcare systems contributes to obstacles in optimum adherence to medication (WHO, 2012). Health system related factors according to WHO (2013) includes, quality of health care services, distance, physician patient relationship and stocks out, guideline for management, cost of drug and distance. Patients associated factors includes social economic status, patients beliefs, race/ethnicity, health literacy, and others. Studies have been conducted on patients related factors which have revealed that age influences adherence of hypertensive medication (Atinga *et al.*, 2018, Buckley *et al.*, 2016, Lewis, 2012) Education status has also been shown as a significant factor for non-adherence to antihypertensive medication (Wu *et al.*, 2012; Zyoud *et al.*, 2013),

however other studies oppose the results finding (Nunes *et al.*,2015). (Magadza *et al.*, 2009) revealed that patient's beliefs should also be well-thought-out to give a comprehensive depiction of non-adherence.

Despite the more knowledge and various advances through compliance/adherence research, non- adherence rate have continued unchanged in the last decade. (Primatesta *et al.*, 2006, Hashmi *et al.*, 2007) On contrary Kaufman & Birks (2009) found out that lack of knowledge and established facts is a reason for medications non-adherence and thus most hypertensive patients do not attain optimum BP control and fails to reap maximum benefit of medical treatment. (Brunier, 2015)

The development of a sustainable, systematic healthcare system in Kenya is designed to benefit all the country citizens, including prevention of common health issues and disease-related complications, and to ensure public wellbeing is the focus of the healthcare service. The government in Kenya is intent upon creating mechanisms to improve and implement comprehensive health service programmes through the Ministry of Health (MOH), as well as other related health organizations. (Kioko, 2017). Accordingly, the MOH has adopted a number of programmes and health policies designed to prevent, detect, evaluate and treat non-communicable diseases, one of which is hypertension (MOH, 2018)

Healthcare system sustenance to patients with hypertension has a substantial role in enhancing adherence to HPT treatment. Support related to patients with hypertension in relation to adherence activities contemplates elements of providing information that is supporting or helpful in regards to the recommended medications. Successful management of hypertension relies on comprehension, endurance of hypertension care, and link with health education. The chief emphasis of provision of information resources or educational support is to benefit patient with hypertension to follow medical instruction on drugs and highlight the significance of performing health examinations and screening periodically (Al-Khaldi & Al-Sharif, 2015). Providing educational sessions or educational material through conduction of educational interventions, provide patients with facts concerning their health condition and treatments which can help to better HPT treatment compliance (Beune *et al.*, 2014) Physician communication is a helpful predictor of adherence to medication thus if

physician communication is poor can result to non-adherence to medication (Zolnierek & Dimatteo 2012). A study by Schoenthaler *et al.* (2013) also found that good communication between patient and clinicians led to good patient-client relationship which is a significant predictor increasing adherence to medications.

Non adherence outcome places the burden to economy which affects the decision on how to make use of the scarce health resources, can lead to absenteeism or low work productivity or even can lead to premature deaths. Non-adherence outcome on health by not complying to treatment properly can result to drug resistance, progression of disease, treatment failure, tolerance to drugs and drug related morbidity (Psaty *et al.*, 1990).

This study was thus expected to identify some of these factors influencing non-adherence to antihypertensive medication at local level due to some differences in cultural background or effects of the health system and thus would enable the clinicians to concentrate more on those subgroups at higher risk of low adherence. Interventions will be tailored towards those found to be at risk of poor adherence and will impact positively in improving adherence levels to hypertension treatment. Reports from Chuka referral hospital records showed that hypertension was amongst the top leading causes of both outpatient and in-patient morbidities and mortalities. In 2016, 560 hypertensive patients attended Chuka referral Hospital with hypertension, 140 with hypertensive complications out of which 16 died due to hypertension complications (Chuka, 2016).

1.2 Statement of the Problem

The medical treatment non-adherence remains a great challenge to social scientist and medical professions. It has been recognized that antihypertensive medication non-adherence is the most significant cause of poor controlled blood pressure (BP). Despite the more knowledge and various advances through compliance/adherence research, non- adherence rate have continued unchanged in the last decade. Consequently, most patients with hypertension do not achieve optimal control of blood pressure and fails to reap total benefit of medical treatment. This result to poor outcomes in health, burden in health care cost and lower quality of life. Associated factors of non-adherence are

complex, are both internal and external to the patient but most significantly, and are difficult to extrapolate. This can partly be because the determinants of non-adherence to hypertensive, may have a locality effect due to many factors such culture and health system in a given locality. At Chuka referral hospital out of 560 hypertensive patients followed in the clinic, 140 had hypertensive complications. Therefore, there was need to study the factors associated with non-adherence at a local scale.

1.3. Objectives of the Study

This research was guided by both broad and specific objectives.

1.3.1 Broad Objective

To evaluate factors associated to non-adherence to antihypertensive medication among patients followed up at Chuka referral hospital

1.3.2 Specific Objectives

- i. To establish patient related factors associated with non-adherence to antihypertensive medication among patients followed at Chuka referral hospital.
- ii. To establish health system related factors associated with non-adherence to hypertension medication among patients followed at Chuka referral hospital.

1.4 Specific Hypotheses

H0₁: There is no statistically significant association between patient related factors and non-adherence to anti-hypertensive medication among patients followed at Chuka referral hospital.

H0₂: There is no statistically significant association between health systems related factors and non-adherence to antihypertensive medication among patients followed at Chuka referral hospital.

1.5 Significance of the Study

The study finding will be of significance to patients, the overall population, health workers and the county government. The results findings will be shared to patients attending the hypertensive clinic, health care workers or interested parties at arranged

seminars or workshops. Patients' compliance to hypertensives drugs would thus be enhanced significantly and therefore prevent medication non-adherence faced in drug management. Hence much savings of investments on the pharmaceutical financial plan for both patient and the entire government since cost of management and treatment will be minimized.

1.6 Operational Definition of Terms

The following terms are operationally defined as follows in the study:

Adequate Blood Pressure Control: Maintaining blood pressure levels below those considered for diagnosis of hypertension (140/90 mmHg). For this study is maintaining blood pressure below 140/90 mm of mercury.

Adherence/ Compliance: This refers to the agreement of the patient to the drugs or therapeutic advice that is taking doses of medications and sticking to the treatment plan.

Blood Pressure: Force or pressure applied by blood against the walls of arteries as a result of the pumping action of the heart.

Co morbidity: Additional diseases occurring with a primary disease. For this study it is additional chronic conditions to hypertension

Health System Related Factors: are influences that decrease the utilization of health care services

Hypertension: Recurrently elevated blood pressure with a systolic pressure above 140 mmHg or a diastolic pressure above 90 mmHg in this study hypertension is two apart readings of elevated blood pressure above 140/90mmhg.

Hypertensive Patient: patients with high blood pressure, for this study it will be used to refer to patients with high blood pressure and has already been started on antihypertensive medication.

Medication non-adherence/Noncompliance: is the number of doses not taken or taken incorrectly that jeopardizes the patient outcome. For this study is the failure in compliance to taking of drugs prescribed.

Patient Related Factors: are influencing and causal factors that that contribute to the patient non-adherence and may mitigate the outcome of non-adherence

Stocks Outs:

Lack of certain commodity at a time, for this study it means situation in which the antihypertensive are out of stock

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Hypertension

Hypertension is a chronic medical condition characterized by raised (BP) of 140/90 of mercury (mmHg) or more in individuals aged above 18 years. This also relates to those subjects who are on hypertensives medication even though their present BP is lower than 140/90mmhg, Ministry of Health (MOH, 2018). HPT is among the most prevalent non-communicable disease which contributes to high morbidity and mortality rate globally. The overall prevalence of elevated BP in 2010 was around 31%. In high income countries the prevalence was 28.5% and 31.5 in middle and low income countries (Mills *et al.*, 2016). Transversely the World health organization (WHO) regions, Africa had the highest occurrences of elevated BP of 46% for both genders combined (WHO, 2018). According to a study carried out in Kenya, 24% of Kenyans had either raised blood pressure or were on antihypertensive drugs. The study reiterated that 56% of Kenyans have never undergone screening for hypertension. Additionally only 15% of individuals with hypertension knew their status, 8% are on medication and only 4.6% of patients on treatment have well controlled BP levels (STEPS, 2015).

Non-adherence to chronic medication regimen is common, approximately 43% to 65.5% of patients who fail to prescribe regimen are hypertensive's patients (Tadesse *et al.*, 2017). Raised BP cannot be related to identifiable cause, though there are definite associated factors to include; obesity, family history, alcohol, cigarette smoking, increasing age sedentary life and diet with increased salt and fat. Obesity places much load to the heart causing increase in cardiac output. Atherosclerosis of the blood vessels increase with increased age and can also result from obesity due to biochemical abnormalities (Stephen & Maxine 2011). Nicotine from cigarrates can result to vasoconstrictive effect which can result to increased total peripheral resistance thus rise in BP. In families with history of hypertension there is a risk factor of developing primary hypertension. Consumption of alcohol elevates the BP levels by causing vasoconstrictive effects while excess use of salt leads to raised cardiac output due to increased blood volume (Hawkins *et al.*, 1992).

The causes of hypertension can either be primary or secondary. In essential or primary hypertension, the cause is not known and it constitute to 95% of cases in adult where no single cause can be identified. In this group elevated BP results from complex relations between environmental and multiple genetics causes. These risk influences include; obesity, weight gain, effects of dietary salt, alcohol consumption, age stress low dietary potassium, physical in activity, tobacco use and race (Stephen & Maxine 2011). The reason of secondary hypertension is well-known, it a case where the cause is identified or caused by preexisting condition. Secondary hypertension conditions are at times treated, and they set up 5% of total cases of hypertension. Causes of secondary hypertension includes; excessive glucocorticoids, thyroid disorder, chronic parenchyma kidney disease, psychoactive drugs, sleep apnea, coarctation of aorta, thyroid diseases, too much aldosterone secretion drugs such as contraceptives, renal artery stenosis amongst others (Weber *et al.*, 2013). Majority of patients are asymptomatic, though occasionally patients may present with headache, dizziness or complication of hypertension like heart failure, renal failure or stroke thus regular BP measurement is needed (Giles, 2005).

The accurate analysis of blood pressure can be determined by accurate measurement of BP. BP readings are presented in two figures, systolic and diastolic BP. Systolic pressure (the top readings) demonstrates the BP when the heart is beating whereas diastolic (the bottom reading) pressure shows the pressure when the heart is resting between the beats (MOH,2018). In BP, systolic of below 120mmHg and diastolic of below 80mmHg is considered as optimal blood pressure. Adults with systolic BP from 120 to 129 mmHg and diastolic BP of 80 to 84mmHg are considered to have normal blood pressure. Those with systolic pressure of 130-139mmHg and diastolic of 85 to 89mmHg are categorized as high normal. Grade 1 hypertension is categorized as systolic of 140-159 mmHg and diastolic of 90 to 99 mmHg, grade 2 hypertension is between systolic of 160 to 179 mmHg and /or diastolic of 100 to 109 mmHg, grade 3 hypertension ranges from more than 180mmHg of systolic and or more than diastolic of 100 mmHg while isolated systolic hypertension is blood pressure of more than 140 mmHg systolic and diastolic of less than 90 mm Hg. In diagnosing the hypertension the classification is determined by whichever measurement or reading is highest. (Mancia *et al.*, 2013).

According to American Heart Association (2014) hypertension does not exhibit symptoms unless in severe cases when systolic blood pressure is more than 180mmHg and diastolic of more than 110mmHg. The symptoms include anxiety, severe headaches, shortness of breath and nose bleeding. The BP estimation can be measured in office (clinic), ambulatory (out of office) or home measurements (MOH, 2018) In office measurements patient is allowed to rest for 3-5 minutes before commencing measurements. Ambulatory BP estimations is taken with the individual wearing a portable BP monitoring device usually on the non-active arm for 24-25 hour period to provide information on BP during the daily activity and at night (Mancia *et al.*, 2013).

To measure BP, allow the patient to be seated down, relaxed and quiet for 3-5 minutes before commencing measurements. The arm should be stretched and in a supported position. The BP machine cuff size must be the precise size for patient's arm and the monitoring device should be accurate (NICE, 2011). The systolic blood pressure is estimated first by palpation to avoid missing the auscultatory gap, then the right monitoring device is placed to take the readings. Two readings are measured for 1-2 minutes apart and if consecutive reading vary by more than 5millimetre of mercury additional reading is taken. At first consultation BP is taken for both arms and if discrepancy upper arm readings are used for forthcoming estimation (MOH, 2018). In case of arrhythmias like atrial fibrillations, BP is taken many times for accuracy. Ambulatory BP is a better predictor of stroke and cardiovascular conditions for example in myocardial infarction ambulatory BP is better than health facility or office BP measurements because some individuals tend to have white coat hypertension (European society of hypertension and European society of cardiology (ESH &ESC 2013).

To accurately diagnose hypertension, BP is measured from both hands and different BP monitoring devices are used. BP of 140/90 mmHg an additional readings are measured with ambulatory blood pressure monitoring for validation. BP of 180/110 mmHg or more is regarded as severe hypertension and immediate treatment is advised (NICE, 2011).

The goal of treatment with antihypertensives to patients with no comorbidity (absence of additional conditions co-occurring with hypertension) is to attain the BP to lesser

than 140/90mmHg, and for those with comorbidity is to attain a BP lesser than 130/80 mmHg, a level essential to decrease the risk of cardiovascular complications. (Brinker *et al.*, 2014). To achieve the BP levels, use of effective medical therapies in management is advocated. Use of medication for hypertension is key to long-term approach in controlling BP levels. There is a substantial evidence to show that control of hypertension can play a crucial role in decrease in the relative risk of cardiovascular disease events, stroke and other hypertension complications as well as lower healthcare costs (MOH, 2018). Hypertension knowledge, treatment, and control rates are low in every region of the world and poor rates of BP control have been reported worldwide (Pereira *et al.*, 2011).

2.2 Hypertension Management

The aim of management of HPT is to attain satisfactory control of BP and other risk factors with the goal of reducing morbidity, complications and deaths. Effective control and treatment of hypertension entails physicians and patients to work in unison to balance non pharmacologic and pharmacological interventions and prevent target organ damage. Non pharmacological or lifestyle modification are important to all patients with hypertension despite the stage because healthy lifestyle choices can control BP, reduce cardiovascular risk, the dose and the number of hypertensive medication required (MOH, 2018). Lifestyle recommendation for hypertension include adequate daily physical exercises, weight reduction, avoidance of alcohol, avoidance of tobacco, consumption of healthy diet to include, eating vegetables, dietary and soluble fiber, low fat daily products, whole grain, protein sources from plant and avoid added salt and high salty diet (MOH, 2018).

Strategies that are aimed at improving high BP control in the general population of patients with HPT, signify an ultimate phase of any preventive strategy in the Country, as well as in Western and Developing Countries, with subsequent beneficial effects for the National Health System (Volpe *et al.*, 2012). Several initiatives to include creation of awareness of hypertension to people in the community through use of social networks and media, enlightening people to use ambulatory BP monitoring devices and production of consensus guideline in management have been established (Volpe *et al.*, 2012).When treating HPT, management is geared towards therapeutic lifestyle

interventions or non-pharmacological modification to lower BP. Patients categorized with high normal BP must be followed yearly to check their blood pressure levels and manage HPT promptly. Choices as regards to pharmacological/use of drugs in treatment should be grounded on cardiovascular risk level of individual patient (Abdul *et al.*, 2011).

According to Abdul *et al.* (2011) non pharmacological lifestyle changes should be recommended for all individuals with HPT and pre-HPT. Non pharmacological treatment could be the single management required to manage hypertension in grade 1 category and high normal or pre-HPT. Non pharmacological management requires motivation to the patient in order to achieve the benefits and it requires not only advice but also concurrent behavior intervention. Decision to start non pharmacological intervention should be based on cardiovascular risk level. Physicians or clinicians also require intensive effort to assist patients during management (Abdul *et al.*, 2011) Lifestyle modification can delay onset of hypertension, eliminate the need of HPT medication and can lead to lowering of BP in patients who are already on antihypertensive (Gabb *et al.*, 2016).

The main obstacle to attaining satisfactory blood pressure control is due to non-adherence/noncompliance with hypertension management. In both pharmacological and non-pharmacological management patient notably get lost from medical care. Some patients find it difficult to follow the prescription as some require them to develop new skills like reading food labels and time management (Volpe & Tocci, 2013).

