

**FACTORS ASSOCIATED WITH ADHERENCE TO ANTIHYPERTENSIVE  
TREATMENT IN KIAMBU DISTRICT HOSPITAL**

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**REG. NO. H57/68901/2011**

**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC  
HEALTH IN THE SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH  
SCIENCES, UNIVERSITY NAIROBI**

**OCTOBER, 2014**

## DECLARATION

This research project is my original work and to my knowledge has not been presented to any other University for a degree or any other award.

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This dissertation has been submitted to the University of Nairobi, School of Public Health, with our approval as supervisors.

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**APPROVAL BY THE SCHOOL OF PUBLIC HEALTH**

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## **DEDICATION**

This dissertation is dedicated to my dear wife, Winnie and my lovely son, Brian for their encouragement and support during my postgraduate training while carrying out this study.

I also dedicate it to my caring parents, Mr. and Mrs. Kimuyu for their sacrifice and upbringing since my early childhood.

## **ACKNOWLEDGEMENTS**

I would like to give my special thanks to my supervisors, Dr Dismas Ongore and Mr. Erastus Njeru for their support and guidance during development of my proposal, data collection, data analysis and compilation of this report.

I also thank the Ethics and Research Committee of the University of Nairobi/Kenyatta National Hospital for their review and approval of my proposal.

I acknowledge the management of Kiambu District Hospital led by Dr Kariuki, the Medical Superintendent for allowing me to carry out the study in their institution. I cannot forget to appreciate the support of the all health workers in the medical outpatient clinics led by Dr Mwita, the physician in charge and those in records department for enabling me in data collection.

Sincere thanks to all those hypertension clients in Kiambu District Hospital who spared their valuable time to participate in this study.

Finally, my special acknowledgment to the Almighty God for giving me good health during the entire period at the University of Nairobi and while conducting this study.

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## LIST OF ABBREVIATIONS

<b>ACEI</b>	Angiotensin Converting Enzyme Inhibitor
<b>BMI</b>	Body Mass Index
<b>BP</b>	Blood Pressure
<b>CHD</b>	Coronary Heart Disease.
<b>DALY</b>	Disability Adjusted Life Years
<b>ENT</b>	Ear, Nose and Throat
<b>HBP</b>	High Blood Pressure
<b>HIV AIDS</b>	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
<b>ISH</b>	International Society of Hypertension
<b>KEMSA</b>	Kenya Medical Supplies Agency
<b>KEPH</b>	Kenya Essential Package for Health
<b>Kg</b>	Kilograms
<b>KNH</b>	Kenyatta National Hospital
<b>MDGs</b>	Millennium Development Goals
<b>mm Hg</b>	Millimeters of Mercury
<b>MoH</b>	Ministry of Health
<b>MOPC</b>	Medical Outpatient Clinic.
<b>NCDs</b>	Non-Communicable Diseases
<b>NHANES</b>	National Health and Nutrition Examination Survey
<b>NHSSP</b>	National Health Sector Strategic Plan
<b>NSAIDs</b>	Non Steroidal Anti Inflammatory Drugs
<b>OPD</b>	Out-Patient Department

## DEFINITION OF OPERATIONAL TERMS

**Adherence** - The extent to which a person's behavior (taking medication, following a diet and/or executing lifestyle changes) corresponds with agreed recommendations from a health worker.

**BMI** - Body Mass Index, a measure of overweight and obesity, calculated as body weight in kgs divided by height in meters (m)

**Chronic diseases** - Those diseases which require regular and persistent use of medication and follow up by health care providers.

**Co morbidity** - Is a condition where an individual has two or more other medical conditions in addition to a disease initially diagnosed.

**Disability Adjusted Life Years (DALYs)** - for a particular disease is calculated as the sum of years of life lost to premature death secondary to that disease and the years lost due to disability caused by that particular disease in a given population. It is a measure of the burden of a disease in terms of morbidity and mortality.

**Hypertension in adults** - raised blood pressure, defined as a systolic BP  $\geq$  140 mm Hg and/or diastolic BP  $\geq$  90 mm Hg.

**Morbidity** - A measure of occurrence of a particular disease or a health related event in a given area or population.

**Non-communicable diseases** - These form a class of diseases or health related events which are not spread through infectious agents or their pathogenic products. They are caused by how people live e.g lifestyles and diet, conditions they are born with and by environmental hazards. Examples include cardiovascular diseases, diabetes, cancers, obesity, alcoholism and accidents.

**Screening** - The administration of an appropriate test to people who are considered to be at risk of a particular disease and are asymptomatic for the purpose of classifying them with respect to their likelihood of having the disease.

## ABSTRACT

**Introduction:** Hypertension is a chronic medical condition characterized by an elevated blood pressure (systolic and diastolic blood pressures of 140/90 mm Hg or more). It is an emerging public health concern alongside other NCDS in developing countries including Kenya partly due to globalization and industrialization. One of integral elements in management of hypertension is adherence to treatment to ensure optimal BP.

**Objectives:** The purpose of this study was to assess factors that affect adherence to hypertension medication in Kiambu District Hospital.

**Methodology:** A cross sectional study was conducted in 327 patients attending clinic at Kiambu District Hospital during the months of May, June, July and August, 2013. Those participating in the study were randomly sampled and included those above 18 years of age, those known to be hypertensive for more than one year and after obtaining an informed consent. Information was obtained by direct interview while adherence was assessed using Morisky Medication Adherence Scale. Knowledge on hypertension was done using 10 questions adopted from Susan et al (2005). BP was measured on each participant after a 5 minutes rest during the interview using sphygmomanometer machine. Data analysis was done using SPSS version 20. Chi-square test was used to establish associations between adherence and various factors while logistic regression was used to ascertain independent predictors of adherence to hypertension medication.

**Results:** It was found that 62.4% of the respondents were fully adherent to treatment while only 48.3% of them had their BP controlled. Independent predictors of adherence were found to be monthly income, gender, number of antihypertensives and knowledge on hypertension and its treatment. There was a statistically significant association between adherence to

treatment and BP control. Majority of the respondents were not knowledgeable on hypertension and its treatment (54.7%).

**Conclusion:** Independent predictors of adherence to hypertension medication were found to be sex, monthly income, number of antihypertensives and knowledge of hypertension and its treatment.

**Recommendations:** In order to avert morbidities and mortalities associated with hypertension, health care workers should ensure high quality management of the disease with emphasis on a strict compliance to treatment. They should formulate interventions tailored towards scaling up adherence in those subgroups of hypertensives found to be at risk of low adherence as informed by the findings of this study i.e. male patients, those of low socio-economic status and those taking three or more antihypertensives. Health education on hypertension and adherence counselling by clinicians are critical aspects in the management of hypertension to ensure an improved adherence levels, optimal BP and consequently avert or reduce morbidities and mortalities associated with hypertension.

## 1.0 BACKGROUND INFORMATION

### 1.1 Definition

Hypertension is a chronic medical condition characterized by an elevated blood pressure (systolic and diastolic blood pressures of 140/90 mm Hg or more). High blood pressure is a trait as opposed to a specific disease and represents a quantitative rather than a qualitative deviation from the norm (Christopher et al, 2002).

**Table1.1: Classification of hypertension in adults**

Category	Systolic blood BP(mm Hg)	Diastolic BP(mm Hg)
Optimal	Less than 120	Less than 80
Normal	Less than 130	Less than 85
High normal	130-139	85-89
Hypertension stage 1	140-159	90-99
Hypertension stage 2	160-179	100-109
Hypertension stage 3	180 or higher	110 or higher

### 1.2 Epidemiology of Hypertension and other NCDs

Globally, the overall prevalence of hypertension in adults aged 25 years and above was about 40% in 2008, highest in Africa (46%) and lowest in America (35%), with slightly higher prevalence in men (Daniel G, 2011). Hypertension is estimated to cause 7.5 million deaths annually, accounting for 57 million disability adjusted life years (DALYs) or 3.7% of total DALYs (WHO 2009).

In Kenya, prevalence of hypertension in 2008 was 38.9% for males and 35.1% for females with all NCDs combined accounting for 28% of all deaths (WHO, 2011). As a developing country, the magnitude of all forms of NCDs is on the increase with a negative impact on socio-economic development and posing a big threat to the achievement of both short and long term national and international goals such as The Second National Health Sector



Strategic Plan (NHSSP II-2005-2012), vision 2030 and the Millennium Development Goals (MDGs). Much emphasis in Kenya has been geared towards communicable diseases especially Malaria, Tuberculosis and HIV/AIDS as spelt out in the MDG number 6, at the expense of the increasing burden of the NCDs. This has been addressed by the implementation of the Kenya Essential Package for Health (KEPH which is enshrined in the NHSSP II 2005-2012) and focuses on addressing the health needs for different life cohorts with a shift in service delivery from the predominance of the traditional curative services to an increased emphasis on promotion of individual, household and community well being as envisioned in the NSSP II.