In pharmacological threshold for initiating the blood pressure management both systolic and diastolic should be measured on at least three separate occasion over two months period as the cardiovascular risk level of patient is observed. More than 18 years old individuals with BP of 140/90 mmHg or over 80 years with BP of more than 150/90mmhg and in grade 1 should be started on life style changes, monitored for three months if goal of lowering blood pressure is not attained (<140/90mmhg) or patient is in grade 2 with BP > than 160/100 then the patient is started on antihypertensive therapy. Patients with increased blood pressure and comorbidities /complications of hypertension are also initiated to treatment. The treatment consist of six main classes of hypertensive agents: beta blocker, angiotensin converting enzyme inhibitor, calcium

channel blockers, thiazide, aldosterone antagonists and others to include sympatholytic and direct arterial vasodilators. The choice of medication is determined by comorbidity of the patient. (MOH, 2018). During follow-ups patients are reviewed at a 4 weeks interval to evaluate antihypertensive effectiveness and to monitor for side effects so as to regulate medication appropriately. Patients have to be counselled to return early in case of new symptoms like persistent cough, persistent headache or if they feel ill (MOH, 2018).

Numerous factors lead to the perseverance with pharmacological management like the discomfort of side effect, poor tolerability of the drug agent and choice of the first antihypertensive drug regimen (WHO, 2005). Medication non-adherence concern are related with adverse effects. Defaulting in drug therapy can result in loss of benefit of controlled BP and can lead poor health outcome or mortality. Individuals do not get the total benefit of drug therapy due to non-adherence leading to poor health outcome, poorer quality of life and increased health care costs. The effect of lack of adherence to drugs is the most important factor cause of uncontrolled hypertension (Burnier, 2015). Non-compliance to chronic drug regimens is estimated to be 43% to 65.5% and the highest percentage of these individuals who fail to comply to recommended treatments are hypertensive patients (Tadesse *et al.*, 2017). Lack of adherence to medication is a possible causative factor to the manifestation of associated diseases (Tadesse *et al.*, 2017). Arshia *et al.* (2015) in their study revealed issue of medication noncompliance which resulted in varying results. Several factors are associated with lack of compliance which varies in different studies thus understanding the explanations for patient's lack anti-hypertensive medications adherence is crucial if BP levels is to be more efficiently achieved.

Hypertension affects several organs like kidney, brain, eyes, heart and peripheral circulation. The aim of treating hypertension is to achieve normal blood pressure and prevent organ damage. Related complication of hypertension include; in heart, left ventricular hypertrophy where muscles of the heart are affected which is a risk factor to cardiovascular disease like ischemic or myocardial infarction and heart failure, In brain cerebrovascular disease which is marked as ischemic stroke, transient ischemic attacks, hemorrhages and multiple cerebral infarcts. Kidney disease can also result from uncontrolled blood pressure due to increased intra-glomerular pressure which results to

nephrosclerosis. Peripheral arterial disease results from atherosclerotic vascular disease which can cause death of cell/tissue and in some cases could necessitate revascularization measures or amputation of extremity. Eye complications due to hypertension can also lead to retinopathies that may progress to blindness or papilledema (Mac Mahon *et al.*, 1990).

2.3 Factors Associated with Non-Adherence to Antihypertensive Medication

Nearly half of all patients with antihypertensive in the nation do not adhere to their therapy (Rash *et al.*, 2014). Identifying obstacles to treatment non-adherence is an important issue and remains a main challenge for physicians or clinicians. Barriers to treatment with antihypertensive consist of many influences that are associated to providers of care, health care system and patients (Rash *et al.*, 2014). To recognize the causes for non-adherence with hypertensive medications among patient with hypertension several factors are categorized in this research as patient related factors and health system related factors.

2.4 Patients Related Factors

Following literature , patient related factors are individual influences/ obstacles that affect adherence of antihypertensive treatment, these includes economic status, gender, marital status, individual beliefs and perception, age, education level, knowledge level, conflicting medical information, fear of side effect, un coordinated care and polypharmacy and presence of comorbidity.

2.4.1 Economic Status of the Family

Economic status determines the health of the individual because they dictate the income that one gets. Arshia *et al.* (2015) found non-adherence to hypertensive medications of 86% amongst individual patients who funded their medications than those whose medicines were funded by family. Adebawal *et al.* (2014) reported that in sub-Saharan Africa patients recognized lack of ability to pay for the charges of medicines as significant obstacle to treatment adherence. An affirmative association among treatment non-adherence and cost has similarly been established in research studies outside Africa (Mathes *et al.*, 2014). Patients were forced to use herbal medicine due to increased cost of the recommended treatments and therefore felt economically weak to

continue purchasing the medications, some other patients revealed that they defaulted to drugs just because they did not want to be used to drugs that were unaffordable and they had an option to herbal drugs that were less expensive and available all the time and so they felt the earlier they commenced the herbal treatment the better (Atinga *et al.*, 2018). Study on barriers and facilitators to nurse management in HPT revealed that hypertensive treatment was expensive. Lifelong care management went further than the aggregate cost of lifelong treatments, these include expenses related to laboratory testing, consultation and transportations. Given the realism of low economic status in the form of income or wealth, increased cost of drugs was an obstacle to achievement of any program geared in hypertension management (Rajesh *et al.*, 2016). This is consistent with United Nation Child Fund (UNICEF) Kenya that cardiovascular medication were unaffordable as approximately 50% of Kenyan survives underneath the poverty line with significant individuals making less than 1 US dollar in a day (UNICEF, 2014).

2.4.2 Gender of the Patient

Gender is a feature that can subject an individual not to adhere to medication. Individual factors like social demographic differences, income level and educational background ought to be taken into consideration when looking on the variances in adherence of medication behavior amongst genders. Study conducted on Chinese immigrants in America investigating the association amongst cultural associated factors and socio-demographic associated factors relative to adherence to hypertension medication, revealed that women had greater adherence than men (Li *et al.*, 2008).

2.4.3 Marital Status of the Patients

The participation in domestic relationship with a partners is significant to health management as it positively influences the uptake of prescriptions. As a result it is significant to reflect the role part of marital status in hypertension treatment adherence. Marital status is social network that is well thought-out as a supportive factor for individuals during management of illnesses (Sperber *et al.*, 2013). A cross section study of two primary care clinic at Duke University in United State of America, that explored emotional well-being for unmarried hypertension individuals in respect to their hypertension treatment compliance revealed that those who were married related with a greater chances of hypertension treatment compliance (Trivedi *et al.*, 2008).

2.4.4 Beliefs in individuals and Perceptions on Antihypertensive Treatment

Compliance to drug management frequently increases when the patients have positive beliefs on the effectiveness of the drugs they take, and also the belief that the management they are in, is working well to manage their illness (Debbie, 2015). Beliefs on medical treatment and drugs in specific is driven by the awareness that the patient has. For example, there some patients who believe that taking hypertension drugs could result to in side effect (Justin *et al.*, 2014). Others fear that the side effects they may experience may be more than the hypertension disease they have therefore this side effects that one could experience may influence the behavior due to the belief they hold (Marie *et al.*, 2016).

Some religious beliefs and cultural background contribute to patient practices regarding taking medications. A study conducted by Justin and others in South Africa revealed that use of Aloe (green and bitter mixture) to control hypertension and that use of prayers and holy water would also control the blood pressure (Justin *et al.*, 2014).

Some studies have gone further to categorize beliefs. There are two beliefs that influences the uptake of medication. The belief of necessity which include assessment of individual need for the medication and the belief of concern where the individual is concerned with the length of time of medication. The belief of need of drugs in management of hypertension revealed the patients' awareness of their ailment, as a result the belief influences the inspirations to follow the medication regimen. Belief of concern is where the subject is concerned with the length of time that he will be on the medication. Further concerns of patients due to mistaken belief or experiences with respect to the medications can also be a factor to non-adherence to antihypertensive drugs Magadza *et al.*, 2009; Saleem *et al.*, 2015).

A recent systematic review study, confirmed that exact belief of necessity and concern, was a satisfactory framework to recognize patients' perceptions on recommended prescriptions (Horne *et al.*, 2013).The perception of not improving while on medication could further impact on choices to discontinue the treatment, this is due to patients having poor perception on the drug's effectiveness in lessening their illnesses (Atinga *et al.*, 2018).

2.4.5 Age of Patients

Age is a significant factor in hypertension treatment non-adherence. HPT prevalence increases with age and persons who have attained 65 years and more are amongst those with higher rate of hypertension (Gillespie & Hurvitz, 2013). According to Mukora & Chadambuka (2013) found that adherence improves with increasing age. These study results are in line with the result findings of former study that investigated the relationship between increasing age and medication adherence to patients, which put forward that older patients made fewer errors in adherence and were more consistent in drugs taking and this was an effect due to their regular daily practices (Demonceau *et al.*, 2013). A study by Jin *et al.* (2016) revealed that elderly patients were more likely to abide by doctors prescription if they had a chronic ailment, had education, had enough counselling, had received satisfactory clarification of their prescriptions, and were on lower frequency of doses. Due to age factor elderly patients have precise age-associated difficulties for not adhering to drugs like, they have psychosocial issues for example cognitive inability or physical incapability such as; problem with eyesight or low manual skills. Therefore, clinicians and physician should be attentive in the number of risk factors affecting elderly patients (Jin *et al.*, 2016). In some other studies age was not associated with hypertension treatment non-adherence (Arshia *et al.*, 2015; Vincent *et al.*, 2015).

2.4.6 Education Level of the Patients

Patients with formal education in greater levels may possibly have enhanced understanding of the aim of controlling their BP. Vincent *et al.* (2015) noted increase in adherence with increasing educational status however Arshia *et al.* (2015) found out that non-adherence was greater among individuals with more years of learning. All health care providers to include physicians, nurses' physician assistants, clinicians, dieticians, pharmacist and nutritionists have a significant role in accessing the education level of the patients so as to aid in educating and counselling of patients with hypertension. Patients with low education levels may have trouble understanding doctor's prescription and this may affect adherence and medication management (Praska *et al.*, 2005).

2.4.7 Knowledge Level of Patients

Patients who were more knowledgeable were more adherent to their drugs taking (Ambaw *et al.*, 2012), which positively correlated with a similar study from Nigeria on adherence to antihypertensive medications which revealed that patients who were conversant with their ailment and therapy were more compliant to treatment regimen than those who did not have the knowledge (Ebenezer, 2013). Adherence to hypertensive treatment is low in African countries and ignorance of severity and low knowledge of the treatment of hypertension were the main influences to non-adherence (Kaboru, 2013). A recent study revealed that most patients read drug information leaflets and others researched online in regards to the medication they were put on before commencing the drugs. They also explained that the side effects information scared (Atinga *et al.*, 2018). Studies elsewhere revealed that patients with low education levels are likely to result to unintended non-adherence (Lowry *et al.*, 2005; Uzun *et al.*, 2009). Non communicable diseases especially hypertension is accountable for increased office visits to primary care clinicians than other health ailments and the persistent rise in its occurrence results due to rise in obesity lack of better knowledge on foods and increasing age of the population. Hence this calls for boost of physicians and clinicians by use of ancillary health workers in managing hypertension (MOH, 2018).

According to Park *et al.* (2018) it is imperative to let the patients know of the side effects of the prescribed drugs. This enlightenment in a way helps to enhance adherence to medication as the patients will have prior knowledge of what is likely to happen in case they missed medication. Educating the patients about the diseases, its side effects and how to manage them boost their confidence. Practitioners also need to discuss with the patients about the use of complementary alternative medicines and possible effects of those drugs on the management program. Due to increase of drugs in the treatment regimen individuals may be psychologically burdened and overwhelmed. Thus during counselling and follow-up, establishing side effects of the recommended drugs aids in recognizing the explanations for non-adherence, it is of significant to explore if patients are taking supplementary medication including complementary substitute drugs.

2.4.8 Employment Status of the Patients

Employment status can positively or negatively impact on non-adherence to hypertensive treatment. The positive impact on adherence is by fact that there will be financial security to cope with structural barriers like money to pay for clinic visits, transport, medication refills and for out of pocket payments. The negative impact would be interruption of medications due to financial constraints. A matter of importance in view of employment status as an influence to non-adherence of hypertension treatment, is to the fact that antihypertensive medicines are oral tablets that are easy-to-use and need no preparation that could interrupt the work routines (Okuboyejo, 2014). The relationship of adherence with employment status can be argued by obtainability of individual financial provision that enables support to pay for medical treatment and other services.

In a recent study with 241 older Korean hypertension clients employment was associated to a greater likelihood to adherence to antihypertensive treatment. (Park *et al.*, 2013). However, another study argued that medication adherence and illness management were impacted in those with employment mainly due to demanding routine where observing to treatment routines could not fit (Okuboyejo, 2014). The study continued to recommend that when in view of employment status as an issue, it was important to consider non adherence of antihypertensive treatment in setting where unemployed and employed patients were offered free healthcare and were not experiencing the strain of wanting financial sustenance to account for their management. (Okuboyejo, 2014).

2.4.9 Conflicting Medical Information

Patient with chronic illnesses get contradictory facts from physician/ clinicians, internet or media leading to lower adherence of drugs (Carpenter *et al.*, 2014). Directions to consume medicines through advertisements including long list of side effect leave the patients confused and thus fear in taking the prescribed drugs (Marie *et al.*, 2016).

2.4.10 Fear of Side Effects

The consequences of use of drug to patient makes them to get afraid due to thinking that they may do more harm than good (Marie *et al.*, 2016). Un intended side effects felt by others or individually and fear concerning potential side effect impacts the

behavior. Marie *et al.* (2016) continues to say that when patient are mandated to select between side effect and control of asymptomatic ailment some patients may deliberately non-adhere. Patients probably assessed the risk of the unintended side effect than by evaluating the circumstance (Paling, 2003). Three quarter of hypertensive patients in a study stated clinician/physician did not discuss the possible side effects that they were likely to experience (Lapane *et al.*, 2007). Side effects like weight gain ,chronic cough, impotence, sexual dysfunction, fatigue, gynecomastia and depression to include others made the patient feel that there was more harm than good (Marie *et al.*, 2016).

2.4.11 Forgetfulness of the Patients

Clinician make prescriptions to patients with the expectation that they will be taken correctly. 30% of all non-adherence is accounted by forgetfulness although health care workers erroneously attributes a greater amount of non-adherence due to complex regimen (Osterberg *et al.*, 2005). Classifying the category of forgetfulness is important and appropriate to finding a solution for example an elderly patient or patient with mild cognitive impairment who might not comprehend to the medical instructions may require a simplified regimen so that there is less to remember, than a busy person whom the work is so demanding who missed some pills due to demands at work place, who might require a different intervention (Marie *et al.*, 2016).

2.4.12 Uncoordinated Care and Poly pharmacy

Patient with long withstanding medical conditions are most vulnerable to poly pharmacy due to the fact that they take many drugs to either treat hypertension or for their other medical condition (Palterson *et al.*, 2014). Polypharmacy is related with greater risk of adverse events, drug to drug interaction and increased care cost. Information of medications that may interact with known hypertensive medication agents are important to eliminating the adverse drug effects, increased health care cost and frequents hospitalizations. All health workers should be enlightened on polypharmacy so that their care and prescriptions are coordinated. Innovation approaches like fixed dose combination therapy, electronic reminder system, medical reviews, ingestible sensor systems and the collaboration of care providers need to be provided to prevent polypharmacy mismanagements (Mukete *et al.*, 2016).

Multiple health providers who manage hypertension patients to include nurses, clinicians, primary physician, consultants and nutritionist all caring for one individual may rise the risk of inappropriate poly pharmacy due increased prescriptions (Marie *et al.*, 2016). About 28% of older patient in unbend situations are receiving poly pharmacy (Barnett *et al.*, 2012). Greater number of prescribers and pharmacies are related with reduced adherence to medication (Marie *et al.*, 2016).

2.4.13 Presence of Co-morbidities in Hypertensive Patients

Co-morbidity is occurrence of one or more than one additional illnesses co-occurring with the primary condition. Co morbidities may aggravate the condition of the individual and result to non-adherence to hypertensive medication. Number of co morbidities among the hypertensive patients impacts on compliance level. Individuals with lesser comorbidity (one or no) were likely to comply with the therapy regimen than with 2 and more co morbidities due to lesser complications and complex treatment regimen (Ambaw *et al.*, 2012). A study by Mutua *et al.*(2014) suggest that old age, taking of 3 or more drugs and diabetes were important influences of un controlled blood pressure. This reports contradicts with, An and Nichol (2013), which revealed that lack of co-morbidities influenced non-perfect adherence to hypertension medication. Health condition of individuals with depressing symptoms (Morris *et al.*, 2006) and emotional function impairments disabilities (Lagi *et al.*, 2006), and those with communication and physical disability (Park *et al.*, 2008), showed medication adherence which was in appropriate compared to patients with no disability. In contrast other studies revealed that adherence to medication improved in co-morbid individuals as in comparison to individuals with no comorbidity (Lagi *et al.*, 2006; Friedman *et al.*, 2010). This is to the fact that experience with numerous symptoms from comorbid illnesses and hypertension requires them to comply with their treatment to relieve the symptoms.

2.5 Health Care System Related Factors

Healthcare system sustenance to patient with hypertension has a substantial role in improving adherence to hypertension medication. The who recognized the complexity and inadequacies with the system in healthcare which contributed to obstacles to ideal prescription adherence (WHO, 2003). The exact associated support to patient with hypertension in regard to their adherence behaviour deliberates on easy availability of

hypertensive medications and basics of providing supportive evidence concerning the recommended treatments. Effective management of hypertension depend on comprehensive steadiness of care linked up with health education. The chief focus of provision of information resources or educational support is to benefit patient with hypertension to follow medical instruction on drugs and highpoint the significance of performing health examinations and screening periodically (Al-Khaldi & Al-Sharif, 2015). Providing educational sessions or educational material through conduction of educational interventions provided patients with information regarding their health condition and medications which led to increased hypertension medication compliance (Beune *et al.*, 2014). In terms of management of hypertension health care system associated factors include; Prescribed guidelines for management and policy, quality of health care services, distance, physician patient relationship, stock outs, failure to communicate critical information and hospital discharges.

2.5.1 Guidelines for Management and Policy

The guidelines are formulated with the aim to successfully make accurate diagnoses of hypertension and to aid in choosing accurate ant-hypertensives therapy thus improving BP control and reducing associated burden of cardiovascular complications (MOH, 2018). Hypertension guidelines have been formulated and dispersed globally in order to promote the control of hypertension. Procedures regarding screening, diagnosis and management of hypertension are enclosed in the guidelines. Proof from clinical trials in managing hypertension endorses certain groups of drugs for managing hypertension with comorbidity and without comorbidity. These drugs guide daily therapeutic care when evaluating the quality of pharmacotherapy (Ahamad, 2012). National guidelines in Kenya has been developed for prevention and controlling of cardiovascular diseases (MOH, 2018).

2.5.2 Quality of Health Care Service to Antihypertensive Patients

Health care delivery needs improvement in regard to quality of health care services which comprises of provision of safe, effective and individual centered care that is equitable, timely, integrated and efficient. The quality of the system in health care has a role in clients and patients' compliance practices. For instance the provision of efficient record system of keeping records for patients is significant in following non-adherence who fail to keep appointments and medicine refills. Information recording

on patient's consistent follow-ups, last refill date, condition that the patient has currently, and the medication refills frequency are vital in following adherence of a patient and hence prevents complications through suitable interventions initiation for those found with non-adherence (Atinga *et al.*, 2018). Poor system of keeping records and poor recording were revealed from across sectional study done in Saudi Arabia that was intended to detect the practices in the management of hypertensive patients through assessing patients' records (Fatmah, 2012).

2.5.3 Distance to Access of Health Service

Distance to access health service is determined by longer travel time to reach a health facility for services. Lack of accessibility to health services can influence to reduction of utilization of health care and making of few drug refills. Ambaw *et al.* (2012) in their study on compliance to antihypertensive treatment and associated factors in Ethiopia showed that distance to healthcare facility led to non-adherence of patients to medications. Travel burden has been demonstrated as a barrier to non-adherence to medication. Travel distances to drug stores affected medication refills and thereafter led to medication non-adherence (Ambaw *et al.*, 2012). In a study conducted at Chicago, distance to pharmacies was greater and number of pharmacies were low thus citizens had difficulties in accessing the refills (Ambaw *et al.*, 2012). In the same study the distance to the nearby drugstore was longer for racial-ethnic subgroups (Ambaw *et al.*, 2012).

2.5.4 Physician Patient Relationship

The level of fulfilment and the independence patients feel when dealing with healthcare workers is contributed by the quality of therapeutic relationship (Armstrong, 2010). Patients may conclude that the healthcare environs is not therapeutic if they are discontented with their relationship with providers for health. Counseling has been advocated so as to increase adherence among patients with hypertension Arshial *et al.* (2015) revealed half of participants were non adherent due to lack of lifestyle and drugs counselling. The study is consistent with another study in Ethiopia which showed substantial relationship between poor patient- physician relationship and compliance to treatment (Ambaw *et al.*, 2012). Physicians' engagements have been shown to encourage adherence for example providers who correctly explains the regimen to the understanding of patients promotes adherence (Atinga *et al.*, 2018). However health

providers who had poorly written instructions about the dosage regime influenced non adherence (Atinga *et al.*, 2018). A good relationship between provider and patient improved medication adherence through empowerment of patients to become inclusive in their therapy plans (Atinga *et al.*, 2018).

2.5.5 Stock Outs of Antihypertensive Commodities

Stock out of medical supplies is related to low physical quality of care which involving low care delivery, preventable deaths or even low levels of patient fulfilment (Donabedian, 1988). Medicine stock out in government institutions are the major influences for out-of-pocket expenditures encountered by families in low and middle-income backgrounds which limits the accessibility of care (WHO, 2004). Thus provision of vital drugs and medical commodities remains an obstacle for many low-income nation health systems. A study done by Rajesh and Vadathan (2016) on barriers and facilitators to nurse in hypertension management revealed that there was repeatedly reported stock outs and unaffordability of hypertensive medications. This is consistent with UNICEF Kenya that cardiovascular medication is less available in rural population (UNICEF, 2014).

2.5.6 Failure to Communicate Critical Information

Physician often forget to inform important information of drug use to patient. A recent study revealed that physician fail to discuss on medication adherence at around 60% of the time (Marie *et al.*, 2016). When recommending lifelong treatment clinicians/physician fail to talk on the period of treatment (Tam *et al.*, 2006). Physician fails to inform the patients on the essential for lifetime treatment for explanations like, fear of lengthening the visit, would cause resistance to patients, sense of futility or being uncomfortable delivering unwelcoming messages (Marie *et al.*, 2016).

2.5.7 Hospital Discharges

Discharge of patients from hospital can be challenging, difficult and often unclear for care givers and patients. This results in errors in drug taking, adverse effect and consequently to non-adherence (Marie *et al.*, 2016). Estimates suggests that half of patients are faced with at least medical error after release from hospital (Cua *et al.*, 2008; Cohon *et al.*, 2012). Unintended drug inconsistency on discharge, was the omission of drugs to take at home which may be risky to patient's health. Clinicians/

physician have a tendency to overestimate patient understanding and their skills in communication during explanation on the recommended therapy (Block *et al.*, 2013). Summaries for discharges which are intended to assist in change of care are hardly available for most patients during discharges (Kripitani *et al.*, 2007).

2.6 Theoretical Framework

2.6.1 Theoretical Domains Framework (TDF), model development described by Cane *et al.*, (2012).

This study was grounded on behavior change theory known as theoretical domain framework.

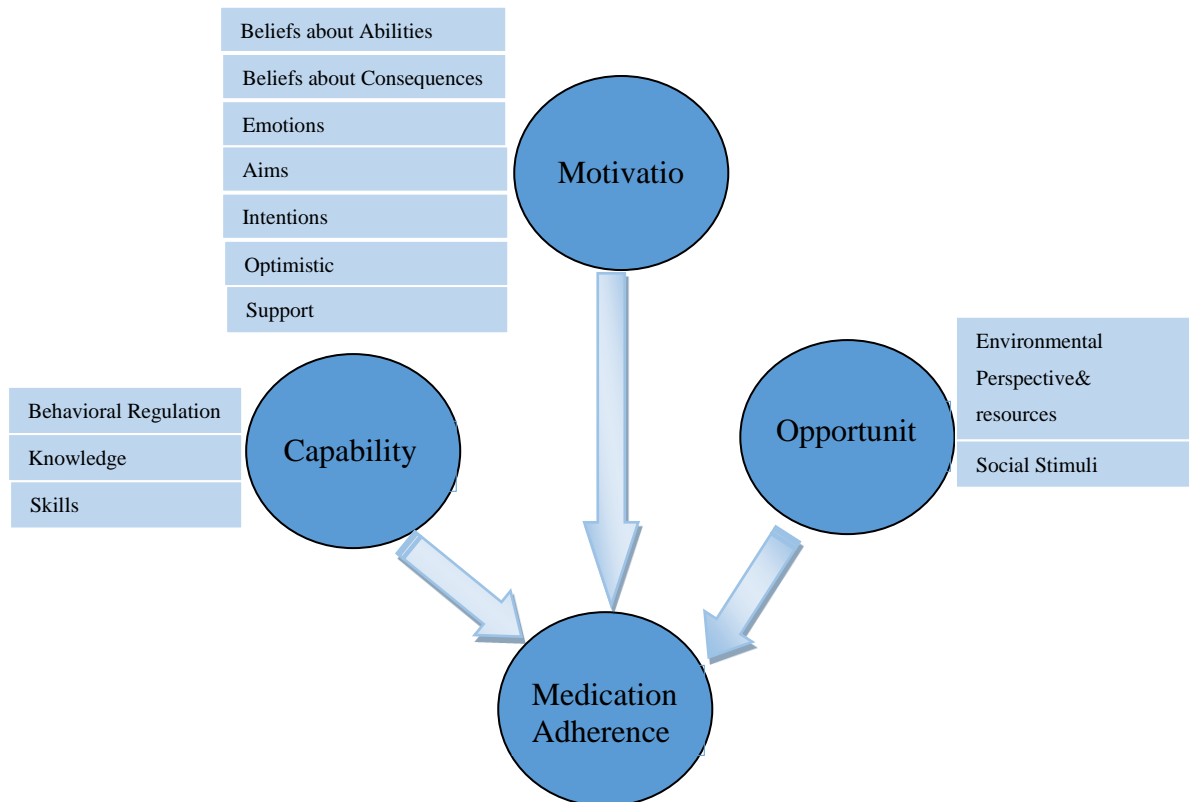


Figure 1: Representation of the theoretical domains framework. Adapted from Cane *et al.*, (2012).

The TDF was chosen because it incorporates 33 behavior change theories and has related tools to support the application of behavior change interventions. Guideline from council of medical research acclaims that evidence and applicable theory should be acknowledged to enlighten the progress of an intervention (Craig *et al.*, 2008). Many adherence interventions to date have not been effective (Haynes, *et al.*, 2008).

Intervention which are effective have often involved a level of difficulty that has been too expensive and challenging to apply in practice (Haynes *et al.*, 2008). And thus clarifications and models of medication adherence/non-adherence have changed over the years. Previous studies focused on the part of patient and doctor statement and its outcome on satisfaction of patient, comprehension and forgetfulness as main factors of succeeding adherence to treatment (Ley, 1988).

Though, research in health behavior has reliably proven that the delivery of facts alone is not an actual means to modification of behavior, and thus studies have now progressed onto models and approaches which concentrate on beliefs of patients' planning abilities and motivation as the main descriptive variables. The models includes self-regulatory models and social cognition models which put emphasis on the importance of the opinions that the persons has in regard to their ailment and management as well as their own capability to track the advice and treatment recommended (See Conner & Norman, 2005). Growth in behavior change comprises also of participants who records and monitors their behavior (Michie *et al.*, 2013). And these interventions were found to be more effective and significantly at supporting healthy eating and physical activity more than interventions that the technique was not included. (Michie *et al.*, 2009).

The growth of classification of behavior change techniques lead to new techniques of theorizing the factors which determine or explain persons health associated behaviors and at the central of this new methodology is a psychological model for explanation of human behavior that is wished to include the array of technique that will be included in change (Michie *et al.*, 2011). The classifications includes Capability, Opportunity and Motivation (COM) B behavior. These classification was established with quotation to current theories of behavior change. A consensus meeting held by behavioural theorist in United State of America which reflected the fundamentals for the enactment of an identified volitional behavior (Michie *et al.*, 2011). They proposed that classifications were set as a preliminary in directive to select interventions that were more effective (Michie *et al.*, 2011).

The model postulates that there are relations amongst 3 models to include Capability, Opportunity and Motivation (COM) which results to the enactment of Behavior (B)

thus this can also offer a justifications for reasons of not engaging in acclaimed behavior. To effectively accept and proceed with long-term treatment regimen like hypertensive regimen, behavior change is required and hence behavior change ideologies can be used to hasten the acceptance of medication adherence. The effectiveness of behavior-changing interventions, aimed to each individual stage of change has been established in numerous health behavioral areas and interventions includes monitoring devices, reminder techniques and rewards. Which are very significant for patients in advanced stages of behavior change, but patients in earlier stages require interventions that are consciousness-raising aimed on consciousness of the advantages of treatment.

According to Cane *et al.* (2012) behavior change is crucial to promoting hypertension adherence and improving the health outcomes for example: Behaviors may be those of healthcare providers such as evidenced based practice implementation, of patients, such as adhering to medication or of the general population, such as cessation of smoking and increasing physical activity. In spite of high-level noble work to promote execution of evidence-based practice by developing field of implementation in science and Clinical Effectiveness Research Agenda Group (CERAG), 2008). Execution remains variable, with various individual and organizational factors influencing healthcare providers' behavior. These factors includes the accessibility of evidence, relevance to exercise, the distribution of guideline and evidence, motivation of individual, clarity of roles and practice, culture of specific healthcare practices and the ability to preserve current changes (Newman, *et al.*, 1998).

Hypertensive medication adherence can be attained through changing health care workers behavior, managers, other health professionals and administrators (Grol and Grimshaw, 2003). If intervention are based on principle of change of behavior, changing is easy but if there are no principles guiding change of behaviour then change of behaviour is not easy (Abraham, *et al.*, 2009). The principles that guide change of behaviour form part of many theories of behavior change, but are rarely drawn on in assessing execution of intervention or even in designing and there is some evidence that behavior change interventions informed by theory are more effective than those that are not (Noar & Zimmerman, 2005). TDF is a theoretical framework rather than a theory thus does not suggest testable relations between components but delivers a theoretical

lens through which factors influencing behavior are viewed, these include; the affective, cognitive, social, and environmental effects on behavior.

According to Michie *et al.* (2011) Capability' is divided into physical capability which is the ability to be involve in required physical processes and psychological capability which is the ability to be involved in the required thought processes. Psychological capability includes the understanding of the illness and its therapy, cognitive functioning such as the thinking, capacity for judgment, or memory as well as exclusive function for example ability to strategize. Physical capability is ability to get used to lifestyle changes such as a social behavior or diet (Jackson *et al.*, (2014).

Opportunity' is divided into social and physical opportunity. Social opportunity is given by the cultural milieu that directs the way we think about things, it includes the fear of disclosure of the disease, stigma of the disease and religious or cultural beliefs while physical opportunity is explained by what the environment provides for example complexity, the cost, or accessibility to services (Michie*et al.*, 2011).

Motivation' is divided into automatic and reflective processes. Automatic processes involves impulses and emotions that arise from associative learning, cues or stimuli for action, as well as mood state or mood disorder such as depression and anxiety. Reflective processes involves evaluation and plans which entails the perception of the illness beliefs and treatment.

2.6.2. Applying COM-B to Medication Adherence

While signifying COM-B structure aimed at adherence, adherence in this case is depicted as a scale which replicates the extent to which any management recommendation is adopted and thus, it can consist of non-adherence to psychological therapies or to endorse lifestyle change (Vrijens *et al.*, 2013). The universal word 'medication adherence' includes starting the treatment, right dose, and continuing with management (Vrijens *et al.*, 2012).

The assumed interaction whereby capability and opportunity can influence motivation enables explanation of the complex means by which a recognized factor of non-adherence, like treatment complexity might have its effect. For a multifaceted regimen

(for example multiple varying medication schedules throughout the day) might be past the planning capabilities of some, while for others, even though it is within their capacity to follow, it might be an aspect which negatively impacts drive to take treatment. For instance Nunes *et al.* (2009) stated that persons using complex treatments opted to take those drugs offering relief of symptoms or for the greatest feared disorder, signifying that complex treatments might be a limitation to both capability and motivation.

Individuals might alter or stop treatment and look at the consequence thus influencing perceptions of the necessity for prescription and effectiveness of treatment (Pound *et al.* 2005). Kardas *et al.* (2013) recorded withdrawal of symptoms or cured as factors related to non-adherence. Thus, feedback loops between compliance of treatment, opportunity and capability are likely. For instance, experience of using medical equipment like use of digital blood pressure machine will improve physical capability to continue measuring the BP even at home and this will improve adherence to drugs so as to maintain the BP under control. Example in improving Opportunity is that when there is good patient/ physician relationship the care provider is motivated to counselling the patient more on adherence to medication. COM-B offers a more comprehensive explanation of non-adherence/ adherence than existing models where initially it takes into account of automatic processes such as habits then, it openly includes factors at a systems level lastly, it permits a defined explanation of the association between person's determinants and adherence, making it easier to recognize suitable interventions. In COM-B the factors of medication non-adherence are Capability, Opportunity and Motivation, some of which are intentional and others unintentional, 'thus non adherence is associated to the behavior itself for example not using medication at the right period, right time, right manner and right quantity.