According to World Health Organization (WHO) report on global status report on NCDs 2010, NCDs are the leading cause of death globally, killing more people each year than all other causes of death combined. In 2008, there were estimated 57 million deaths globally, and 63% of these deaths (about 36 million deaths) were attributed to NCDs, comprising mainly cardiovascular diseases, cancers, diabetes and chronic lung diseases WHO 2010). Low and middle-income countries contributed to 80% of these deaths, with cardiovascular diseases accounting for 48% of the deaths, cancers 21%, chronic respiratory diseases 12% and diabetes 3%. According to the annual status report of 2007 by the Ministry of Health in Kenya, NCDs contributed to over half the top 20 causes of morbidity and mortality. NCDs also contributed to about half of the ten leading causes of morbidity in Kenya (MOH, 2007). The leading risk factor for CVD globally is hypertension, responsible for 13% of deaths globally, with tobacco use contributing 9%, diabetes 6%, physical inactivity 6%, overweight and obesity 5% (WHO, 2009).

### **1.3 Aetiology**

In majority of hypertension cases (about 95%), no definite cause can be incriminated and this type of hypertension is called essential or primary hypertension. The pathogenesis of this type

of hypertension is not well understood, although scientists believe that the primary pathology is in the kidney, peripheral blood vessels or the sympathetic nervous system and in some cases affecting several systems in the body. Secondary hypertension account for about 5% of all cases, where hypertension is because of some other conditions. The pathogenesis of this type of hypertension is through sodium retention and vasoconstriction.

Causes of secondary hypertension include

- Alcohol consumption
- Pregnancy
- Renal diseases including renal vascular diseases, renal parenchymal diseases and polycystic kidney disease
- Endocrine diseases e.g phaeochromocytoma, Cushing's syndrome, Conn's syndrome, hyperparathyroidism, acromegaly and thyrotoxicosis
- Drugs e.g oral estrogen containing contraceptives, anabolic steroids and non-steroidal anti-inflammatory drugs (NSAIDS)
- Coarctation of the Aorta.

Some of the risk factors for the development of hypertension include genetic, high salt diet, heavy consumption of alcohol, obesity, lack of exercise, impaired intrauterine growth, race and stress.

#### **1.4 Signs and Symptoms**

Most of the times there are no accompanying signs and symptoms in patients with hypertension. Majority of patients are diagnosed to have hypertension during physical examination when they present themselves for management of other medical conditions or during screening exercises for hypertension.

Some of the symptoms are headaches (occipital or frontal usually in the morning), light-headedness, vertigo, tinnitus, altered vision and fainting episodes. Some of the patients may

present with complications of hypertension e.g stroke, heart attack, heart failure, renal failure, subarachnoid hemorrhage and hypertensive retinopathy.

## **1.5 Complications of Hypertension**

Complications from hypertension involve blood vessels, central nervous system, the heart, the retina and the kidneys, and involve end organ damage.

Changes in the blood vessel wall lead to trauma and arteriosclerosis throughout the vasculature. These changes can be seen on fundoscopy.

Effects of uncontrolled hypertension on the heart include ventricular hypertrophy, ventricular dysfunction and failure, arrhythmias, coronary artery disease and acute myocardial infarction.

On the kidneys, uncontrolled hypertension causes glomerular sclerosis leading to impaired kidney function and finally ends stage kidney disease. It also causes ischemic kidney disease especially when the cause of the hypertension is renal artery stenosis.

Uncontrolled hypertension has an effect on the central nervous system causing stroke, intracerebral and subarachnoid hemorrhages, cerebral atrophy and dementia.

The effects of uncontrolled hypertension on the eye include retinopathy, retinal hemorrhages and impaired vision. It also leads to vitreous hemorrhage, retinal detachment and neuropathy of the nerves causing extra ocular muscle paralysis and dysfunction.

## **1.6 Management of Hypertension**

### **1.6.1 Clinical assessment and investigations**

This involves a complete assessment of the patient through taking appropriate history, thorough physical examination and running some of the investigations, which will assist in proper management of the patient. History taking and physical examination including blood pressure recordings will help in identifying possible risk factors for hypertension in a

particular patient as well as revealing some of the complications associated with hypertension. Some of the investigations necessary for hypertension patients are chest x-rays to detect cardiomegally and heart failure, echocardiogram, renal ultrasound, electrocardiogram and serum cholesterol levels, urinalysis, blood urea, electrolytes and creatinine and blood glucose levels.

### **1.6.2 Non-drug therapy**

In those patients with high-normal BP, appropriate dietary and lifestyle measures can lower and maintain the blood pressure levels that may not require medical treatment. In addition, those on medical treatment may need lower dosages or fewer drugs if the dietary and lifestyle risk factors are well addressed.

Some of these measures include lowering weight for those overweight and obese, restricting salt intake and saturated fats, exercising regularly, reducing alcohol consumption, and quitting smoking and improved consumption of fruits and vegetables.

### **1.6.3 Anti-hypertensive drugs**

These are classified into the following classes based on the mechanisms of lowering the blood pressure.

1. Thiazides and other diuretics-e.g frusemide
2. B-blockers e.g atenolol
3. Combined B and  $\alpha$  blockers e.g labetalol
4. Angiotensin converting enzyme inhibitors (ACEI) e.g. captopril
5. Angiotensin II receptor antagonists e.g. losartan
6. Calcium channel blockers e.g. amlodipine
7. Alpha receptor blockers e.g. prazosin
8. Others e.g. hydralazine, methyl dopa

The choice of the drug to use is dictated by cost, convenience to the patient, efficacy, comorbid conditions and side effects. Combination of different classes of drugs is

recommended for optimal control of the blood pressure and to ensure lower dosages, which translate to fewer side effects. Adjuvant drug therapy with low dose aspirin to reduce risks of stroke and cardiovascular risk and statins to lower cholesterol levels; a known risk factor for cardiovascular diseases is also recommended in hypertensive patients.

### **1.7 Adherence to treatment**

WHO defines adherence to treatment as the extent to which a person's behavior (taking medication, following a diet and/or executing lifestyle changes) corresponds with agreed recommendations from a health worker. One of the major impediments to improving compliance to treatment of hypertension is the difficulty experienced in measuring adherence (Haynes et al, 2001). Methods of measuring adherence to hypertension treatment include patients' self reports, pill counts, electronic monitoring and measuring plasma drug levels. Some of these methods are costly to undertake especially in a clinic set up and when dealing with many patients e.g electronic monitoring where equipment is used to establish the number of times the drug containers are opened by the patient within a given period.

Some validated instruments have been developed to estimate compliance to hypertension treatment through eliciting patients' reported compliance related activities e.g Hill-Bone Compliance to High Blood Pressure (HBP) therapy Scale (Hill et al, 2000). This method measures patient behavior concerning the three domains of management of hypertension including reduction in sodium intake, keeping of appointment and taking of medication. The scale consists of 14 items each of which is graded to a four point Likert scale (Hill et al, 2000).

Morisky et al in 1985 introduced a four-item medication compliance scale for hypertension that consisted of questions focusing on forgetting or being careless in taking hypertension drugs or failing to take medication because patients were feeling well or sick. Shea et al later

extended this method in 1992 who added a fifth question thus “Do you ever miss taking your high blood pressure medication for any reason”. In 2008, Morisky et al revised the adherence scale to an eight item. Morisky Medication Adherence Scale (MMAS) and Hill Bone Compliance Scale are both used to assess compliance to treatment of chronic diseases including hypertension.

In my study, I proposed to use Morisky medication adherence scale to estimate adherence to hypertension medication. A template of this tool is annexed in this dissertation.

## 2.0 LITERATURE REVIEW

Most of the published research work on adherence in Kenya is on chronic communicable diseases. Little research has been done on adherence to non-communicable diseases in Kenya. In a study to establish the factors associated with non-adherence to Highly Active Antiretroviral Therapy (HAART) in Nairobi, Kenya, 82% of the patients were found to be fully adherent to HAART (Wakibi et al, 2011). Age and duration of HAART treatment were found to be the independent predictors of adherence in this study. A study conducted in Kenyatta National Hospital to establish the determinants of adherence to anti-tuberculosis treatment in paediatric patients found that 92% of them were fully adherent to treatment (Nyamokami et al, 2011). Marital status of the caregiver was found to be an independent predictor of adherence to treatment in this study.

One of determinants of the outcome of raised blood pressure for hypertensive patients is compliance to treatment, both non-drug and drug treatments. Appropriate adherence levels are important in ensuring optimal control of blood pressure and consequently reduce morbidity and mortality associated with hypertension. Studies in America revealed that 60-75% of those treated for hypertension never reached the recommended target BP of less than 140/90 mmHg (Hyman et al, 2001). WHO describes poor adherence as the most important cause of uncontrolled BP and estimates that 50-70% of people do not take their medication as prescribed.

A descriptive cross sectional study was undertaken in Kenyatta National Hospital (KNH) to determine adequacy of BP control and level of adherence with antihypertensive therapy (Achieng et al, 2008). Adherence level was found to be 31.8%, with only 26% of the 264 study participants having an adequate BP control. 58.5% of those found to have poor BP control had BP of 160/90 mm Hg and above while non-adherence to hypertension medication was associated with poor BP control ( $p=0.006$ ,  $r^2=0.54$  for systolic BP and 0.63 for diastolic

BP). A comprehensive study on the determinants of adherence to hypertension medication has not been done in our Kenyan set up which would inform decision making on interventions tailored towards the subgroups of hypertensive patients at higher risk of poor adherence.

### **2.1 Patient related factors**

Several studies across the world have elicited some of the patient related factors, which influence adherence to hypertension medication. A cross sectional institution based study was carried out in Ethiopia to establish adherence to antihypertensive treatment and associated factors among patients on follow up at University of Gondar Hospital, Northwest Ethiopia (Abere et al, 2012). In this study, gender and patient's knowledge about hypertension and its treatment were found to be significantly associated with adherence to treatment of hypertension. 64.6% of the patients studied were found to be fully adherent to medication using Morisky Medication Adherence Scale.

A cross sectional study was done in Iraq to assess compliance of hypertensive patients to management in Duhok Governorate using Morisky-Green test (Samim et al, 2010). Old age, female gender, low level of education, average socioeconomic status, knowledge of using medication, perception of hypertension as a health risk and practicing of life style changes were found to be associated with good adherence. 54.6% of the sampled patients were fully adherent to hypertension medication.

Stewart et al (2006) conducted a cross sectional study to establish the cultural factors associated with antihypertensive medication adherence in Chinese immigrants. Using patients self reports, they found that 75% were adherent and out of the eight cultural factors, four were statistically significant predictors of adherence. These are perceived susceptibility,



perceived benefit of Chinese herbs, and perceived benefit of western medication for hypertension and length of stay in the United States.

A cross sectional study in urban primary care centre in Indianapolis, Indiana was carried out to determine characteristics associated with drug adherence and blood pressure control among patients with hypertension (Andrew et al, 2006). Age, marital status and race were independent predictors of adherence.

National Health and Nutrition Examination Surveys (NHANES) 1999-2002 in America estimated adherence to hypertension medication to be 87.5% using patient reports and pill counts methods. Low adherence was associated with younger age, men, race (low in Hispanics), low income, lack of insurance and missed appointments.

## **2.2 Organizational factors**

Several studies have highlighted some of the organizational factors associated with adherence to hypertension medication. Larissa et al (2012) assessed adherence in uncontrolled predominantly African-American hypertensives from large urban public and private primary care clinics in America using Medication Event Monitoring System (MEMS). They found that 77% of the patients were adherent to treatment, and attending a public funded primary care clinic was significantly associated with low adherence.

A cross-sectional study was conducted in Tunisia in 2002 by Ghannem et al to ascertain doctor-patient agreement in the appreciation of arterial hypertension severity. Good compliance to antihypertensive therapeutic regimens was found to be related to a good doctor-patient relationship that permits adequate informing of hypertensive patients about the disease and its treatment.

### **2.3 Disease related factors**

Several diseases related factors are believed to affect adherence to treatment of hypertension. A longitudinal study to assess the impact of symptoms of depression and anxiety on adherence to antihypertensive medication in a cohort of newly treated hypertensive patients was done in America (Leonelo et al, 2012). This study used pill counts to measure adherence to hypertension medication, and found that more than 90% of the patients were adherent to hypertension medication. Patients with at least mild depression symptoms were 2.5 times and those with at least mild anxiety symptoms were 1.6 times more likely to become non-adherent to treatment in the following three months than those without symptoms.

Nirav et al in 2009 conducted a retrospective cohort study using electronic health records and claims data from patients insurances to establish predictors of first fill adherence for patients with hypertension in America. They found that those patients with multiple co morbidities and/or with relatively lower blood pressures were less likely to fill a first prescription for antihypertensive medication.

A cross sectional study was carried out in America to establish predictors of poor adherence to hypertension treatment in an urban health clinic setting (Amanda et al, 2007).

Patients diagnosed with hypertension less than 10 years ago were significantly associated with poor adherence while those with history of heart attack or stroke were more likely to be adherent. In this study, 61% of patients were adherent using Morisky Medication Adherence Scale.

### **2.4 Medication related factors**

Medication related determinants of adherence to hypertension medication include emergence of adverse effects and number of antihypertensives prescribed. In Pakistan, a cross sectional study was conducted to establish determinants of adherence to hypertension medication in

Aga Khan University Hospital (AKUH) and National Institute of Cardiovascular Diseases, Karachi (Hashmi et al, 2007). Monotherapy was found to reduce adherence. In this study, adherence to antihypertensive medication was measured using MMAS and patient self-reports about number of pills taken over a prescribed period expressed as adherence in percentage. Adherence was found to be 77%.

## **2.5 Adherence in context of behavioural theories**

Health behavior theories and models suggest more effective methods and strategies for accomplishing patient compliance and other behavior change related to treatment regimens (John et al, 1999).

Some of behavior change recommended in the management of hypertension include moderation/reduction of alcohol intake and tobacco use, regular physical exercises, low salt intake and adequate adherence to hypertension medication. Many of these behavioral theories and models share the following factors: intentions to behave, environmental constraints impeding the behavior, skills, outcome expectancies, norms for the behavior, self-standards, affect and self-confidence with respect to the behavior (John et al, 1999).

This means that the person must;

1. Have a strong positive intention or predisposition to perform a behavior.
2. Have information processing and physical, logistical and social environmental barriers to performing the behavior.
3. Have the requisite skills to perform the behavior.
4. Believe that material, social, or other reinforcement will follow the behavior.
5. Believe there is normative pressure to perform the behavior.
6. Believe that the behavior is consistent with self-image.
7. Have a positive affect regarding the behavior.

8. Encounter cues/enablers to engage in the behavior at the appropriate time and place.

### **2.5.1 Cognitive/Information processing models.**

This model emphasizes on the ability of the patient to understand and follow on the communication from the health provider. The health care providers may provide to the patient written information, use low literacy materials, stress the more important information as well as check the patient understanding (John et al, 1999). In the management of hypertension, adherence counseling is done to ensure adequate compliance to treatment and thus optimal blood pressure control.

### **2.5.2 Health belief model.**

The developer of this model (Becker, 1974) maintains that health related behaviors are determined by whether individuals:

1. Perceive themselves to be susceptible to a particular health problem.
2. See this problem as serious.
3. Are convinced that treatment or prevention activities are effective.
4. Are exposed to a cue to take action.

### **2.5.3 Theory of reasoned action**

This theory places more emphasis on the concept of behavioral intention. This can in turn be predicted by the person's expectancies regarding the outcomes of a certain behavior, attitudes towards the behavior and normative beliefs the person has with respect to what "influential's" (especially peers) would do in a specific situation (John et al, 1999).

### **2.5.4 Social cognitive (Learning) theory**

This theory puts an emphasis on the interactions between person's cognitions and his/her behavior through processes like self-efficacy and outcome expectancies. Outcome expectancy here represents the expectancy that a positive outcome/consequence will result as a function

of the behavior. Self-efficacy is a self-perception of having the capacity to undertake a particular behavior (John et al, 1999)

### **2.5.5 Behavior modification**

Behavior modification theory also known as behavior analysis or contingency management, believes that behavior may or may not occur as a function of either performance or skills deficit (John et al, 1999). Performance deficits means that a person has the capacity to perform a behavior but chooses not to engage in the behavior while skill deficit indicates that a person might like to perform a behavior but is limited from doing so due to lack of ability.

### **2.5.6 Interpersonal and social support theories**

These theories emphasize on effective interpersonal communication between the health care provider and the patient, and providing the patient with social support necessary to accomplish certain behavioral change (John et al, 1999).

### **2.5.7 Transtheoretical model**

Transtheoretical model, also known as stages-of change model, assumes that behavioral change progresses as the individual moves through the following stages (John et al, 1999):

1. Precontemplation, where benefits of lifestyle change are not considered,
2. Contemplation, where the individual starts to consider change but not yet begun to act on the intention,
3. Preparation, where the person is ready to change the behavior and prepares to act,
4. Action, where one makes the initial steps towards behavior change and
5. Maintenance, where one maintains behavior change while often experiencing relapses.

Health care providers can utilize and apply one or a combination of these behavior change theories and models to optimize their client's behavior change efforts to achieve better health outcomes.

In my study, I assessed adherence to hypertension medication using Morisky medication adherence scale in context of cognitive/information processing behavioral theory, which emphasizes on the ability of the patients to comprehend and follow what their clinicians recommend.

### **3.0 RATIONALE**

#### **3.1 Research problem and Justification**

Hypertension and other NCDs are increasingly becoming diseases of public health importance owing to the upward trend in their prevalence especially in the developing countries. This translates similarly to the alarming increase in the morbidity and mortality associated with these diseases. In 2008, WHO estimated the global prevalence of hypertension in adults aged 25 years and above to be 40%, being highest in Africa at 46%. It is estimated that hypertension accounts for about 7.5 million deaths globally in a year (12.8% of total annual deaths), and NCD deaths are projected to increase by 15% by 2020 (WHO report, 2010). In 2008, the report estimated that cardiovascular diseases caused more than 17 million deaths globally. In 2008, the prevalence of hypertension in Kenya was estimated to be 38.9% for males and 35.1% for females, with cardiovascular diseases accounting for 12% of all deaths (WHO, 2009). In Kenya NCDs contribute over half of the top 10 leading causes of morbidity and over half of the top 20 leading causes of both morbidity and mortality (MOH, 2007). Reports from Kiambu District Hospital records showed that hypertension was amongst the top ten leading causes of both outpatient and in-patient morbidities and mortalities. In 2011, 193 patients were admitted in Kiambu District Hospital with hypertension complications out of which 27 died. There were 40 deaths out of 328 cases admitted in 2012 due to hypertension complications.