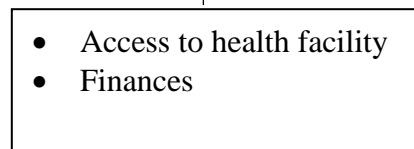
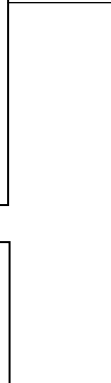
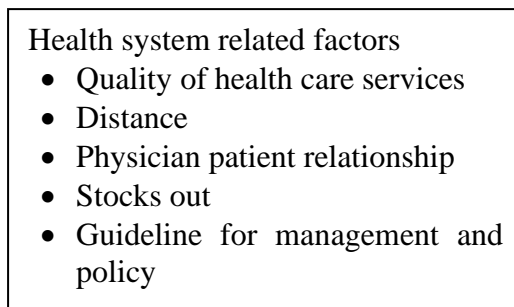
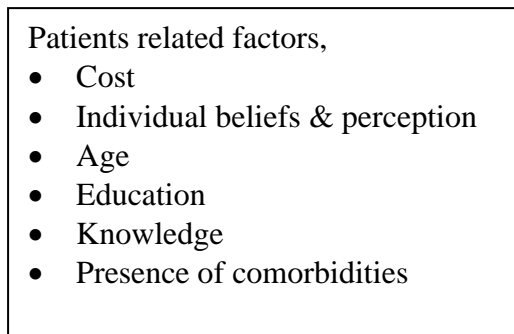
Table 1

Applying COM-B to factors associated with non-adherence to medication, : Definitions adapted from Michie et al., (2011).

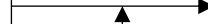
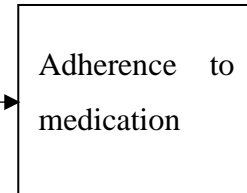
Capability	Motivation	Opportunity
The persons psychological and physical capability to involve in the behavior	intellect processes that direct and drives behavior	influences found outside of the persons that makes presentation of behavior likely
Psychological capability	Reflective motivation	Physical Opportunity
Def: Capacity to engage in necessary thought processes	Def: Evaluation and plans	Def: Physical opportunity delivered by environment
<ul style="list-style-type: none"> • Understanding of the hypertension and its management • Thought functioning and memory capability for judgment thoughtfulness. • Executive function e.g. ability to strategize 	<ul style="list-style-type: none"> • Perception of illness e.g. cause of uncontrolled blood pressure • Beliefs about treatment e.g. necessity efficacy concern about current or future adverse effects general aversion to taking medication • Outcome expectancies self-efficacy. 	<ul style="list-style-type: none"> • Cost • Access e.g. availability of medication • Packaging physical characteristic of medicine e.g. taste, smell size shape route of administration. • Regimen complexity • Social support • Health care provider patient relationship/communication
Physical capability	Automatic motivation	Social opportunity
Def: Capacity to engage in necessary physical processes	Def: Emotion and impulses arising from associative education or natural disposition.	Def: Cultural setting that dictate how we reason about things
Physical capability to adapt lifestyle changes e.g. social behavior, diet or physical exercise	<ul style="list-style-type: none"> • Stimuli or cues for action • Mood state/ disorder e.g. anxiety and depression 	<ul style="list-style-type: none"> • Fear of disclosure or stigma of disease. • Cultural beliefs or religion

2.7 Conceptual Framework

Independent Variables



Dependent Variables



Intervening variables

Figure 2: Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area

The research study was conducted at Chuka referral hospital in Tharaka Nithi County. Chuka referral Hospital is a Government health facility located in Chuka town of Tharaka-Nithi County. It borders Meru County to the north east and north, Embu County to the south west and south and Kitui County boundaries are in south east and east. The division lies between latitudes $0^{\circ} 15' 0''$ and longitudes $37^{\circ} 1' 45''$. Study was carried out in the Medical outpatient clinics. The site was selected for the reason that most of patients with hypertension whose condition were detected from level 2, level 3 and level 4 health system were referred to Chuka referral hospital which is a level 5 for specialized management and obtainability of hypertensive medication. The facility has the others clinic such as eye clinic, surgical clinic, medical clinic, pediatric clinic and comprehensive care clinic for HIV.

3.2 Study Design

The drive of this study was to detect the factors related with non-adherence to antihypertensive. To attain the objectives, the study used a descriptive survey design. Descriptive design was chosen to collect precise data concerning the current status of the non-adherence phenomenon and then draw a valid conclusion from the facts discovered. This being a social science research, it enabled proper procedures for collecting both qualitative and quantitative data. The researcher adopted this designs to examine the social issues of patients who attended Chuka referral hospital where participants were observed in a normal and natural environment. The design allowed in-depth gathering of facts that were both quantitative (surveys) and qualitative (interviews).

3.3 Target Population

The study population comprised of 575 people among them doctors, pharmacists, nurses, record officers and hypertension patients, who had been using antihypertensive treatment and attending Chuka hospital hypertension clinics. Table 2 presents the spread of population that the study targeted

Table 2
Distribution of the Target Population by Category (N=575) obtained from Chuka Referral Hospital Registry, 2016

Population	Frequency
Patients	560
Doctors	3
Pharmacists	5
Nurses	2
Record officers	5
Total	575

The frequency used for patients, are the patients who attended clinic in 2016 (Chuka, 2016). Due to the health workers strikes in the year 2017 health record returns were unreliable and therefore could not be used for sample calculation.

3.4 Sampling Procedure

The study used simple random sampling to choose study sample size for hypertensive patients and census sampling technique for health workers/providers in the medical clinic that included, doctors, pharmacist, record officers and nurses attached to the medical clinic because they are too few to sample. Hypertensive patients with more than 18 years were qualified to play part in this study. Registration of study participants was undertaken at the start of every clinic day. This was carried out at the registration counter which is the initial place for their appointments. The study adopted simple random sampling to select a subsample of the patients from a population of 560. A list of accessible patients was prepared and then the number to be interviewed was determined from the attendance list. Every client was asked to pick randomly a piece of paper with a number which were found in a container ,the patient matching to the number chosen was involved in the sample. To avoid multiple enrollments, each patient's file number was entered in the questionnaire and the record for the numbers were kept and scrutinized during each recruitment process.

3.5 Sample Size

The size of the sample was derived according to Nassiuma (2000) whereby a coefficient of variance at most is 30% of the population which is considered adequate for most surveys.

Sample size

Where

$$\frac{NC^2}{C^2 + N - 1}$$

n = sample size

N = population from which sample is obtained

C = coefficient of variance 30%

e = standard error 0.02

$$n = \frac{560(0.3)^2}{(0.3)^2 + (560 - 1)(0.02)^2} = 161 \text{ patients}$$

The total number of respondents were 161 patients and 15 health care workers totalling to 176.

3.6 Data Collection Instruments and Procedures

Data was collected using structured questionnaires attached in appendix II and an interview schedule attached on appendix III. The questionnaire was divided into three sections; section A, gathered facts on demographics, section B on patient factors related to medication non-adherence and section C on health system factors related to antihypertensive medication non-adherence. Interview schedule was conducted on health service providers attached to medical clinic to explore their perception of influences on antihypertensive medication non-adherence. The two tools formed effective means of measuring the associated factors to non-adherence to hypertensive medication.

3.6.1 Validity of the Instrument

Questionnaires were reviewed by specialists at the hypertensive clinics and conversation were held together with the investigator to inspect on matters of specificity and clarity of variables to be measured and significance of the content in the questionnaire.

3.6.2 Reliability of the Instrument

To ensure reliability, the researcher piloted the instrument in Meru Level five hospitals. The hospital was selected because it is a County referral hospital and its shares similar characteristics with those in Chuka referral hospital. Data was collected and split half technique was used to correlate the scores from the two groups. A correlation coefficient of at least 0.7 was acceptable otherwise the instrument would be revised appropriately. The instrument's reliability coefficient was 0.76 above the minimum recommended alpha.

3.6.3 Pilot Study

A pilot study was carried out so as to assess practicability, cost, time and statistical inconsistency of the study, in an effort to improve upon the instrument and research design. The study tool to be used was piloted at Meru County referral hospital to observe if it was understood by the patients. The participants were 10% representation of the sample size (16 patients) and two (2) key informant that is the physician and a nurse working in medical outpatient Clinic. This was done before the data collection so as to ascertain whether the instrument captured what it was meant to capture and where there were inconsistencies, necessary adjustment were done.

3.7 Data Processing and Analysis

After collecting each clinic day data it was then moved in a excel spreadsheet where it was cleaned for mistakes. After the end of data gathering the entire data base in excel spreadsheet was exported to a Statistical Package for Social Sciences (SPSS) version 25 which was used for statistical analysis. Descriptive analysis was used to obtain frequencies and percentages. Interview schedules were analysed through open coding and results were presented by use of charts, tables and graphs. Binary logistic regression models were used to analyze the association between the patients' related and health related factors allied with medication non-adherence. The Nagelkerke R^2 was tested to measure the percentage of difference accounted for by the independent variables (Nagelkerke, 1991). Predicted probabilities of an event occurring was determined by $\text{Exp}(\beta)$. The Wald statistic was used to measure the support of individual predictors or the significance of individual coefficients in the model. A p value of less than 0.05 was considered statistically significant for this study.

Table 3
Summary of Hypotheses and Data Analysis Statistical Tests

Hypothesis	Independent Variables	Dependent Variables	Analysis
H0 ₁ : There is no statistically significant association between patient related factors and non-adherence to anti-hypertensive medication in patients followed at Chuka referral hospital	Patients related factors, <ul style="list-style-type: none"> • Cost • Individual beliefs & perception • Age • Education • Knowledge • Presence of co morbidities 	Non-adherence	Descriptive statistics <ul style="list-style-type: none"> • Percentage • Mode Inferential statistics <ul style="list-style-type: none"> • Binary regression • Multinomial regression
H0 ₂ : There is no statistically significant association between health systems related factors and non-adherence to antihypertensive medication in patients followed at Chuka referral hospital	Health system related factors <ul style="list-style-type: none"> • Quality of health care services • Distance • Physician patient relationship • Stocks out • Guideline for management and policy 	Non-adherence	Descriptive statistics <ul style="list-style-type: none"> • Percentage • Mode Inferential statistics <ul style="list-style-type: none"> • Binary regression • Multinomial regression

3.8 Ethical Considerations

All medical and ethical standards were observed at all times during the study. Approval of proposal was sought from Chuka University Ethics Committee to undertake the study. Clearance was sought from Chuka Ethical and Research Committee, permit to undertake the data collection was sought from National Commission for Science, Technology and innovation (NACOSTI). The clearance is as attached in appendix IV on page 96, and Chuka referral Hospital management team was requested for permission to conduct the study in their institution. Description of the study subjects on the drive and the importance of the study was done and Consent was sought before administration of the questionnaires. Data acquired was managed with privacy at all times. All participants were assured of confidentiality. The questionnaires were numbered and nowhere were the respondent being asked to write their names or reveal their identity in the process.

CHAPTER FOUR RESULTS AND DISCUSSIONS

4.1 Response Rate

The overall questionnaire response rate was 50%, (81/161), of the patients who were engaged in the study. In addition, 10 medical staff members participated in interview, intended to gather information to elaborate the quantitative facts. The response rate was good and agrees with Mugenda and Mugenda (1999) recommendation that a response rate of 50% is adequate for analyzing and reporting findings. The involvement of an expanded spectrum of stakeholder involving patients, nurses, pharmacists, and doctors illuminates on the representativeness of the sample and thus, the external validity of the results.

4.2 Profile of the Respondents

In an attempt to profile the research participants, the study focused on their age, gender, education level, occupation and marital status.

4.2.1 Gender of the Respondents

First, the study wanted to know the gender of the participants. The findings are shown in figure 3.

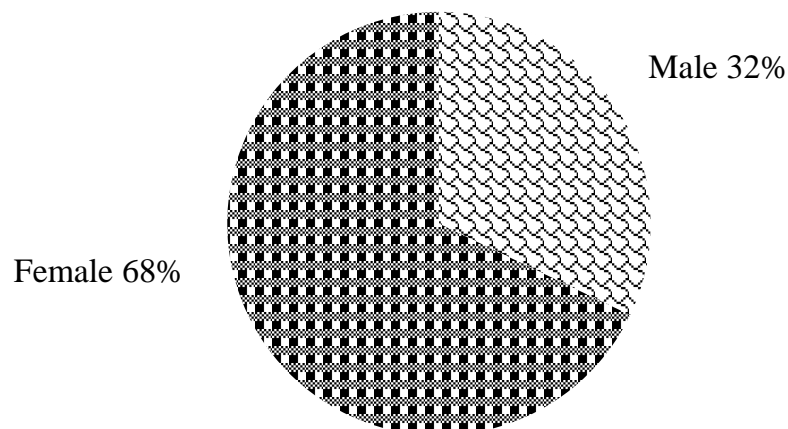


Figure 3: Gender of the respondents (n= 80)

The finding indicate that a most of the respondent (68%) were female while 32% were male.

4.2.2 Age of the Respondents

The participants were also asked to give their ages. Figure 4 shows percentage distribution of the respondents on the basis of age.

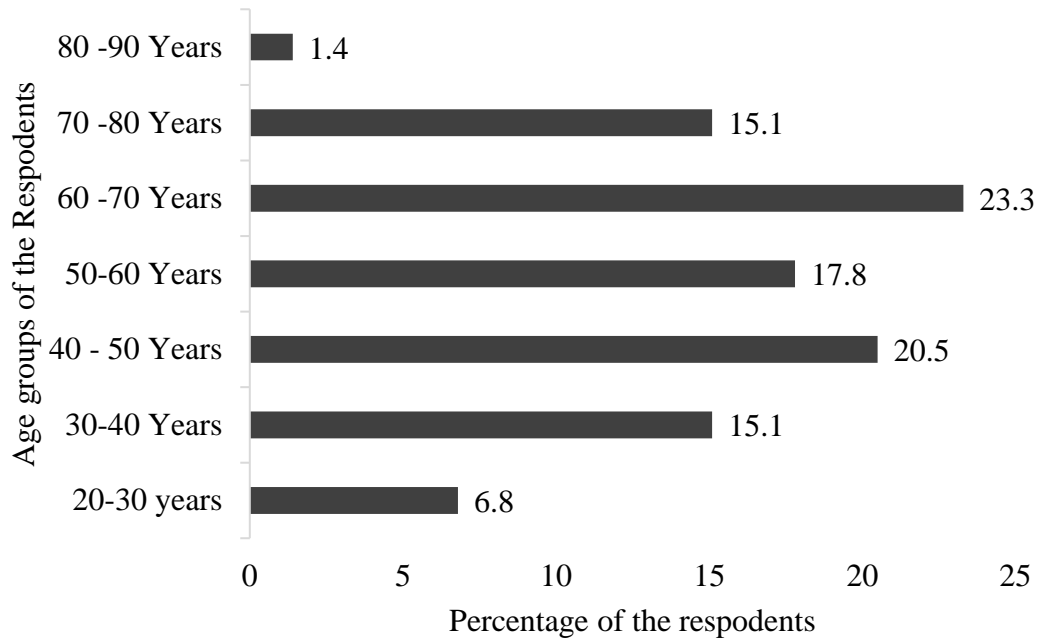


Figure 4: Age groups of the respondents' n=81.

The respondents' ages ranged between 20 and 90 years. The category with the highest number was between 60-70 years (23.2 %), followed by 40-50 years (20.5%), and at third place is the group with 50-60 years (17.8%). The respondents above 50 years of age totaled to 57.6% . .

4.2.3 Marital Status of the Respondents

The study also wanted to know the profile of the respondents in terms of their marital status. The findings are tabulated in Figure 5.

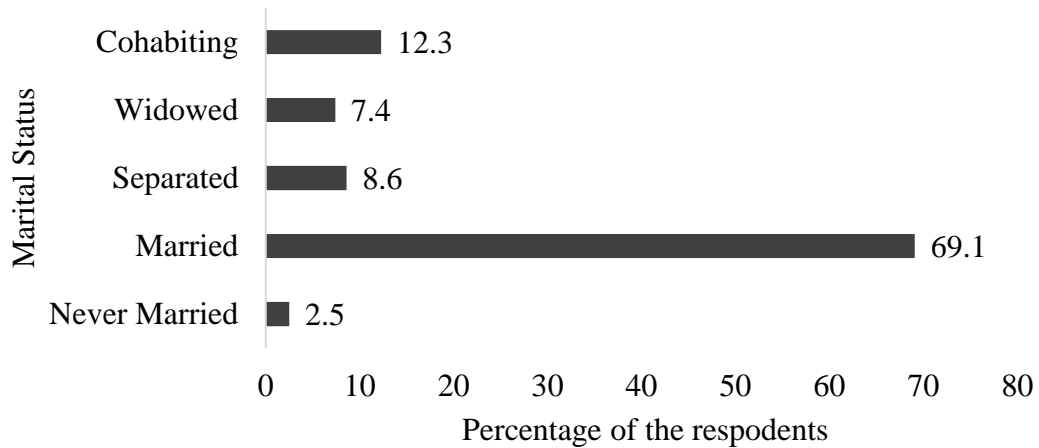


Figure 5: Marital status of the respondents (n= 81)

The status of marriage of the research participants varied from unmarried (2.5%) to married (69.1%). In between these extremes are the widowed (7.4%), separated (8.6%) and those cohabiting (12.3%).