The main objective in the management of hypertension is to attain an optimal BP to avert morbidities and mortalities associated with raised BP. One of the key elements in controlling high BP is a strict compliance to both drug and non-drug treatment of hypertension. Poor adherence has been described as the most important cause of uncontrolled BP and estimated that 50-70% of the people do not take their antihypertensive medication as prescribed (WHO, 2003). All studies conducted worldwide on hypertension have revealed that a significant

proportion of hypertension clientele were not fully adherent to hypertension medication. Adherence to treatment can be influenced by many factors. These factors can be grouped into patient related factors e.g age and gender, disease related factors e.g co morbidity, medication related factors e.g occurrence of drug adverse effects and organizational factors e.g access to treatment. This study is expected to identify some of these factors influencing compliance to antihypertensive medication and enable the clinicians on how to focus more on those subgroups at higher risk of low adherence. Interventions tailored towards those found to be at risk of poor adherence would impact positively in improving adherence levels to hypertension treatment. Scaling up on the proportion of patients fully adherent to treatment will consequently avert some of the morbidity and mortality associated with uncontrolled BP.

### **3.2 Conceptual Framework**

The ultimate goal in treatment of hypertension is the control of BP. This is because high BP is associated with morbidity and mortality arising from complications of hypertension e.g. cerebrovascular accidents and cardiovascular diseases. Formulating strategies tailored towards those patients thought to be less adherent to treatment is critical in achieving adequate BP control.

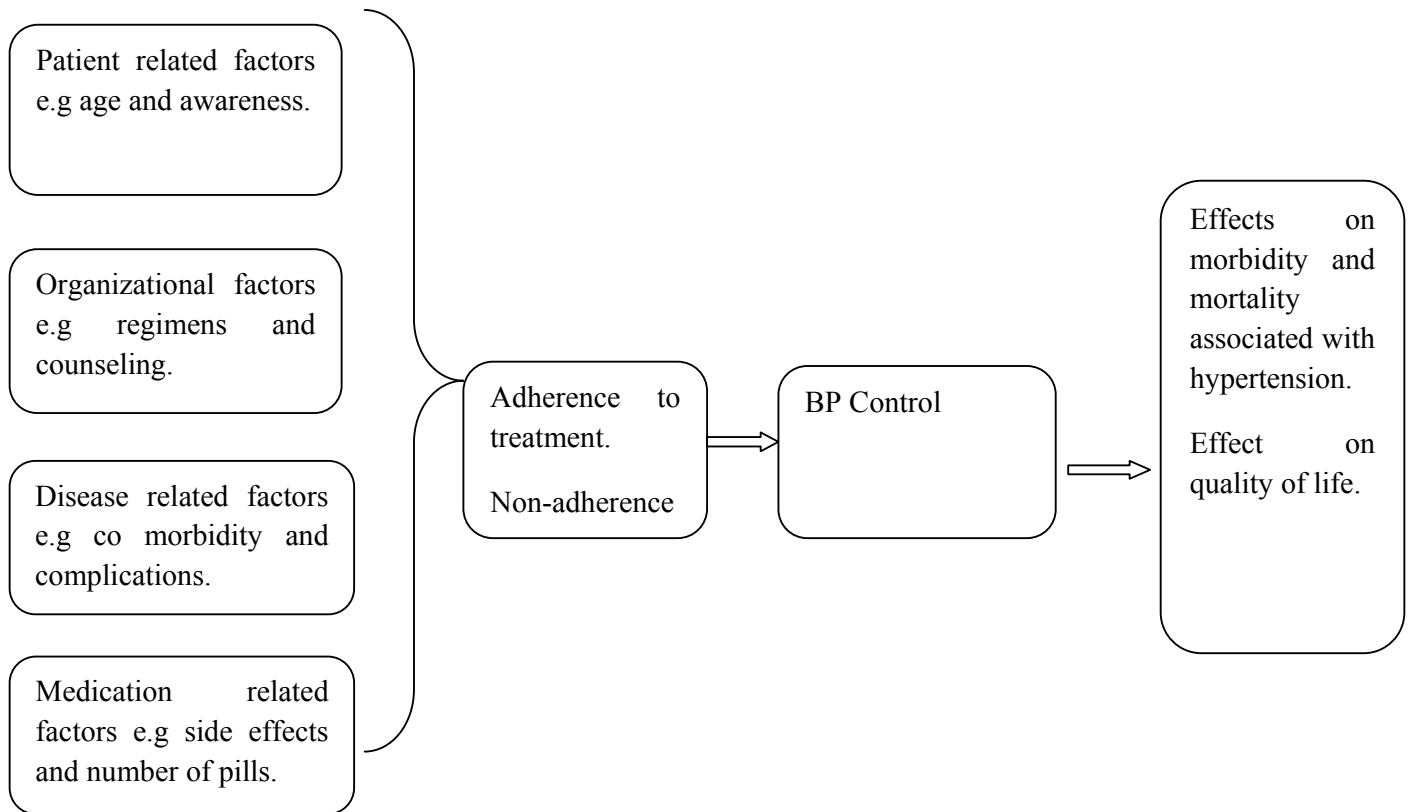
The factors associated with adherence to medication can be grouped into patient related, disease related, medication related and institutional related. Patient related factors include gender, knowledge about hypertension and its treatment, age, level of education, socioeconomic status and practicing lifestyle changes and marital status.

Some of the disease related factors affecting adherence to treatment of hypertension include co morbidity, symptoms of depression and anxiety, duration of hypertension and hypertension complications e.g. stroke and heart attack (Amanda et al,2007). Health institutional factors influencing adherence to hypertension medication include distance to the



health facility, health facility ownership i.e. private or public and doctor patient relationship. Medication related factors include number of pills and adverse effects. Appropriate treatment guidelines for hypertension that addresses these factors can lead to optimal adherence to treatment with consequent control of blood pressure and significant reduction in morbidity and mortality secondary to hypertension (Abere et al, 2012).

**Figure 3.1 Conceptual Framework**



### 3.3 Null Hypotheses

1. Patient related factors are not associated with adherence to hypertension drug treatment.
2. Organizational factors are not associated with adherence to hypertension medication.
3. Disease related factors have no association with adherence to hypertension medication.
4. Medication related factors are not associated with adherence to hypertension drug treatment.

### **3.4 Research Questions**

1. Are patient related factors associated with adherence to hypertension medication?
2. Are organizational factors associated with adherence to hypertension medication?
3. Are disease related factors associated with adherence to hypertension medication?
4. Are medication related factors associated with adherence to hypertension medication?

### **3.5 Objectives**

#### **3.5.1 General Objective**

To establish the determinants of adherence to hypertension medication in patients followed up at Kiambu District Hospital.

#### **3.5.2 Specific Objectives**

1. To estimate adherence to hypertension medication in patients seen at Kiambu District Hospital.
2. To determine patient related factors associated with adherence to hypertension medication.
3. To determine the organizational factors related with adherence to hypertension medication.
4. To determine disease related factors associated with adherence to hypertension medication.
5. To determine medication related factors related with adherence to hypertension medication.

## 4.0 METHODOLOGY

### 4.1 Study Design

This study was hospital based, using descriptive cross-sectional study design to establish factors associated with adherence to hypertension medication for those patients attending hypertension clinics. Both quantitative and qualitative methods were used to collect data.

### 4.2 Variables

#### 4.2.1 Outcome Variable

The outcome variable in this study was adherence to hypertension treatment. This is the extent to which a patient complies with hypertension pills as prescribed by their clinicians. Morisky Medication Adherence Scale (MMAS) was used to measure adherence, where participants were classified to be either adherent or non-adherent to hypertension medication. A MMAS of less than six was considered good adherence while a score of six and above was classified as non-adherence to hypertension medication.

#### 4.2.2 Predictor Variables

These were the factors under study, which may influence adherence to hypertension treatment. These have been grouped below.

- **Patient related factors:** These include age, gender, marital status, level of education and income.
- **Organizational factors:** Including prescription patterns by clinicians, adherence counseling, access to health care and quality of health care.
- **Disease related factors:** These include duration of the disease, co morbidity, disease associated complications and hospitalizations.
- **Medication related factors:** For instance adverse effects from medication and number of hypertension pills prescribed.

### **4.3 Study area description.**

The study was carried out in the medical outpatient clinics in Kiambu District Hospital. The hospital is a high volume level 4 health facility located within Kiambu town in Kiambu County, about 15 Kilometers from Nairobi city. The hospital offers out-patient and inpatient curative, promotive and rehabilitative health services with all departments that are functional including pediatrics, surgery, internal medicine, obstetrics and gynecology as well as special clinics including ENT, Ophthalmology and psychiatry. There are two special medical outpatient clinics, diabetes and medical outpatient clinic (MOPC), each on its day. Hypertension patients are followed up in the MOPCs, which are held once in every week. On average, 120 patients are booked for every MOPC, and about 60 new hypertensives are diagnosed at the OPD every month. The hospital has a bed capacity of 316 beds and 67 baby cots.

Kiambu County is located within Central Kenya bordering Murang'a County to the North, Machakos to the East, Nairobi and Kajiado to the South, Nakuru to the West and Nyandarua County to the North West. With acreage of 2,543.4 KM<sup>2</sup>, the county has an estimated population of 1,623,282 people (National Census, 2009).

The age distribution is that 34.5% constitute those aged 0-14 years, 61.9% are aged 15-64 years and those aged 65 years and above make 3.6% of the population. There are 11 Districts and 8 constituencies within Kiambu County. The main economic activities in the County include farming, food processing, leather manufacturing, textile (cotton), and motor vehicle assembly, wholesale and retail trade.

Health facilities within Kiambu County are distributed as follows; 4 District Hospitals, 3 Sub-District Hospitals, 29 Health Centers, 108 Dispensaries, 170 Medical Clinics, 9 Nursing homes, 1 Maternity home and 22 others (unclassified).

#### **4.4 Study Population**

The study population consisted of adult hypertensive patients on treatment and attending hypertension clinics in the hospital. These patients are followed up in the hospital for regular treatment and checkups depending on high blood pressure control.

#### **4.5 Inclusion Criterion**

- Hypertensive patients 18 years and above
- Patients on follow up at the hospital
- Patients on treatment for over 6 months
- Patients consenting to participate in the study.

#### **4.6 Exclusion Criterion**

- Sick patients on the appointment day warranting an admission
- Pregnant hypertensive patients.
- Patients declining consent for participation

#### **4.7 Sampling**

The sampling frame included all hypertensive patients on follow up at the hospital hypertension clinics. Patients aged 18 years and above were eligible to participate in this study. Enrollment of study participants was carried out at the beginning of each clinic day. This was done at the registration desk where all patients report for their appointments. Systematic random sampling method was used to recruit a specific number of study participants each day depending on patient turn out. Participants were also informed on the need to participate only once in the study.

Sampled participants were interviewed after being reviewed by the clinicians. This was done after assessing their eligibility and obtaining informed consent to participate in the study. To avoid multiple enrollments, each patient's file number was entered in the questionnaire and

all interviewers kept a record of those numbers, which were scrutinized during each recruitment process.

#### 4.8 Sample Size

356 participants were sampled in this study with 29 opting out by either not giving their informed consent or giving incomplete information. This sample size was arrived to using Fisher's formula and adherence level of 30% found out in KNH (Achieng et al, 2008).

Formula,

$$n = \frac{(Z_{1-\alpha/2})^2 (pq)}{d^2}$$

Where,

n=Sample size

$Z_{1-\alpha/2}$ =Critical value associated with significance level of 0.05, taken as 1.96 for a 95% confidence interval.

p= Estimated proportion of medication adherence by hypertensive patients=0.3

q= Estimated proportion of medication non-adherence amongst hypertensive patients=0.7

d= Acceptable degree of accuracy required taken as 0.05

$$n = \frac{(1.96)^2(0.3 \times 0.7)}{0.05^2}$$

=323

Adding 10% for non-response=323+33=356

Sample size=356

#### **4.9 Data Collection**

Four research assistants were recruited and trained on the objectives of the study as well as the data collection instruments. These research assistants were the clinicians working in the hypertension clinics and who were available for the entire period of data collection. Pretesting of questionnaires was carried out at Kiambu District Hospital on 25 hypertensive patients who were not included in the final sample. Necessary adjustments to the questionnaires were made as informed by the findings of the pilot study to improve on the reliability of the data to be collected in the main study. Following recruitment of study participants and obtaining informed consent to participate in the study, data were collected through administering structured questionnaires. These questionnaires captured socio-demographic data and other patient related, disease related, medication related and organizational factors that may influence adherence to hypertension medication. Knowledge on hypertension and its treatment was assessed using a ten questions tool adopted from Susan et al (2005). A self-report on adherence to hypertension medication using the Morisky Medication Adherence Scale model was also part of the questionnaire. Blood pressure was measured using mercury sphygmomanometer BP machines. Participants were allowed to rest for about 5 minutes while seated before taking two BP readings whose average was then calculated.

#### **4.10 Data Processing and Analysis**

After each clinic day, data collected were entered into an excel spreadsheet where it was cleaned for errors and any other inconsistencies. Data from those participants who did not complete their questionnaires were not included in analysis. At the end of data collection, the entire database in excel spreadsheet was exported to a SPSS version 20 which was used for

statistical analysis. Descriptive statistics, frequency distribution tables and graphs were used to present the collected data. Adherence to hypertension medication was measured as a binary variable where participants were classified as either, yes or no, for adherence to medication and non-adherence respectively. Bivariate analysis using Chi-square tests was used to ascertain associations between adherence to hypertension medication and patient related, medication related, disease related and organizational factors. Logistic regression was done to identify independent predictors of adherence using adherence status as the outcome variable and the various factors as the predictor variables. A p value of less than 0.05 was considered statistically significant for this study.

#### **4.11 Minimization of Errors, Bias and confounding.**

The following was done to minimize errors , bias and confounding thus improving the quality of data collected and reliability of the study findings.

1. The questionnaires were standardized to ensure uniformity. Questionnaires were written in English and also translated to Kiswahili so that questions asked were understood uniformly.
2. The research assistants were trained on the objectives of the study as well as the data collection tools. This ensured uniformity in the data collection process.
3. The questionnaires were pretested before the actual study after which necessary adjustments were done. This improved on the reliability and validity of these instruments.
4. Study participants were sampled randomly to avoid selection bias. Participants were also advised to participate only once in this study as the researcher and assistants ensured so through confirmation with the records.
5. Statistical modeling (logistic regression) was used in data analysis to control for confounding effects.



### **5.12 Ethical Issues**

**All medical standards and research related ethical standards were observed at all times during this study.**

Clearance was sought from Kenyatta National Hospital/University of Nairobi Ethical and Research Committee to carry out the study in the hospital. The Kiambu District Hospital management team also gave an approval to conduct the study in their institution. Explanation to the study subjects on the purpose and the benefits of the study, confidentiality of their information and volunteerism was carried out in addition to obtaining an informed consent from the study subjects. Data obtained were treated with confidentiality at all times.

### **4.13 Study Limitations**

1. This being a hospital based (clinic setting), the study participants were not an accurate representative of all hypertensive patients in the community hence the study findings are not generalizable to the general population.
2. The information on adherence to hypertension medication was obtained through self-reporting which is prone to recall bias.

## 5.0 FINDINGS

### 5.1 Introduction

This chapter presents the findings on factors associated with adherence to antihypertensive treatment at Kiambu district hospital, in Kiambu County, Kenya. The study was conducted on 356 respondents out of which 327 were fully interviewed and 29 opted out making a response rate of 92%. The study made use of frequencies (absolute and relative) on single response questions as well as inferential statistics. The findings are presented in tables, graphs and charts as appropriate with explanations given in prose.

### 5.2 Description of Study Sample

#### 5.2.1 Socio Demographic data

The socio-demographic characteristics of the study population were as described in this section.

##### 5.2.1.1 Sex of the respondents

This is summarized in table 5.1

**Table 5.1: Respondents' Sex**

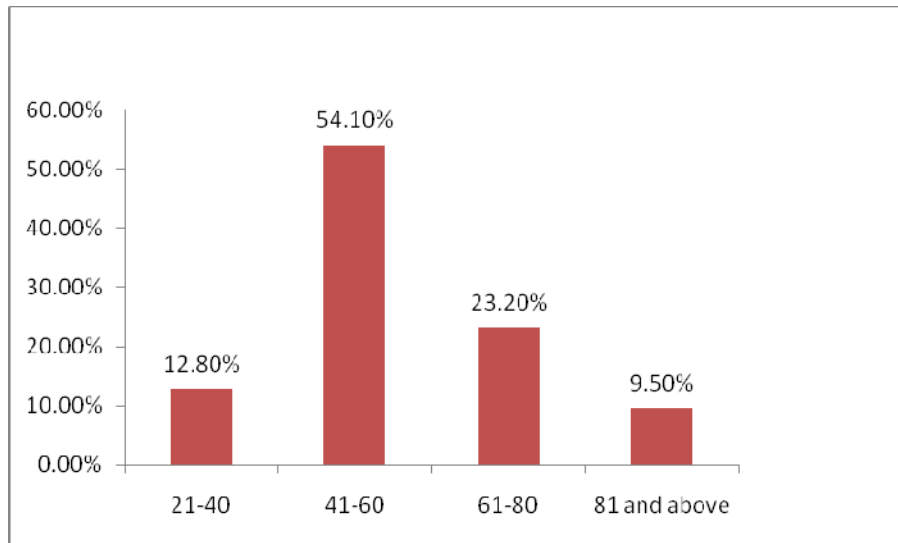
	Frequency	Percent
Male	131	40.1%
Female	196	59.9%
Total	327	100.0

Majority of the study participants were women who accounted for 59.9% of the total participants while male constituted 40.1% making a female male ratio of 1.5:1.

### 5.2.1.2 Age distribution of the respondents

The ages of the respondents at the time of the study are as shown in the figure 5.1

**Figure 5.1 Age distribution of the respondents**



Majority of the participants fell in the age bracket of 41-60 years constituting 54.10% of the total participants while the least were those aged over 81 years accounting for 9.50%. Those aged between 61 and 80 years constituted 23.20% while 12.80% of the participants were aged 21 to 40 years.