4.2.4 Education Level of the Respondents

The education levels is found to influence many decision making. The study therefore desired to know the highest level of education of the participants, and the findings are revealed in Figure 6

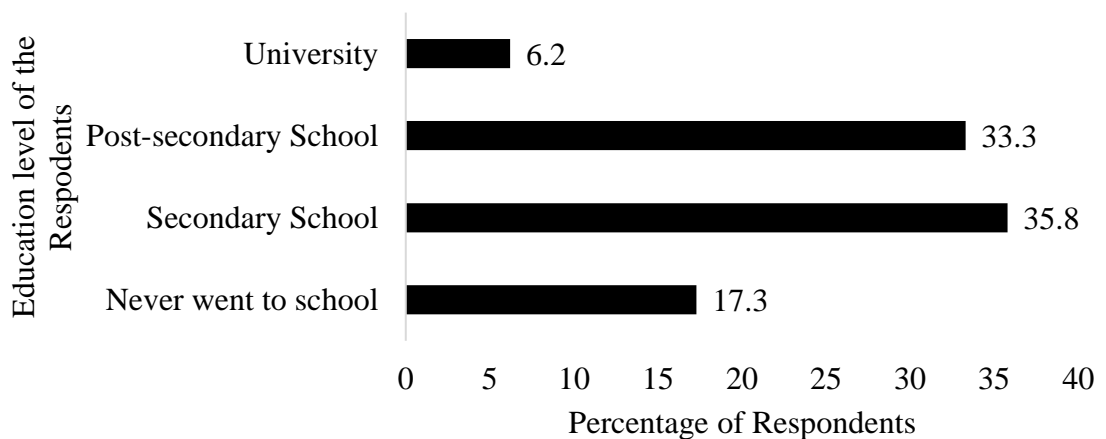


Figure 6: Level of education for the participants (n =81)

Figure 6 illustrates the distribution of study participants by their education levels. The findings further revealed that most of the participants (75.3%) knew how to read and write, hence capable of following doctor’s directions and adhering to hypertension medication. Sixty nine percent (69%) had secondary and post-secondary education and only 17.3% had no education.

4.2.5 Occupation of the Respondents

Figure 7 show the frequencies and percentages of respondents based on their occupation. The results suggests that the patients fell under four categories of employment, government employees, private firms employees, self-employed and unemployed.

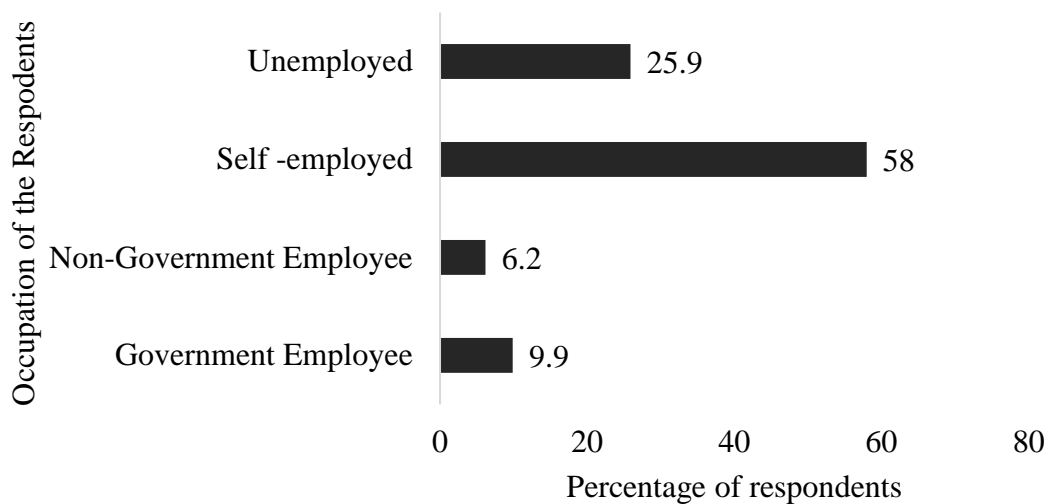


Figure 7: Distribution of respondents by occupation (n=81)

The research study found that over half of the participants (58%) were self-employed. This suggest that most of the hypertension patients in the county are self-employed either working on their farms or in private business. Surprisingly, less than 10% of the patients were government employees.

4.2.6 Economic Status of the Respondents

Figure 8 shows the distribution of participants depending on their levels of monthly income. The income levels were grouped in classes of kshs 10,000.

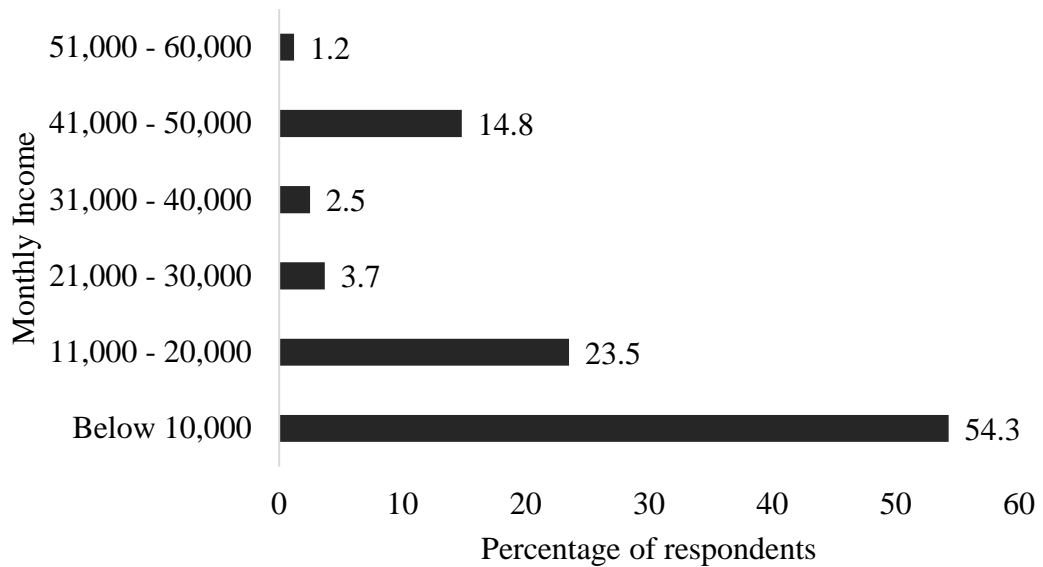


Figure 8: Distribution of Respondents by Income (n=81)

The results in Figure 8 show that a majority (54.3%) earned less than Kshs 10,000 per month.

4.3 Association between Respondents Profile and Non-Adherence to Hypertensive Medication

Table 4

Association between Patients' Characteristics and Non-Adherence to Medication (n=81)

Characteristics	Non-adherence (r_{pb})
Age	-0.271*
Gender	0.127
Education Level	-0.064
Marital status	0.129
Economic status	-0.241*

* $p < 0.05$

4.3.1 Gender of the Respondents

Research has shown that gender is one of the most significant factors influencing behavior in health including medication adherence (Courtenay, 2000). More studies

have shown that women visit care providers to a greater extent than does men, for both physical and mental health concerns (Silva *et al.*, 2016; Thompson *et al.*, 2016). A Phi correlation among gender and non-adherence revealed no significant association ($r_{pb} = 0.127, p = 0.26$) between gender and antihypertensive medication non-adherence. The findings contradict the results of Courtenay (2000) and Tadesse, *et al.*, (2017) who found in their study that anti-hypertensive medication non-adherence is 1.3 times higher in male than in female patients. The research finding also contradicts results from study conducted on Chinese immigrants in America investigating the association amongst cultural associated factors and socio-demographic associated factors in relation to adherence to hypertension medication which revealed that women had greater adherence than men (Li *et al.*, 2008).57yet36

4.3.2 Age of the Respondents.

The current study findings revealed that most of the patients (57.6%) were aged over 50 years thus elderly people have been found to be more non-adherent to medication than young people. The study results revealed a negative correlation ($r_{pb} = -.271$) between age and non-adherent to medication (Table 4). This implies that young ages relates with high levels of adherence. This can be interpreted to mean that elderly patients were more likely to miss drugs than young people. The findings confirms the results of the previous study. A study by Lucca *et al.* (2015) which compared persistence across six chronic classes of medication and adherence revealed that adherence decreased with increasing age. The study findings contradict the results of prior study that investigated the relationship between adherence to medication by patient and increasing age which put forward that older patients made fewer errors in non-adherence and were more regular in taking their prescribed treatments due to influence of having more consistent daily schedules (Demonceau *et al.*, 2013).

4.3.3 Marital status of the Respondents.

Majority of the participants (69.1%) were found to be married. The point biserial test revealed a negative negligible relationship between non adherence to medication and marital status ($r_{pb} = -0.12, p = 0.25$). Involvement of domestic relationship with a spouse did not contribute positive to adherence of antihypertensive. This contradicts a cross-sectional study at Duke University in the United States of America, which explored emotive well-being for hypertensive individual who were unmarried in respect

to their adherence to hypertensive medication which found that being married was related with a higher likelihood adherence to hypertensive medication (Trivedi *et al.*, 2008). Marital status is well-thought-out that it a measure of social networking and is related with better control of hypertension (Caldewell *et al.*,1983). It is perceived that married people should be more adherent than other forms of marital status because of the support from the spouses. A study by Chung *et al.*, (2009) who examined mediation between marital status and outcomes in individuals with heart failure revealed that unmarried individuals with heart failure had a higher risk of cardiac events than married patients.

4.3.4. Education Level of the Respondents.

Regarding education, the study found that most of the patients (75.3%) knew how to read and write, this revealed an insignificant ($r_{pb} = -.06$, $p = 0.57$) correlation between patients' education level and adherence to hypertension medication. Most of respondents had basic education hence capable of following doctor's directions and adhering to hypertension medication. Patients with higher levels of formal education may have a better knowledge of the aim of maintaining their blood pressure, Vincent *et al.*,(2015) noted increase in adherence with increasing educational status which is inconsistent with this study however Arshia *et al.* (2015) found out that non-adherence was high in the individuals who had more education years which confirms the results of this study, thus this calls for collaborative work, not only clinicians but even other health care workers to include nurses clinicians, physicians, dieticians physician assistants pharmacists and nutritionists have a significant part in the monitoring and educating individuals with hypertension. Plain language is advocated instead of technical language or medical jargon to aid in more understanding.

4.3.5 Economic Status of the Respondents.

A point biserial test results (Table 7) revealed a positive correlation between monthly income of the patients and medication non adherence ($r_{pb}=0.241$, $p=0.04$). This means that an increase in the patients' income by one unit would result to an increase in adherence by 0.241 units. The study finding further revealed that majority of the participants earned less than 10, 000 shillings per month which is in line with a study done in the United States of America which showed that individuals with poor health management and low-income were more non adherent due to the of the struggle they

encountered to seek out healthcare services or afford treatment. (Ibrahim, 2003; Shaw & Bosworth, 2012). Thus low levels of economic status is associated with high levels of non-adherence.

Hypertension treatments are long term medications that necessitate repeated refilling however one of the obstacles in medication adherence is cost which obstructs the steadiness of medication for patients with low incomes (Atinga *et al.*, 2018). The main reason for the present result is that not all prescriptions are obtainable in the hospital and thus patients have problems dealing with the cost of prescriptions. Research has previously indicated that poor treatment adherence which are cost related may tell the meaning of necessity and offer explanation for non-adherence to treatment (Atinga *et al.*, 2018).

Hypertension drugs vary in price from expensive to affordable (Després *et al.*, 2014; Goldman, *et al.*, 2007). The role of individual economic status is relative to adherence of prescription as restricted to the capability to purchase the medications. In this study education level did not matter as most participants had post-secondary education though many were still self-employed. Therefore, it is reasoned that individual with high earnings are associated with better management of their health.

Individuals with poor health management and low-income had struggle to afford drugs or even other services in health care. Low-income status was a problem related with poor adherence as was the case for low-income African Americans in the United States of America (Ibrahim, 2003; Shaw & Bosworth, 2012), and in individuals in urbanized communities in rural Eastern Uganda (Bagonza *et al.*, 2015). A study carried out in Iraq to assess compliance of hypertensive patients to treatment found out that an average socioeconomic status was associated with good adherence (Samin *et al.*, 2010). Similarly, NHANES survey of 1999-2002 in America found out a relationship between low adherence and income to hypertension medication. Therefore poor adherence was associated to low monthly earning for patients attending Chuka referral hospital.

4.3.6 Employment Status of the Respondents

The results of employment and association to ant hypertensive medication non-adherence can be argued by in availability of personal financial support that enables

support to purchase of medicines and access of other medical services. The findings are in line with a study from Korea where patients with hypertension showed that employment was related to a greater likelihood of adhering to antihypertensive medication compared to unemployed or retired patients (Park *et al.*, 2013).

4.4 Hypertension Status

The study aimed to describe the hypertension status in the hospital with a focus on the duration of disease, stage of hypertension and avoidance of alcohol.

4.4.1 Period with Hypertension

When asked to indicate the year that they were identified with increase in blood pressure, the responses were as presented in Figure 9

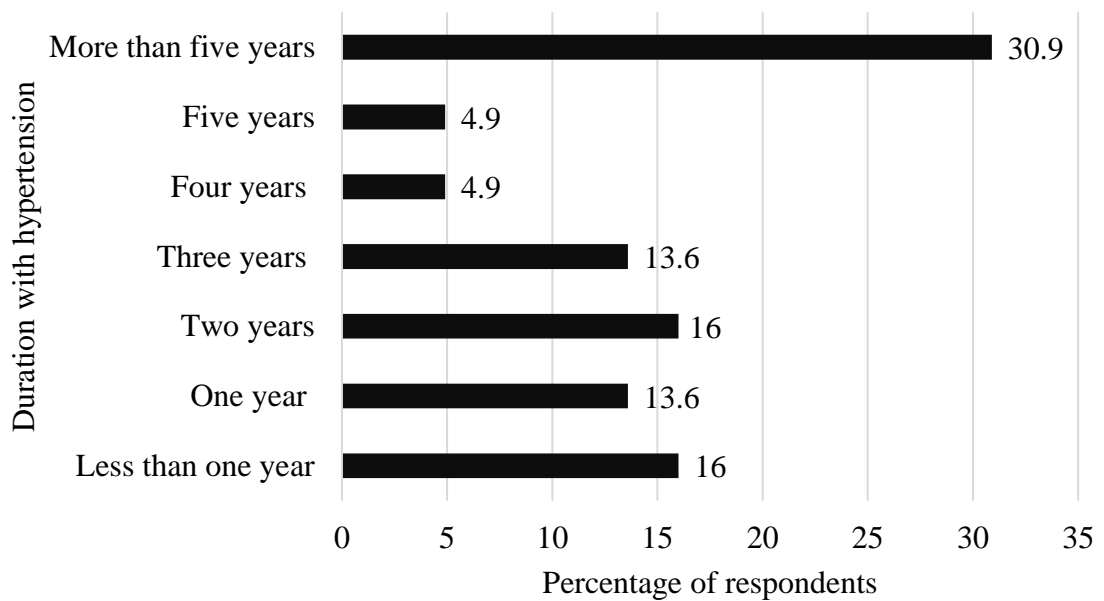


Figure 9: Distribution of respondents by year of hypertension diagnosis (n=81)

Figure 9 results show that 31% of the respondents stated that it was more than five years ago, 16% of the respondents stated that it was less than a year ago, another 16% two years ago, 14% one year, another 14% stated 3 years, 5% four years and 5% five years. This shows that over half of the respondents (54.3%) had been having the disease for more than 3 years.

4.4.2 Kind of Medication

Table 5 shows the distribution of respondents based on the kinds of medication they were taking.

Table 5
Kinds of Hypertension Medication Taken (n=81)

Kind of medicine	Frequency	Percent
One	19	23.5
Two	41	50.6
Three	13	16.0
More than Three	8	9.9
Total	81	100.0

A majority of the respondents (77%) were taking two or more hypertensive drugs. This can be taken to mean most of the patients in the hospital are at the second stage of hypertension. A stage where hypertension lowering medication and healthy lifestyle changes and are recommended.

4.4.3 Alcohol Consumption

Figure 10 demonstrates the distribution of participants on the basis of alcohol consumption.