### 5.2.1.3 Marital status of the respondents

The marital status of the participants was as summarized in table 5.2

**Table 5.2 Marital status of the respondents.**

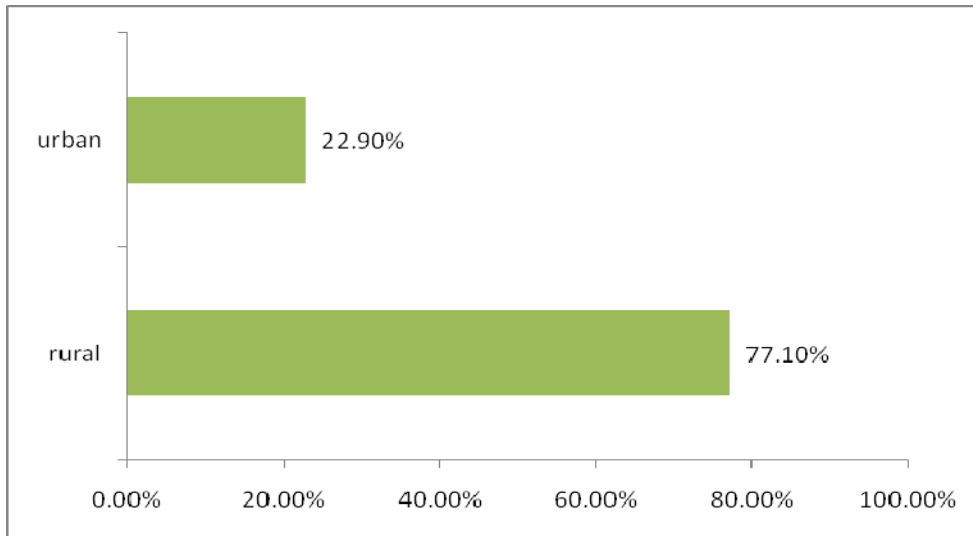
Status	Frequency	Percentage
Never married	18	5.5
Married	236	72.2
Divorced/separated	25	7.6
Widowed	48	14.7
<b>Total</b>	<b>327</b>	<b>100.0</b>

Majority of the interviewees stated they were married (72.2%), followed by widowed (14.7%), divorced/separated (7.6%) and those who have never been married (5.5%).

#### **5.1.2.4 Current place of residence of the respondents**

The places of residence for the respondents were as shown in figure 5.2

**Figure 5.2 Current place of residence of the respondents**



From the above figure, majority (77.10%) lived in rural areas while the rest (22.90%) lived in urban areas.

#### **5.2.1.5 Employment status of the respondents**

The findings for the employment status of the respondents are as indicated in figure 5.3

**Figure 5.3 Employment status of the respondents**



According to the figure above, the highest numbers of respondents were self-employed (65%) while 30% were unemployed. Pensioners constituted about 5% of the participants..

**5.2.1.6 Total monthly income (Ksh) of the respondents**

The total monthly income for the participants was as shown in table 5.3

**Table 5.3: Total monthly income (Ksh) of the respondents**

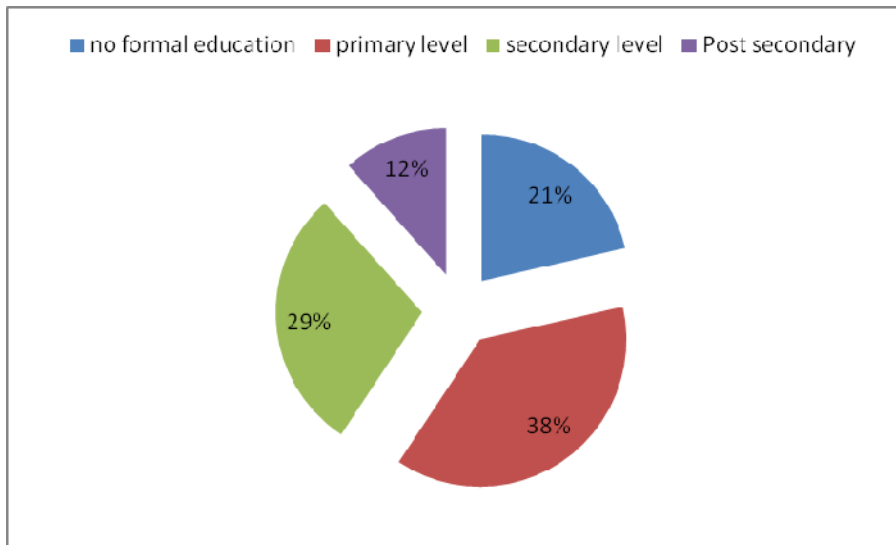
	Frequency	Percent
Ksh 0-10,000	185	56.57
Ksh 10,001-30,000	110	33.6%
Ksh 30,001-50,000	13	4.0%
Ksh above 50,001	19	5.8%
Total	327	100.0

Asked how much income they earned per month, 56.57% of the respondents were in the Ksh. 0-10,000 range, 33.6% of the respondents were in the Kshs10,001-30,000 range, 5.8% were earning more than 50,001 and the remainder (4%) were in the Ksh. 30,001-50,000 range.

**5.2.1.7 The highest level of education attained by the respondents**

These findings are shown in figure 5.4

**Figure 5.4 The highest level of education attained by the respondents**

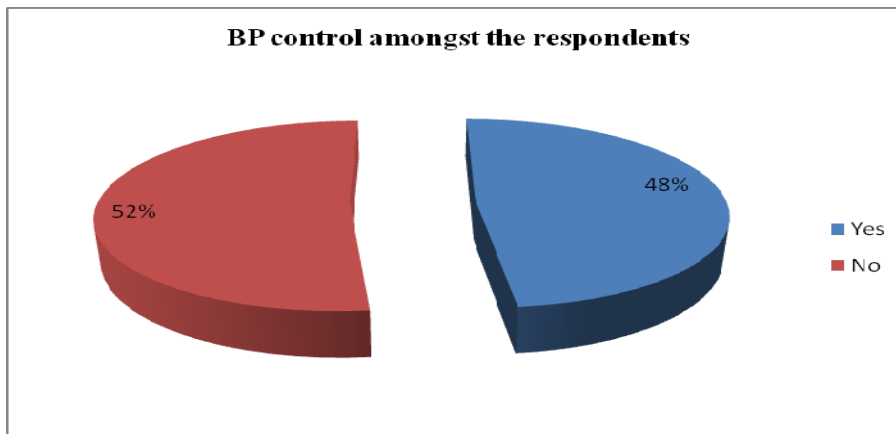


On the highest level of education, 38% of the respondents said they had reached primary school level while 29% had reached secondary level. Those without formal education constituted 21% of the respondents with 12% having attained a post secondary school education.

#### **5.2.1.8 BP control amongst the respondents**

The proportion of respondents with their BP controlled, where their systolic BP was equal to or below 140 mm Hg and equal to or below 90 mm Hg for diastolic BP was also assessed.

**Figure 5.5: BP control amongst the respondents**



From the study, it was found that 51.7% of the respondents had high BP, whereas 48.3% had their BP controlled.

### **5.2.1.9 Respondents' knowledge of hypertension and its treatment**

The respondent's knowledge on hypertension and its treatment was assessed using 10 questions adopted from Susan et al (2005). Those that scored more than half of the questions correctly were labelled as knowledgeable while those scoring less than half were described as non knowledgeable.

**Table 5.4: Respondents' knowledge**

	Frequency	Percent
Yes	148	45.3%
No	179	54.7%
Total	327	100.0

From the findings above it can be noted that majority of the respondents (54.7%) were not knowledgeable on hypertension and its treatment with the remainder (45.3%) being knowledgeable.

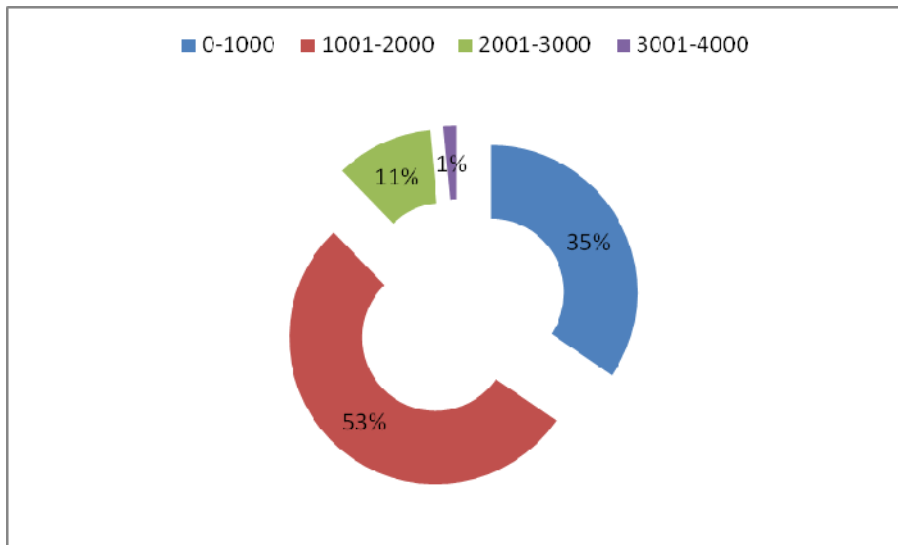
### **5.2.2 Organizational factors related with adherence to hypertension medication**

The study examined the organizational factors associated with adherence to hypertension medication. The average cost of hypertension medication, availability of the drugs in the hospital and relationship between the doctors and patients were the factors assessed.

#### **5.2.2.1 Cost of hypertension medication per month**

Figure 5.6 shows the findings.

**Figure 5.6: Average cost of hypertension medication(Ksh) per month**

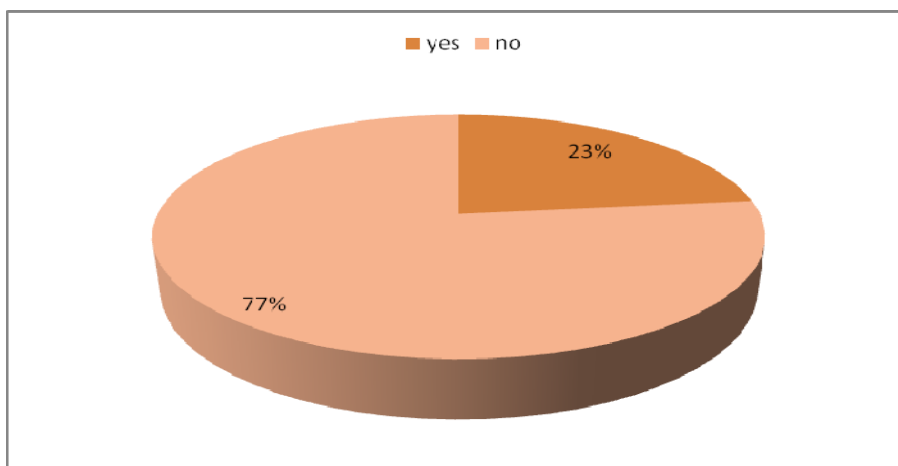


It was found out that majority (53%) of the respondents said that the hypertension drugs cost them between Kshs. 1,001-2,000, 35% said the drugs cost them Kshs.0-1,000, 11% said the drugs cost them Kshs. 2,001-3,000 and 1% said the drugs cost them 3001-4000.

#### **5.2.2.2 Availability of the drugs in the hospital pharmacy**

The findings are shown in figure 5.7

**Figure 5.7: Availability of the drugs in the hospital pharmacy**



From the findings above, it can be noted that most of the respondents (77%) felt that the drugs were not readily available in the hospital pharmacy with 23% saying they were.



### 5.2.2.3 Advice on the importance of taking HBP medication by the respondent's clinicians

Respondents were asked if the clinicians had explained to them on the importance of adherence to medication and other lifestyle modification aspect of hypertension management at initiation of treatment or during follow up. The findings are summarized in table 5.5

**Table 5.5: Adherence counseling**

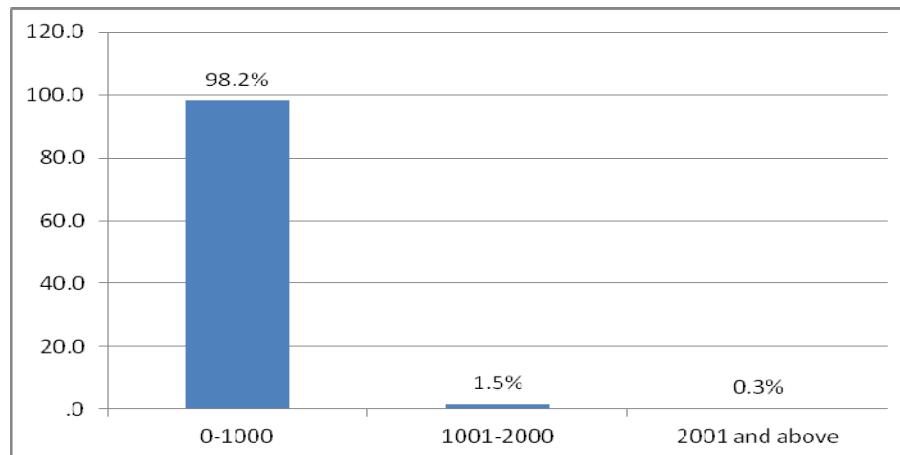
Adherence counseling done	Frequency	Percent
Yes	256	78%
No	71	22%
Total	327	100.0

In conclusion, 78% of the respondents said that they had been counseled on the importance of taking their HBP medication, 22% on the other hand said they were not taught.

### 5.2.2.4 Average fare in Ksh from the respondent's residence to the hospital

The average cost of transport to the hospital and back home for the respondents is as presented in the bar graph below.

**Figure 5.8: Average cost of transport per visit (Ksh)**



In reference to the above, it was found that most of the respondents (98.2%) spent Ksh 0-1000 on fare to the hospital and back, 1.5% spent 1,001-2,000 and 0.3% spent Ksh. 2,001 and above.

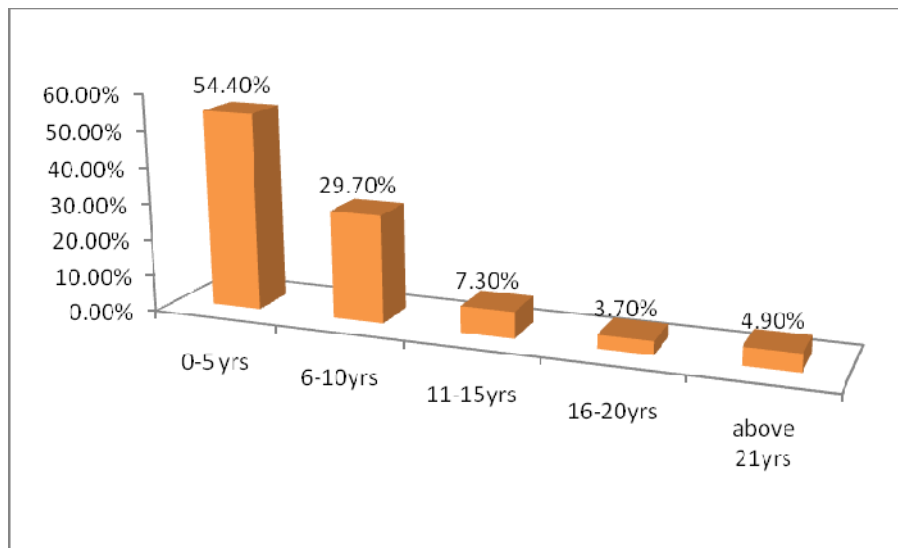
### 5.2.3 Disease related factors associated with adherence to hypertension medication

The fourth objective of this study was to determine disease related factors associated with adherence to hypertension medication. The period on treatment for hypertension, other chronic ailments suffered by the respondents, hospitalization due to hypertension related complications in the last one-year and the type of complication the respondents suffered were the factors assessed.

#### 5.2.3.1 Period the respondents had been on treatment for hypertension

The findings are outlined using figure 5.9

**Figure 5.9** Period the respondents have been on treatment for hypertension



In reference to the figure above, 54.4% of the respondents had been on hypertension treatment for 0-5 yrs, 29.7% for 6-10 yrs, 7.3% for 11-15 yrs, and 4.9% for 21 yrs and above with 3.7% for 16-20 yrs. These findings depict that majority of the hypertensive patients were on treatment for a period of 0-5 years.

### 5.2.3.2 Other chronic ailment(s) suffered by the respondents

A finding on respondents with other co morbid health conditions is summarized in table 5.6

**Table 5.6: Other chronic ailment(s) suffered by the respondents**

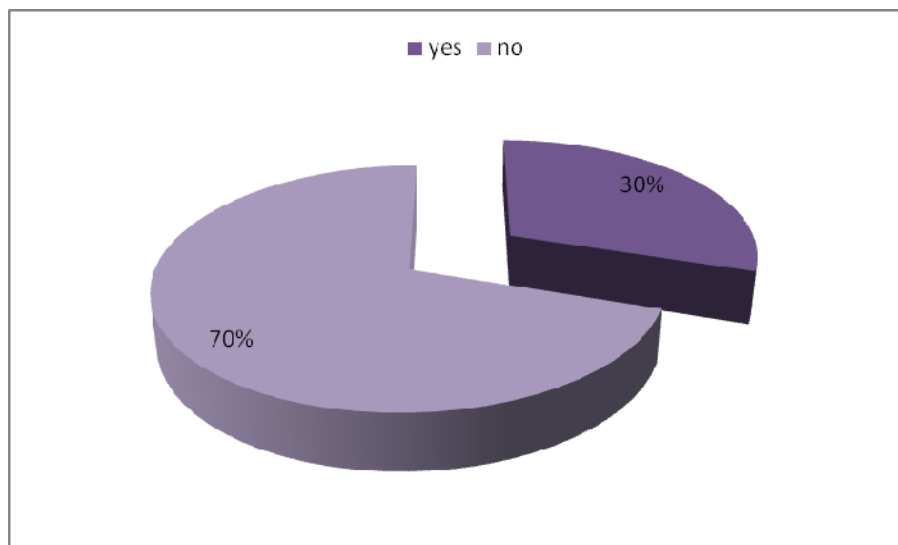
	Frequency	Percent
Yes	144	44.0%
No	174	53.2%
No response	9	2.8%
Total	327	100.0

From the findings it was noted that majority of the respondents (53.2%) did not suffer from any other chronic ailment, whereas 44% did. The remainder (2.8%) did not respond to this question. These chronic conditions included diabetes, asthma, epilepsy, chronic cardiac failure, peptic ulcer disease and pelvic inflammatory disease

### 5.2.3.3 Hospitalization due to complications from hypertension in the last one year amongst the respondents.

The findings are shown in figure 5.10.