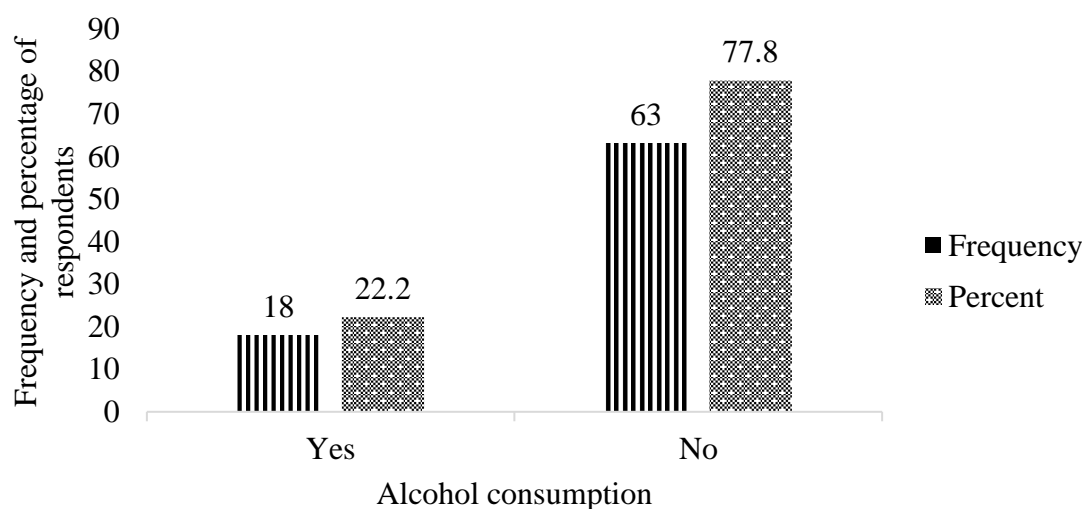


Figure 10: Distribution of participants by Alcohol Consumption (n=81)

The results shows that very few patients were taking alcohol ($n = 18$, 22%) while majority were not taking it ($n = 63$, 78%).

4.5 Hypertension Status and Medication Non-adherence

The research study sought to describe the status of hypertension for patients attending Chuka referral hospital with a focus on the duration of the disease, stage of hypertension and avoidance of alcohol. The findings revealed that majority of the individuals (54.3%) had been having the disease for not less than three years. As a result, many (77%) were taking two or more hypertensive drugs. Inkster *et al.* (2006) in a study to investigate compliance to hypertension treatment and relationship with patient and practice factors found that taking more than three antihypertensive would be more likely to develop adverse effects from the drugs, which would affect compliance to the treatment as some patients opt to discontinue the drugs or skip them for a while. Patients fear side effects thinking that the side effect may harm them than do good (Marie *et al.*, 2016).

Higher numbers of antihypertensive also mean higher cost for the drugs thus affecting on respondent's supply of drugs and adherence. This can be taken also to mean most of the patients in the hospital are at the second stage of hypertension. A stage where healthy lifestyle changes and BP-lowering medication are recommended.

The current study finding implies that majority of the patients were following doctor's advice not to consume alcohol. Drinking a lot alcohol increases BP. More than three drinks at the same time increases BP briefly but recurrent indulge drinking may cause long-term rise of BP due to increase in amount of lipids and fats in blood stream which damages the arteries due to hardening (ESH/ESC,2013).

4.6 Non-Adherence to Hypertension Medication

Figure 11 depicts the frequencies and percentages of hypertension patients who are non-adherent to medication.

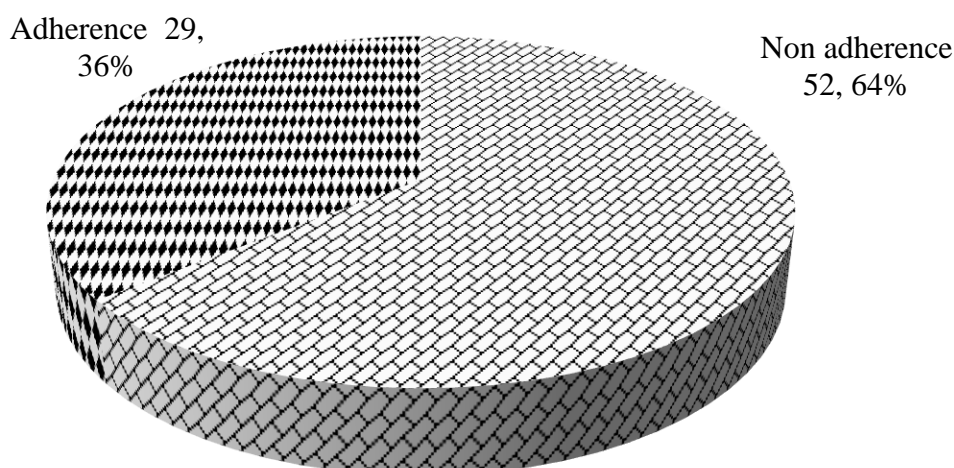


Figure 11: Distribution of Respondents by Non-Adherence (n=81)

The results in Figure 11 shows that 64% of the hypertensive patients had missed medication.

4.6.1 Reasons for Non -adherence

Table 6 reveals the frequencies and percentages of patients with hypertension who are non-adherent to medication.

Table 6
Distribution of patients on reasons for non-adherence n= 81

Reasons for non-adherence	Frequency	Percentage
Lack of funds	29	55.7
Lack of time for refills	12	24.6
Forgetfulness	9	16.4
Thought they had healed	2	3.3

A significant majority (55.7%) of respondents cited lack of funds as the major reason for non-adherence, 24.6% cited lack of time, 16.4% stated that they forgot, and 3.3% thought they had healed. An investigation on the level of non-adherence with

medication indicated that a majority of the hypertensive patients at Chuka Hospital were not adherent to hypertension medication. The results revealed that 64% of the patients with hypertension had missed medication due to lack of funds, forgetfulness, lack of time, forgetfulness and others thought they had healed.

In the present study, forgetfulness is a contributor to hypertensives non-adherence. This is due to the fact that the highest category was elderly patients. Elderly patient are known to forget to take their medicine, alter the schedule of the doses or over use the drugs. This is consistent to the results from Ghana where patients reported of forgetfulness as the main reason for non-adherence (Jambedu, 2006). Forgetting to take drugs is a common problem in older people and especially when older people have several drugs to take.

Participants raised up the issue of lack of refill to antihypertensive treatment which is consistent with a previous study that revealed that lack of knowledge on effects of non-adherence, negative attitude to drugs, lack of time for refills and lack of family member support and cooperation on management contributes to non-adherence (Grueninger, 1995). This calls for focus on behavioral and social support aspect. Behavioural intervention move beyond the cognitive approaches of informational intervention to influence patients behavior by shaping rewarding and reminding desired behavior, social intervention include family members and others in supporting the medication adherence. Adequate and subsidized drugs if supplied to the hospital pharmacy would have reduced the cases of non-adherence. Overall managing hypertension is a behavior change practice that requires thoughtful knowledge efforts from all parties involved. The situation can also be revised by increased follow-ups and stricter advice by the medical practitioners including nurses, doctors, and pharmacists.

4.7 Other Responses from Patients

Figure 12 illustrates the other responses from the patients.

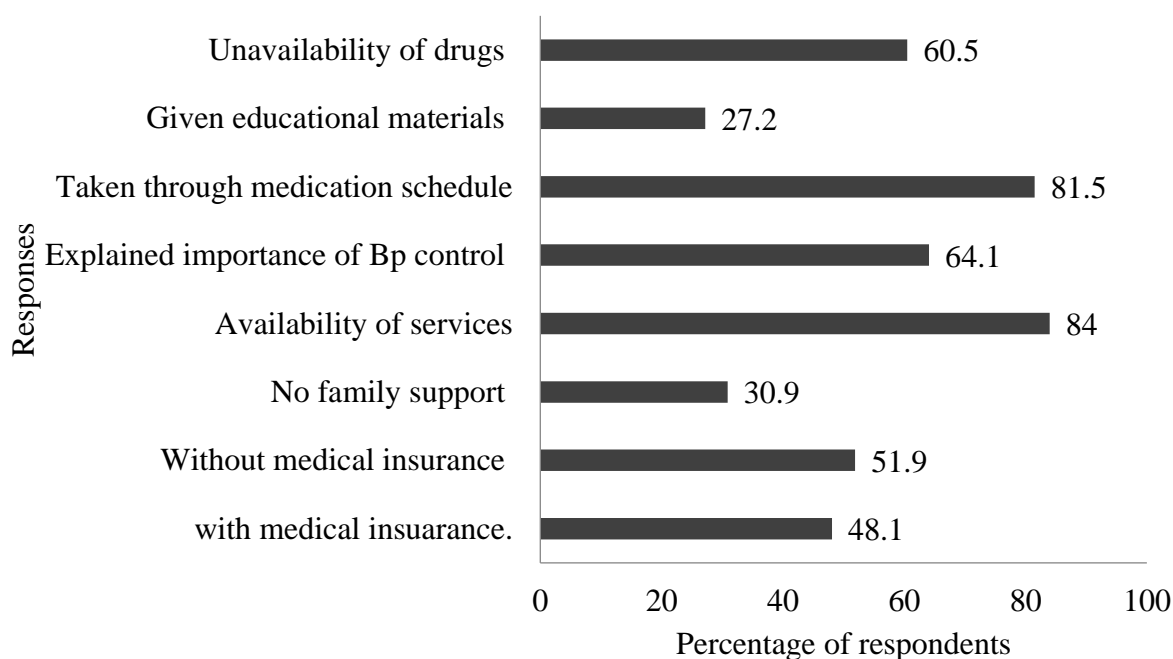


Figure 12: Other responses from Patients (n = 81)

When asked to indicate whether belonged to a health insurance scheme that caters for the medication bills, 48.1% of the respondents stated that they had invested in the scheme while 51.9% had no insurance. Further, the respondents (30.9%) confirmed that they did not get family support in managing the condition. On availability of services, 84% of the respondents confirmed that the care providers were readily available to attend to them, explained the importance of B.P control (64.1%), taken through the schedule of medication (81.5%) although, only a few (27.2%) benefitted from written patient health educational materials on hypertension. The respondents (60.5%) further stated that most of the drugs prescribed by the doctors were unavailable in the hospital pharmacy hence making the patients source them from external chemists at exorbitant prices.

A study done by Baker (2019) on relationship between adherence to antihypertensive medication regimen and out of pocket cost showed that medication non adherence was more likely for those who payed higher out of pocket. This is consistent to the study

results as only 48.1% had a medical scheme and majority of respondents revealed that non adherence was due to inability to pay prescribed medicine, tests and lack of funds to enable access to health facility. Patients with high pill burden and those without family support were found to be non-adherence to antihypertensive medication. 30.9 % of the respondents had no family support. Treatment partners and family support improves patient with chronic conditions (Alwookere *et al.*, 2015). Family support is the most accessible source of support system, therefore hypertension condition, which is a chronic condition requires family support in its management and thus the study emphasizes the necessity of ensuring family support at the commencement and continuation of ant hypertensive therapy.

4.8 Interview Schedule with Health Care Providers

4.8.1 Medical Staff Work Experience and Duties

The study also sought to determine the duties and experiences of the medical staff who were sampled to participate in the study. Distribution of health care providers in term of year of service in medical clinic.

Table 7
Staff Work Experiences n =10

Period in years	Frequency	Percent
1-5	4	40
5-10	4	40
10 - 15	2	20
Total	10	100

As shown in Table 7, 40 % of the medical staff participants had served at the hypertension clinic for a period of between 1-5 years, 40% had worked in the clinic for between 5 and 10 years while 20% had worked in the clinic for a period of between 10 and 15 years.

The detection, diagnosis and treatment of hypertension requires skills much of which are accumulated over a period of time. Skills also come in handy in the detection of cause of secondary hypertension as well as dealing with complications that arises as the disease advances. The study found that a majority (60%) had served in the clinic for a period of over 5 years. Meaning they had adequate experience in management of

hypertension and providing adequate advice to the patients. Hypertension directs attention to itself not only due to its prevalence but also down to the fact that it is asymptomatic, has diverse drugs and treatment procedures, requires long time drug therapy, and demands to be followed up by the medical staff (Kearney *et al.*, 2005).

4.8.2 Medical Staff Responsibilities to Hypertensive Patients

Table 8 presents the daily responsibilities of the medical staff at the hypertension clinic. Three main duties performed at the clinic emerged.

Table 8
Duties of the Medical Staff n=10

Duty	Frequency	Percent
Treating/monitoring hypertensive patients	5	50.0
Registering and counselling patients	2	20.0
Management of hypertensive emergencies	3	30.0

The results revealed that half the participants were allocated with the responsibility of treating and monitoring hypertensive patients 50%. A section of the staff members 20% worked at the registry where they were involved in taking records of the patients. Thirty percent 30% of the respondents handled hypertensive emergencies.

The results findings revealed that there was a multidisciplinary team that worked together in delivering hypertension care services with care purposed to certify individual needs. Team based care in managing hypertension patients involved patients, nurses, physician’s pharmacist and records officers. The professionals compliment the activities of the primary care provider by providing process support and sharing the responsibilities of hypertension care which includes medication management active patient follow up adherence and self-management support. Team based hypertension care has been reported to increase the proportion of individuals to remain in care with controlled blood pressure (Clark *et al.*,2010 ;Carter *et al.*, 2012).

4.8.3 Challenge Facing the Medical Staffs.

The study further investigated on challenges facing the medical staff at the clinic and four main challenges emerged as shown in Table 9.

Table 9 shows distribution of responses by health care providers on challenges they face at the medical clinic in regard to hypertension patient follow-up.

Table 9
Challenges Facing Medical Staff at the Hypertensive Clinic n=10.

Challenges	Frequency	Percent
Stock outs of essential medicine for hypertensive patients	4	40.0
Low knowledge levels of patients on hypertension	1	10.0
Handling too many patients	1	10.0
Ignorance of patients/poor drug compliance	4	40.0

When asked to indicate the major challenges faced while undertaking their duties, 40% stated that stock outs of essential medicine for hypertensive patients, 10% felt that they had too many patients to handle, 10% cited low of knowledge levels of patients on hypertension and 40% mentioned ignorance of patients. They pointed out that some individuals take half dosages or even stay without taking drugs for some time.

Findings of the study on stocks outs of antihypertensive medicines collaborate evidence from Tanzania where review of availability of hypertensive drugs in year 2012-2013 pointed out stock outs (Robertson *et al.*, 2015). Access to essential medicines still remains a challenge. The United Nation under sustainable developmental goals highlighted the need for all members' state to prioritize increased access to quality assured essential medicines as one of the global developmental agenda for 2030.

Steady availability to crucial medicine with emphasis on sensible choice of reasonable prices and justifiable financing should be crucial component of the policy framework (WHO, 2005). Stock outs of hypertensive drugs disproportionately influences low income patients as most often they cannot afford to travel looking for more affordable therapy due to high cost of transportation, for example. Low income patients may most probable be unlikely to send supporters to buy them drugs in other markets due to lack

of extra finances for transport cost and for purchase of drugs, hence they results to purchase of drugs at the nearby private owned drugstore, which is the most costly alternative since it may be the only drug store in Chuka town. Some others for go the drug that is out of stock and thus are left managing the condition with only the available prescribed regimen. Patients also explained that hypertension drugs were more affordable and at times issued out for free at the county health facilities.

Low knowledge or unawareness of hypertension and the asymptomatic nature of hypertension are the primary patient related barrier (Rajesh & Vedathan, 2016). The study findings are consistent with the results which revealed low knowledge on hypertension. Correct knowledge on elevated BP, its treatment and management creates understanding and prevents confusion. A study from Gaza and Pakistan revealed that individual who were knowledgeable about their disease and treatment had improved compliance to treatment compared to those who were less informed of their condition (Baune & Aljeesh, 2006). Though in contrary to the findings, studies from developed world showed no relationship between compliance and knowledge (Krousel-wood *et al.*, 2004; Yiannakopoulou *et al.*, 2005).

A study done in Western Kenya on barriers and facilitators to nurse management of HPT, nurses reported that there was inadequate training and excessive workload. They expressed concern on increased workload in the circumstance of present obligations and fear of further obligations associated to HPT management (Rajesh & Vedathan 2016). The result of this study reviewed that health care providers had too many patients to handle. Health care providers play a key role in provision of health care services. The shortage of health care workers is partly due to migration of health personnel's in search of better living standards, improved enumeration, access to advanced technology and failure of counties to replace those who left the institution. The shortages are multifaced problem and improvement are needed if reduction of HPT related morbidity is to be achieved. Shortage of staffs can explain the findings of the low knowledge of hypertension to patients because of the limited time that the health care worker is to stay with the patient.

Ignorance of patients on adherence of treatment was a predictive factor to patients attending the institution. The observed results on ignorance were also reported by

Isezuo and Opara as being responsible to nonadherence in a study done in India on medication adherence rating of patients with hypertension (Isezuo & Opera 2000). Kaboru in his study on adherence to hypertensive treatment revealed that adherence was low in African countries and this was due to ignorance of severity and low knowledge of the treatment of hypertension (Kaboru, 2013). The reasons for this challenge could be due to providing patients with non-comprehensive information or they may be having insufficient knowledge about the illness and the severity of its complications, making them not to take seriously the recommendation given. Once diagnosis is made should be educated on what is hypertension, its etiology, the length of treatment and the purpose for adherence to treatment, lifestyle changes and on need of sustained follow up visits. Patients who have proper information on hypertension are more expected to accept the medication and follow health care providers' recommendations and are more unlikely to stop medications prematurely.

4.8.4 Reasons for Non -Adherence by Medical Staffs

Health providers were asked what makes their patients miss drugs. According to the practitioners, the patient missed drugs because ignorance (40%), polypharmacy (10%), denial (10%), lack of transport (10%), unaffordability of laboratory investigations and drugs (20%), and intolerance to side effect of the hypertension drugs (10%).

Cost of medication and laboratory investigation are some of the explanations why individuals do not adhere to hypertensive drugs, this is consistent with a study done by Rajesh & Vadathan, (2016) on barriers and facilitators to nurse management in HPT. It revealed that hypertensive medications were un-affordable. Long standing conditions care management went further than the aggregate expenses of lifelong treatments, these include expenses related to laboratory testing, consultation, and transportation. (Rajesh et al., 2016) 54% of participant of this study earned less than ksh.10,000 per month and when a point biserial test was done it revealed positive correlation between monthly income and non-adherence to medication. Given the reality of low economic status in the form of monthly income and patients purchasing their own drugs out of their pocket was a barrier to achievement of adherence.

Health providers reported that side effect is a contributing factor to non-adherence. The consequences of use of drug to patient makes them to get afraid due to thinking that

they may do more harm than good (Marie *et al.*, 2016). Unintended side effects felt by others or individually and fear concerning potential side effect impacts the behavior of adherence. Marie *et al.* (2016) continues to say that when patient are mandated to select between side effect and control of asymptomatic ailment some patients may deliberately non-adhere. Patients probably assessed the risk of the unintended side effect than by evaluating the circumstance (Paling, 2003). Three quarter of hypertensive patients in a study stated clinician/physician did not discuss the possible side effects that they were likely to experience (Lapane *et al.*, 2007). Side effects like weight gain ,chronic cough, impotence, sexual dysfunction, fatigue, gynecomastia and depression to include others made the patient feel that there was more harm than good (Marie *et al.*, 2016).

Polypharmacy which is simultaneous use of multiple medications was a concern to some health care providers .the results finding were consistent with a study by Palterson and others who found out that patient with chronic medical conditions are most susceptible to polypharmacy due to others taking more medication for their other medical disorders (Palterson *et al.*, 2014). Use of numerous medicines is related to an increased risk of adverse effects which may even raise the danger of unwanted drug interaction for example a patient with angiotensin converting enzyme inhibitor which is antihypertensive drug and is also given potassium supplements can cause life threatening elevations of potassium in the blood which requires emergency medical care. Patients with chronic conditions should be empowered to make informed decision about their drugs and other supplements they are taking and thus all health care providers have a vital role in empowering the patient to make these decisions.

Medical staffs revealed that lack of transport by patients was also a factor that influenced non adherence. Longer distance was an obstacle to non-adherence to providers' advice particularly when it was accompanied by poor terrain and poverty. Medical staff continued to say that patients who came from far were more likely to be non adherent as compared to patients who came from nearby. The study finding is consistent with a study in India which revealed that patient who took long time for reviews were the poor and those who came from far (Inkster,2006).

4.8.5 Measures to Adopt to Curb Non adherence

When asked to state the measures that can be adopted to improve adherence to medication, majority of the medical staff (70%) felt that providing counselling services to patients would improve adherence to hypertension drugs. Effective counseling entails providing information on the condition for instance, etiology, risk factors, complications ,contraindication and side effects, promoting health status with adherence, and promoting healthy behaviors. It is crucial to highlight measures of risk factors thought to be contributing to non-adherence so as to improve in measures of controlling BP and to inform on risks of non-adherence to medication for example; risk factors to increased BP include; obesity, family history, alcohol, cigarette smoking, increasing age, sedentary life and diet with increased salt and fat.

Obesity places much load to the heart causing increase in cardiac output. Atherosclerosis of the blood vessels increases with increased age and can also result from obesity due to biochemical abnormalities (Stephen & Maxine 2011). Nicotine from cigarrates can result to vasoconstrictive effect which can result to increased total peripheral resistance thus rise in BP. In families with history of hypertension there is a risk factor of developing primary hypertension. Consumption of alcohol elevates the BP levels by causing vasoconstrictive effects while excess use of salt leads to raised cardiac output due to increased blood volume (Hawkins *et al.*, 1992). When these effect are explained to patients they would then understand the advice given to them by the physicians better than only when told to avoid certain behavior without clear explanations.

Patients require to be updated on management of hypertension, keeping of up-to date record of their blood pressure numbers even when they are feeling fine. If normal BP they should continue managing it through the help of health care provider. If increase in BP, treatment may aid to avert injury to the organs in the body. Patients should be made aware of the notion of HPT and the effects in the blood vessels.

Health care counselors need to emphasize the implications of poor adherence, how alcohol use affects adherence, how to manage side effects, as well as stress the lifelong need for adherence. In particular, patients can be encouraged to utilize their social network as high level of social support is allied with improved adherence. Adherence

to medication would be a suitable strategy to minimise the cost of treatment since it minimises the cost of dealing with side-effects resulting from non-adherence (Osterberg & Blaschke, 2005).

They also (20%) felt that availability of more hypertension diagnostic equipment would aid in better diagnosing the secondary hypertension. A considerable number of hypertensive patients have a risk of cardiovascular involvement at presentation time (Shea *et al.*, 2016). Early diagnosis and prompt treatment of HPT plays a significant role in reducing the dangers of stroke and cardiovascular disease. Both specialized and routine biochemical investigation are vital for examination of patients and subsequent management. The test aid in detecting the patients with greater risk of dysglycaemia, dyslipidemia, target organ damage, renal impairment, damage and to eliminate recognizable causes of hypertension (Shea *et al.*, 2016).

MOH Cardiovascular guideline recommends that a referral hospital should have, echo machines, blood analysis machines, cardiac cathetersation lab, facilities for telemedicine and critical care unit among other equipment in other levels of care (MOH, 2018). Health care providers felt that the equipment would help them in risk screening assessments and management of hypertensive patients.

Other (10%) felt that the nurses should use mobile phone for making follow ups. Usage of mobile phones has extended among the communities (Anglanda *et al.*, 2015). Mobile phones are said to be the fastest adopted technology in high and low income countries (Anglanda *et al.*, 2015). New approach of model of managing health through phones is on increase. Quick adoption of smart phone technology generates an interesting and promising platform to overcome non adherence to medication by offering healthy lifestyle education, providing drug intake reminders and keeping records of biometric measurements (Anglanda *et al.*, 2015). This strategy once adopted will overcome medication non adherence by providing drug intake reminders and clinic follow-ups.

4.9 Patient Related Factors Associated with Non-Adherence

The first objective sought to determine patient related factors related with non-adherence to antihypertensive medication in individuals followed at Chuka referral hospital. The dependent variable was non-adherence, a categorical variable measures

in nominal scale (1 = Yes, 0 = No.) while the independent variables were cost of medication, religious beliefs, age, their education, level, preference to traditional medicine, and sociocultural factors. Logistic regression was investigated to assess if cost of medication, religious beliefs, and age, their education, level, preference to traditional medicine, and other sociocultural factors were significant predictors of the likelihood of hypertension patients not to adhere to medication. The Hosmer-Lemeshow test was assessed for testing goodness-of-fit of the model, $\chi^2=9.11$, $df = 8$, $p=0.33$, which was not significant ($p>0.05$), signifying that the model fit to the data well. According to Field (2013), Hosmer and Lemeshow's measure (R^2) was calculated as follows;

$$R_{L^2} = \frac{(-2LL(\text{baseline})) - (-2LL(\text{new}))}{-2LL(\text{baseline})}$$

$$= \frac{9.709 - 77.172}{92.709}$$

$$= 0.170$$

Table 10 presents 3 inferential statistical tests for overall model evaluation.

Table 10
Overall Logistic Regression Model Evaluation and Goodness-of-Fit Statistics of Predicting Likelihood of Non-Adherence to Medication (n=81)

Test	R ²	χ^2	df	P
Overall model		17.144	1	0.000
Hosmer & Lemeshow	0.170	9.114	8	0.333
Cox & Snell	0.175			
Nagelkerke	0.256			

The Hosmer and Lemeshow statistic ($R^2= .17$) indicates the model accounts for 17% of the variation on hypertension medication non-adherence as presented in table 10. Nagelkerke R^2 estimate indicated that 26% of the variance in non-adherence to hypertension medication can be predicted by patient related factors (cost of medication, religious beliefs, age of the patient, their education, level, preference to traditional medicine, and sociocultural factors). Cox & Snell R^2 showed that the six factors can account for 18% of the variation. The patient related factors; cost of medication, religious beliefs, age of the patient, their education level, preference to traditional

medicine, and socio cultural factors together are significant predictors of non-adherence to hypertension medication, $\chi^2 = 17.144$, $df = 1$, $n = 81$, $p < 0.05$.

Table 11 presents the statistical significance of individual regression coefficients (β_s) tested using the Wald Chi-square statistic.

Table 11
Coefficients of the model predicting non-adherence to medication (n= 81)

	β	SE (β)	Wald's χ^2	df	P	e^{β} (OR)	95% C.I.	
							Lower	Upper
Age	-0.367	0.294	1.553	1	0.213	0.693	0.389	1.234
Traditional medicine	-1.040	0.964	1.163	1	0.281	0.354	0.053	2.339
Religious beliefs	2.447	1.181	4.294	1	0.038	11.554	1.142	116.933
Social/cultural factors	-0.743	0.770	0.933	1	0.334	0.475	0.105	2.149
Cost of medication	1.930	0.626	9.504	1	0.002	6.887	2.020	23.485
Education Level	-0.199	0.268	0.553	1	0.457	0.820	0.485	1.385
Constant	-2.963	1.502	3.889	1	0.049	0.052		

Results shows, religious beliefs ($X^2 = 4.29$, $p = 0.038$) and cost of medication ($X^2 = 4.29$, $p = .002$) was significant predictors of hypertension medication non-adherence. The odds ratios of the two significant predictors were 11.554 (95%, 1.142- 116.933) and 6.887 (95%, 2.020 – 23.485). The odds of predicting the likelihood of patients not adhering to medication increases by 11.55 for each unit increase of religious beliefs and by about 6.89 for every unit increase in cost of medication. The other factors; age of the patient, their education level, preference to traditional medicine and sociocultural were insignificant predictors ($p > 0.05$) of non-adherence to medication. However, the six factors together were significant ($\beta = 1.05$, Wald's $X^2 = 17.14$, $df = 1$, $p < .05$, OR = 0.350). The overall precise prediction, 76.5% shows progress over the chance level which was 74.1%.

Null Hypothesis that was being tested stated, H_{01} : There is no statistically significant relationship between patient's related factors and non-adherence to antihypertensive medication among patients followed at Chuka referral hospital. Using the level of significance as 5% and 1 degree of freedom in chi-square table the critical value of chi

square statistics is 3.84 (read from chi-square table in Appendix VI) and the calculated /test chi-square is $X^2=17.14$, $p=0.00$) which is greater than critical value thus there is statistically significant association between non adherence to hypertension medication and patient related factors hence null hypothesis is rejected.

The research findings are in line with those of the earlier study by Atinga *et al.* (2018) in their study found that patients resorted to herbs due to increased cost of the recommended treatments and thus felt economically incapable to continue purchasing the medications, other individuals felt that they did not want to get used to the treatments which were unaffordable. They felt that, herbal remedies are accessible and cheaper hence the earlier they got used to them the better. In enlightening health behaviors, social factors like religiosity and spirituality are progressively known as impacting treatment and health. Religiosity and spirituality have been presented into the medical field indicating a growing interest in the likely observed health benefits connected with having a spiritual belief and following a religious lifestyle. Religiosity describes more of social and cultural norms and refers to an outward recommended system of beliefs and guidelines of behavior.

It is usually described in a behavioral setting where rites and other associated symbolic events such as reading religious scripts, prayers, meditations, fasting, attending at services are observed by persons according to their specific beliefs and modes of social organization (Miller *et al.*, 2003). All of which are likely to influence compliance to treatment through assisting the individuals with choices in health associated practices. Some religious beliefs and cultural background contribute to patient practices regarding taking medications. A study conducted by Justin and others in South Africa revealed that use of Aloe (green and bitter mixture) to control hypertension and that use of prayers and holy water would also control the blood pressure (Justin *et al.*, 2014). Religion has control of enabling the individual through connection to a community and the ability to empower could be used by medical personnel in helping those patients who struggle with the ailment and to stimulate them in adherence. This empowering can happen through awareness of religious values such as social networking and sanctity thus medical practitioners need to promote the understanding of religion and spirituality.

Cost of medication was a barrier to effective treatment. Non-adherence to treatment places a substantial cost burden on healthcare systems. An improvement in hypertensive medication adherence will not only reduce the cost of treating the disease but also reduce the expense of managing the complications arising from non-adherence. In Saudi Arabia health services are offered at no cost thus individuals do not worry on cost factors (Alkhawajah & Eferakeya, 1992). In developing countries like India where patients are not covered by insurance scheme and are incurring treatment expenses for their health care, they would benefit if clinician provided better services centered on practical and cost effective drug prescriptions (Karne *et al.*, 2014).

The presence of comorbidity becomes an added barrier to cost implication. In the case of Chuka referral Hospital, hypertension drugs were offered at a subsidised cost. It was noted that most of the hypertension drugs were perennially out of stock or were not supplied at all where the patients would then buy the drugs from outside the hospital at higher prices. The cost of hypertension medication per month for the respondents would thus depend on number of drugs prescribed and availability of those drugs at the hospital pharmacy. For such reasons, low-income earners had difficulties in maintain steady supply of their medication hence impacting negatively on their adherence. A study by Atinga *et al.* (2018) showed that individuals with poor adherence due to cost were more probable.

A study done by Rajesh *et al.* (2016) on barriers and facilitators and nurse management to hypertension revealed that there was unaffordability and stock outs of hypertensive medications. Concern on charges of chronic disease went past the collective cost of lifelong medication for example cost of consultation, laboratory testing and transportation. Overall high cost was revealed to restrain the achievement of hypertension management program (Rajesh *et al.*, 2016).

4.10 Health System Related Factors and Non-Adherence to Medication

The objective was to determine health system factors associated with non-adherence to hypertension medication in patients followed at Chuka referral hospital. Logistic regression was conducted to assess if health system related factors; quality of health service, physician patient relationship, stock out, health education and availability of

medicine in the hospital. Hosmer-Lemeshow test was deployed to check for goodness-of-fit of the model, $\chi^2=11.99$, $df = 7$, $p = .10$, which was not significant ($p>.05$), signifying that the model fit to the data well. According to (Field, 2013) Hosmer and Lemeshow's measure (R^2) was calculated as follows;

$$R_{L^2} = \frac{(-2LL(baseline)) - (-2LL(new))}{-2LL(baseline)}$$

$$= \frac{105.673 - 103.588}{105.673}$$

$$= 0.20$$

Table 12 presents the inferential statistical tests for overall model evaluation.

Table 12

Overall logistic regression model evaluation and goodness-of-fit statistics of predicting likelihood of non-adherence to medication (n=81)

Test	R^2	χ^2	df	P
Overall model		6.348	1	0.012
Hosmer and Lemeshow	0.020	11.986	7	0.101
Cox & Snell	0.025			
Nagelkerke	0.035			

$p < .05$

The Hosmer and Lemeshow statistic ($R^2= 0.02$) indicates the model accounts for 2% of the variation on hypertension medication non-adherence as shown in Table 12 Nagelkerke R^2 estimate indicated that 3.5% of the variance in non-adherence to hypertension medication can be predicted by health system related factors (quality of health service, physician patient relationship, stock out, health education and availability of medicine). Cox and Snell R^2 showed that the five factors can account for 2.5% of the variation. The health system related factors; quality of health service, physician patient relationship, stock out, health education and availability of medicine factors together are significant predictors of non-adherence to hypertension medication, $\chi^2 = 6.348$, $df = 1$, $n = 81$, $p < 0.05$.

Table 13 presents the statistical significance of individual regression coefficients (β s) tested using the Wald Chi-square statistic.

Table 13
Coefficients of the model predicting non-adherence to medication (n= 81)

Variable	β	SE (β)	Wald's χ^2	df	P	e^β (OR)	95% C.I Lower Upper	
Quality of health service	0.660	0.509	1.68	1	0.195	1.934	0.714	5.243
Physician-patient relationship	0.412	0.594	0.482	1	0.488	1.510	0.472	4.838
Stock out	0.063	0.450	0.020	1	0.888	1.065	0.441	2.572
health education	0.162	0.594	0.074	1	0.785	1.176	0.367	3.769
Availability	0.184	0.519	0.126	1	0.722	1.202	0.435	3.327
Constant	-2.74	1.901	2.08	1	0.149	0.064		

The results revealed that no individual health system related factors was a significant predictor of non-adherent to hypertension medication as the p -values were greater than confidence interval ($p < 0.05$). The health system related factors; quality of health service ($p=0.20$), physician patient relationship ($p = 0.49$), stock out ($p = 0.89$), health education ($p=0.79$), and availability of medicine factors ($p = 0.72$). The health system related factors; quality of health service, physician patient relationship, stock out, health education and availability of medicine factors together are significant predictors of non-adherence to hypertension medication, $\chi^2 = 6.35$, $df = 1$, $n = 81$, $p = 0.012$.

Null Hypothesis H_{02} : which stated that there is no statistically significant association between health systems associated factors and non-adherence to antihypertensive medication among patients followed at Chuka referral hospital. Using the level of significance as 5% and 1 degree of freedom in chi-square table the critical value of chi square statistics is 3.84 (read from chi-square table in Appendix VI) and the calculated /test chi-square is $\chi^2 = 6.34$, $p = 0.012$) which is greater than critical value proves that is statistically significant association between health system associated factors and non - adherence and hence null hypothesis is rejected.

Prove from the result findings is that health related factors contributed towards non-adherence to hypertensive medication. Health systems factors play a crucial role in the promotion of adherence. A good link between patient and health care provider which

comprises of reinforcement and encouragement from the health worker, has a positive influence on compliance to drugs. Study findings from Ethiopia at university of Gondor hospital indicated a positive relationship between non perfect adherence of medication and poor physician-patient relationship (Ambaw *et al.*, 2012). The results indicated that health education precisely on hypertension treatment including use of drugs with fewer side-effect, and probe of potential side-effects the individual may have resulted to adherence improvement.

In low-income countries provision of drugs in health facilities are scarce and thus majority of patients end up buying from their out of pocket. Approaches for refining access to drugs for instance reliable supply, sustainable financing and subsidized prices have a significant effect on patient adherence and mainly in low income segments of the population (Schafheutle *et al.*, 2009). Hence focus on improving the efficiency health system functions like financing delivery of care and appropriate medication management can create a significant influence to promoting the adherence rates of hypertensive patients.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Non-adherence to hypertension medication is a major problem at Chuka level five hospital. Majority of the individuals diagnosed with hypertension have been missing medication. This due to lack of funds, time, forgetfulness and patient thinking that they had healed. Most of the drugs prescribed by the doctors were unavailable in the hospital pharmacy hence making the patients source them from external chemists at exorbitant prices. To practitioners, non-adherence to hypertension medication resulted from stock out and ignorance on the part of the patients. Absence of hypertensive drugs influences poorer patients due to unaffordability of funds to access cheaper drugs due to the high charges of transport. Low income patients may also be unlikely to send supporter to purchase them drugs in towns or markets.

It is clear that individuals with low income levels and elderly patients are more likely not to comply to HPT drugs than young and those with high monthly income. Education level did correlate with non-adherence of hypertensive medication. However, many of the patients knew how to read and write, hence capable of following doctor's directions and adhering to hypertension medication. Most of the patients had managed the diseases for a period not less than three years and such many are at the second stage of hypertension taking two or more hypertensive drugs. Most of the patients catered for the hospital bills through personal medical insurance schemes and family support. Despite the high levels of non-adherence, the care providers were readily available to attend to them, explained to them the importance of B.P control, took them through the schedule of medication and gave health educational materials on hypertension to some.

The study identified three strategies that can be adopted to minimize if not to eradicate non-adherence. First, effective counselling should be adopted to change the behavior of the patients. This would entail providing facts on side effects and contraindications, enhancing health status with medication adherence, providing facts on side effects and contraindications, and supporting healthy behaviors. Secondly, availability of more hypertension medication equipment would also help to reverse the situation and lastly facilitating the practitioners to make adequate, regular and sustained follow ups. Patient

related factors including cost of medication, religious beliefs, age of the patient, their education level, preference to traditional medicine, and sociocultural elements were together found to be important predictors of non-adherence to hypertension medication at Chuka hospital. Among the patient related factors, religious beliefs and cost of medication emerged as the most influential factors to non-adherent to hypertension medication. Health system related factors; quality of health services, physician patient relationship, stock out, health education and availability of medicine factors were also revealed to be important predictors of hypertension medication non adherence as well. However, no individual factor in health system was a significant predictor of non-adherent to hypertension medication.

5.2 Recommendation

To address the high levels of non-adherent to hypertension medication the study made the following recommendations;

- i. There is need for a continuous supply of hypertension medications to the hospital to prevent patients from missing the drugs especially those who cannot afford to purchase them from private chemists, thus there is need to reduce out of pocket payment through establishment and strengthening of the community health insurance scheme.
- ii. The hospital should set aside some resources for making patients' follow ups especially those treated and left to go home. Community health workers should be deployed to follow up with elderly patients and generally patients with chronic ailments who may forget to take their medications. Text messages from mobile phone could be sent to the patients to remind them of taking drugs as scheduled.
- iii. Discussions with patients during routine practice are crucial to this process as they provide an opportunity for nurses to offer advice about behavior change. Ultimately, nurses are key players in motivating adherence
- iv. Forgetfulness which emerged as a reason for non-adherence may be due to personal beliefs that strict timing of prescription regimens isn't necessary. Under such circumstances, nurses can reinforce patient positively so as to increase motivation. For example, sharing and highlighting evidence of health

improvements made because of their compliance could encourage and motivate them to remain compliant and achieve other health targets

- v. Educating patients has been shown to improve adherence of medication and should therefore be adopted by the clinic managers as an important factor of management program in hypertension illness.
- vi. It is essential for the government to subsidize hypertension medication to make them affordable to all especially those with low income levels and to waive those who cannot afford to pay for their medications.
- vii. Health care providers should cultivate an understanding of how religion affect adherence of medication so as to empower the patient who struggle with the disease to promote adherence.

5.3 Suggestion for Further Research

Based on results of this research, recommendations for further studies were made as follows;

- i. Since, a majority of those missing drugs were women most of whom seemed ignorant, further research is justified to come up with better ways of educating them on dangers of missing drugs. This study would be intended to generate information that can form a basis of developing educational programs that can boost adherence not only to hypertension drugs but also to other drugs as well.
- ii. The research study focused on health system and patients related factors that predict non-adherence to hypertension medication, an exploration study focusing on other factors other than the ones studied would be necessary to generate adequate information to arrest the situation.
- iii. The study focused on hypertension non-adherent, further studies should be conducted with a focus on non-adherent to other kinds of medication.

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APPENDICES

APPENDIX I: LETTER OF INTRODUCTION AND CONSENT

Charity Ngugi Gikunda

P.O Box 652

Nkubu.

0722646483

Dear respondent,

I am a post graduate student from Chuka University at school of Science Engineering and Technology, undertaking masters of Science in nursing (Community Health). I am carrying out academic research on “**Patients and System related factors associated with non-adherence to antihypertensive medication at Chuka referral hospital**”. This is for partial fulfillments of my masters in nursing. Participation is voluntary and facts provided is for educational purpose and will be kept confidential. I would like you to be one of my respondents. The study will provide significant facts essential for improvement of service delivery in the hospital.

I look forward to your cooperation.

Part II: Consent.

The information provided has been read/have read and have understood the purpose and the nature of this study, and that my identity will not be shown in the study. I consent freely to take part in this study as a study participant.

Participant signature:

Date:

The aim and the nature of the study to the above participant has been explained and permission to participate has been sought in writing.

Researchers Signature:

Date:

APPENDIX II: RESEARCH QUESTIONNAIRE FOR HYPERTENSIVE PATIENTS

Research title: Patients and System Related Factors associated with Non – adherence to antihypertensive Medication among patients at Chuka Referral Hospital, Kenya

Questionnaire number

Interview Date / / (dd/mm/year)

Interviewer Code

Section A: Background data and demographic information

1. Gender
 - a) Male
 - b) Female
2. Age (in years)
3. What is your marital status?
 - a) Never married
 - b) married
 - c) Separate
 - d) Widowed
 - e) Cohabiting
4. What is your highest qualification level attained?
 - a) University
 - b) Post-secondary school
 - c) Secondary school
 - d) Never went to school
5. What is your employment status?
 - a) Un employed
 - b) Self employed
 - c) Non-government employed
 - d) Government employed
6. What is your monthly income?
 - a) Below 10,000
 - b) 11,000 to 20,000
 - c) 21,000 to 30,000

- d) 31,000 to 40,000
- e) 41,000 to 50,000
- f) 51,000 to 60,000
- g) Above 60,000

Section B Patient related factors associated with non-adherence

- 7. For how long have you been with hypertension?
 - a) More 5 years
 - b) 5 years
 - c) 4 years
 - d) 3 years
 - e) 2 years
 - f) 1 year
 - g) Less than 1 year
- 8. How many antihypertensive drugs are you taking?
 - a) 1
 - b) 2
 - c) 3
 - d) 3 and above
- 9. If yes what are the reasons.....
- 10. Do you consume alcohol?
 - a) Yes
 - b) No
- 11. Have you ever missed medication?
 - a) Yes
 - b) No
- 12. If yes what are reasons?.....
- 13. Have you ever stopped medication because you are using traditional medicine from traditional healers
 - a) Yes
 - b) No
- 14. Have you ever stopped medication because religious beliefs?
 - a) Yes
 - b) No

15. Have you ever stopped medication because of any other social/cultural factors

- a) Yes. b) No

16. If yes specify

17. Have you ever stopped medication because of cost of medication?

- a. Yes
- b. No

18. Do you have a treatment supporter to remind you to take medication?

- a) Yes
- b) No

Section C. Health system related factors

19. Are you able to access health care provider whenever you need them?

- a) Yes
- b) No

20. Is the cost of services offered affordable?

- a) Yes
- b) No

21. Is there therapeutic relationship when you are with the clinician?

- a) Yes
- b) No

22. Are drugs prescribed readily available in the hospital pharmacy?

- a) Yes
- b) No

23. Are you covered by any health insurance scheme that caters your treatment bills?

- a) Yes
- b) No

24. Do you family support in the care of your condition?

- a) Yes
- b) No

25. Have you been informed by health provider the importance of your blood pressure control?

- a) Yes
- b) No

ii.

26. Does the hospital provide you with written patient health education material on hypertension?
- a) Yes
 - b) No
 - c) Don't know
27. Are the hypertensive drugs you are prescribed available in the pharmacy?
- a) Yes
 - b) No
28. Have you been explained on how to take your medication?
- a) Yes
 - b) No
29. Have you ever noted any adverse effect in the drugs you are taking?
- a) Yes
 - b) No

APPENDIX III: INTERVIEW SCHEDULE FOR HEALTH WORKERS

1. What duration have you worked at the medical clinic ?
.....
.....
.....
2. What tasks do you perform at the medical clinic while attending patients with hypertension?
.....
.....
.....
.....
3. What are your constrains while dealing with patients with hypertension in the clinic?
.....
.....
.....
.....
4. What measures do you recommend to improve the level of adherence to antihypertensive?
.....
.....
.....
.....
5. What influences patients not to adhere to hypertension medication?
.....

APPENDIX IV: RESEARCH AUTHORIZATION



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone +254-20-2213471,
2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Wajaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. NACOSTI/P/19/73345/26594

Date: 25th April, 2019

Charity Ngugi Gikunda
Chuka University,
P.O. Box 109-60400,
CHUKA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Patient and system related factors associated with non adherence to antihypertensive medications among patient at Chuka Referral Hospital, Kenya*" I am pleased to inform you that you have been authorized to undertake research in Tharaka Nithi County for the period ending 25th April, 2020.

You are advised to report to the County Commissioner, the County Director of Education and the County Director of Health Services, Tharaka Nithi County before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a copy of the final research report to the Commission within one year of completion. The soft copy of the same should be submitted through the Online Research Information System.

CHARITY MUSEMBI
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Tharaka Nithi County.

APPENDIX V: NACOSTI RESEARCH PERMIT


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 and any rights thereunder are non-transferable.
3. The Licensee shall inform the 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 within one year 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
P.O. Box 30623 - 00100, Nairobi, Kenya
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Website: www.nacosti.go.ke



REPUBLIC OF KENYA



National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 24288

CONDITIONS: see back page

RE: RESEARCH AUTHORIZATION

THIS IS TO CERTIFY THAT:

MS. CHARITY NGUGI GIKUNDA
of CHUKA UNIVERSITY, 652-60202
NKUBU, has been permitted to conduct
research in Tharaka-Nithi County
on the topic: PATIENT AND SYSTEM
RELATED FACTORS ASSOCIATED WITH
NON ADHERENCE TO
ANTHYPERTENSIVE MEDICATIONS
AMONG PATIENT AT CHUKA REFERRAL
HOSPITAL, KENYA
for the period ending:
25th April, 2020

Permit No : NACOSTI/P/19/73345/26594

Date Of Issue : 25th April, 2019

Fee Received :Ksh 1000



Applicant's Signature

Director General
National Commission for Science, Technology & Innovation

The County Commissioner
Tharaka Nithi County.

APPENDIX VI: CHI-SQUARE TABLE

Chi-square Distribution Table

d.f.	.995	.99	.975	.95	.9	.1	.05	.025	.01
1	0.00	0.00	0.00	0.00	0.02	2.71	3.84	5.02	6.63
2	0.01	0.02	0.05	0.10	0.21	4.61	5.99	7.38	9.21
3	0.07	0.11	0.22	0.35	0.58	6.25	7.81	9.35	11.34
4	0.21	0.30	0.48	0.71	1.06	7.78	9.49	11.14	13.28
5	0.41	0.55	0.83	1.15	1.61	9.24	11.07	12.83	15.09
6	0.68	0.87	1.24	1.64	2.20	10.64	12.59	14.45	16.81
7	0.99	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67
10	2.16	2.56	3.25	3.94	4.87	15.99	18.31	20.48	23.21
11	2.60	3.05	3.82	4.57	5.58	17.28	19.68	21.92	24.72
12	3.07	3.57	4.40	5.23	6.30	18.55	21.03	23.34	26.22
13	3.57	4.11	5.01	5.89	7.04	19.81	22.36	24.74	27.69
14	4.07	4.66	5.63	6.57	7.79	21.06	23.68	26.12	29.14
15	4.60	5.23	6.26	7.26	8.55	22.31	25.00	27.49	30.58
16	5.14	5.81	6.91	7.96	9.31	23.54	26.30	28.85	32.00
17	5.70	6.41	7.56	8.67	10.09	24.77	27.59	30.19	33.41
18	6.26	7.01	8.23	9.39	10.86	25.99	28.87	31.53	34.81
19	6.84	7.63	8.91	10.12	11.65	27.20	30.14	32.85	36.19
20	7.43	8.26	9.59	10.85	12.44	28.41	31.41	34.17	37.57
22	8.64	9.54	10.98	12.34	14.04	30.81	33.92	36.78	40.29
24	9.89	10.86	12.40	13.85	15.66	33.20	36.42	39.36	42.98
26	11.16	12.20	13.84	15.38	17.29	35.56	38.89	41.92	45.64
28	12.46	13.56	15.31	16.93	18.94	37.92	41.34	44.46	48.28
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89
32	15.13	16.36	18.29	20.07	22.27	42.58	46.19	49.48	53.49
34	16.50	17.79	19.81	21.66	23.95	44.90	48.60	51.97	56.06
38	19.29	20.69	22.88	24.88	27.34	49.51	53.38	56.90	61.16
42	22.14	23.65	26.00	28.14	30.77	54.09	58.12	61.78	66.21
46	25.04	26.66	29.16	31.44	34.22	58.64	62.83	66.62	71.20
50	27.99	29.71	32.36	34.76	37.69	63.17	67.50	71.42	76.15
55	31.73	33.57	36.40	38.96	42.06	68.80	73.31	77.38	82.29
60	35.53	37.48	40.48	43.19	46.46	74.40	79.08	83.30	88.38
65	39.38	41.44	44.60	47.45	50.88	79.97	84.82	89.18	94.42
70	43.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.43
75	47.21	49.48	52.94	56.05	59.79	91.06	96.22	100.84	106.39
80	51.17	53.54	57.15	60.39	64.28	96.58	101.88	106.63	112.33
85	55.17	57.63	61.39	64.75	68.78	102.08	107.52	112.39	118.24
90	59.20	61.75	65.65	69.13	73.29	107.57	113.15	118.14	124.12
95	63.25	65.90	69.92	73.52	77.82	113.04	118.75	123.86	129.97
100	67.33	70.06	74.22	77.93	82.36	118.50	124.34	129.56	135.81