**Figure 5.10: Hospitalization due to complications from hypertension in the last one year amongst the respondents**



This figure shows that 30% of the respondents reported to have been admitted due to hypertension and its complications within the previous one year while 70% had not been hospitalized.

#### 5.2.3.4 Type of complication suffered by the respondents

The following table illustrates the various causes of hospitalization the respondents suffered in the previous one year.

**Table 5.7: Type of complication suffered by the respondents**

<b>Complication</b>	<b>Frequency</b>	<b>Percent</b>
High BP	79	78.2%
CCF	9	8.9%
CVA	13	12.9%
<b>Total</b>	<b>101</b>	<b>100.0</b>

From the findings majority of those hospitalized were due to high BP (78%), followed by CVA and CCF at 12.9% and 8.9% respectively.

#### 5.2.4 Medication factors related with adherence to hypertension medication

##### 5.2.4.1 Number of hypertensive drugs the respondents took.

Table 5.8 illustrates the findings.

**Table 5.8: Number of hypertensive drugs the respondents took.**

<b>Number</b>	<b>Frequency</b>	<b>Percent</b>
1- 2	153	46.8
3 and above	174	53.2
<b>Total</b>	<b>327</b>	<b>100.0</b>

In terms of the number of antihypertensive drugs, majority of the respondents (53.2%) were on three or more drugs while the remaining 46.8% were on one and two antihypertensive drugs.

##### 5.2.4.2 Adverse effects of the drugs taken by the respondents

The findings are shown in table 5.9

**Table 5.9: Adverse effects of the drugs taken by the respondents**

<b>Adverse effect</b>	<b>Frequency</b>	<b>Percent</b>
Yes	129	39.4%
No	198	60.6%
<b>Total</b>	<b>327</b>	<b>100.0</b>

From the table above, it was established that 60.6% reported not to have any side effects on the drugs, whereas 39.4% did.

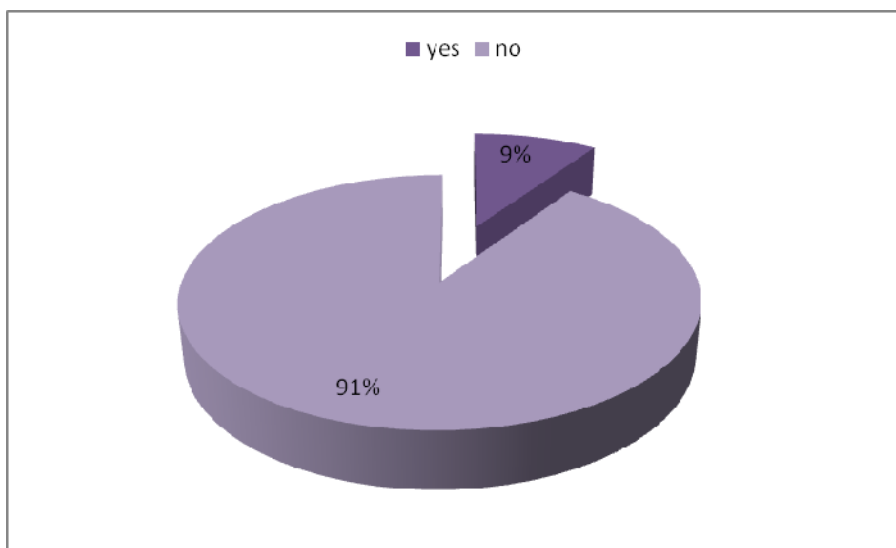
### **5.2.5 Lifestyle factors in management of hypertension.**

The researcher also sought to investigate some of lifestyle modification in regard to management of hypertension such as reduction of alcohol and tobacco intake amongst the respondents.

#### **5.2.5.1 Cigarettes smoking amongst the respondents**

A result on cigarette smoking amongst the respondents is summarized in figure 5.11

**Figure 5.11: Cigarettes smoking amongst the respondents**



Asked if they currently smoked cigarettes, majority (91.0%) said they did not while 9.0% were smokers.

#### **5.2.5.2 Alcohol consumption amongst the respondents**

The finding on alcohol consumption is as tabulated below.

**Table 5.10: Alcohol consumption amongst the respondents**

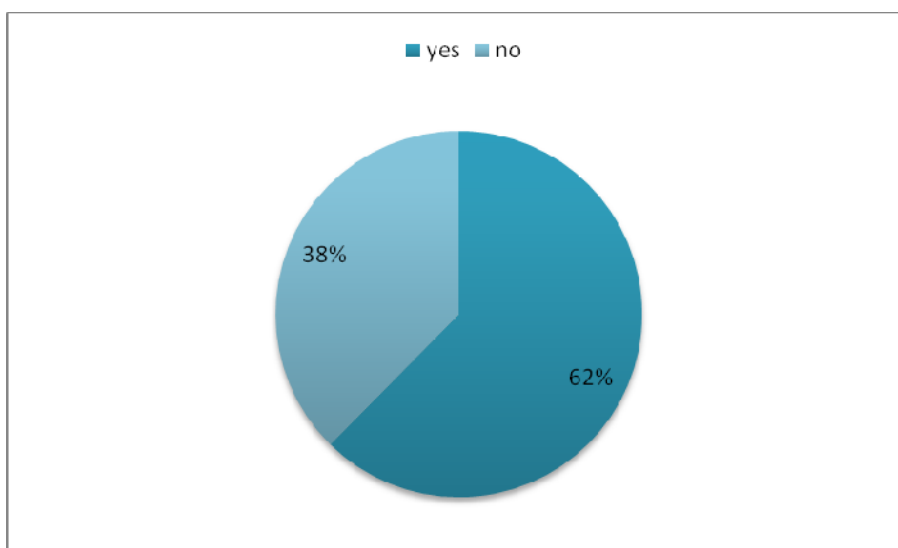
Alcohol intake	Frequency	Percent
Yes	55	16.8%
No	272	83.2%
<b>Total</b>	<b>327</b>	<b>100.0%</b>

From the findings, 83.2% of the respondents said they were not taking alcohol with the remaining 16.8% reported to have been consuming alcohol.

### **5.2.6 Adherence to hypertension medication by the respondents**

The participant's level of adherence to hypertension medication was assessed using Morisky Medication Adherence Scale (MMAS). The results were as shown in figure 5.12

**Figure 5.12: Adherence to hypertension medication by the respondents**



It was found out that 62.4% (95% confidence interval: 56.6%, 67.6%) of the respondents were fully adherent to medication, whereas 37.6% were not. Adherence to medication was assessed using the eight items Morisky Medication Adherence Scale.

### 5.3 Association between Adherence to treatment and various factors

Associations between adherence with patient related factors, disease related factors, medication related factors and organizational factors were assessed using Chi-square contingency table analysis. The findings are as shown in the table below.

**Table 5.11: Association between Adherence and various factors**

Factor	Value	df	Asymp. Sig. (2-sided)
Sex	5.133	1	.023
Age	3.942	4	.414
marital status	1.149	3	.765
Residence	.760	1	.383
Employment status	4.390	4	.356
Monthly income	12.382	4	.015
Level of education	6.115	4	.191
Duration of treatment	5.834	4	.212
Number of antihypertensive	45.708	1	.000
BP control	31.15	1	.000
Adverse effects	7.471	2	.240
Cormorbidity	12.769	2	.002
Cigarette smoking	5.949	2	.110
Alcohol consumption	11.919	1	.001
Knowledge	52.757	1	.000
Hospitalization	7.702	1	.006
Doctor's advice	21.861	2	.000

From these (Chi-square tests) results, significant associations were found between adherence and sex ( $X^2=5.133$ ,  $p=0.023$ ), monthly income ( $X^2=12.382$ ,  $p=0.015$ ), number of pills ( $X^2=45.708$ ,  $p=0.000$ ), co morbidity ( $X^2=12.769$ ,  $p=0.002$ ), alcohol intake ( $X^2=11.919$ ,  $p=0.001$ ), knowledge on hypertension ( $X^2=52.757$ ,  $p=0.000$ ), hospitalization due to hypertension complications ( $X^2=7.702$ ,  $p=0.006$ ) and adherence counseling ( $X^2=21.861$ ,  $p=0.000$ ). Female respondents were more likely to be adherent to treatment than their male counterparts while those who earned a monthly income of Ksh 30,000 and above had higher chances of complying with their medication compared to those who earned less than Ksh

30,000. Participants who were taking one or two antihypertensives were found to be more adherent than those who took three or more pills. Those respondents with other concurrent chronic medical conditions like diabetes were more likely to be adherent than those who suffered from only hypertension. Participants who took alcohol were more likely to be less adherent to their medication than those who abstained from alcohol. Respondents who were knowledgeable about hypertension and those who reported to have been counseled by their clinicians on adherence were found to be more adherent than those who were not knowledgeable and those who had not been counseled by their clinicians on adherence. Adherence was also shown to be associated with BP control ( $X^2=31.15$ ,  $P < 0.05$ ).

#### 5.4 Independent predictors for adherence

**Table 5.12: Independent predictors for Adherence**

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Sex	0.525	0.232	5.096	1	0.024	1.69	1.072	2.666
Age	- 0.062	0.08	0.601	1	0.438	0.94	0.802	1.1
Residence	- 0.204	0.341	0.357	1	0.55	0.815	0.418	1.592
marital status	- 0.258	0.171	0.268	1	0.132	0.773	0.553	1.081
employment status	0.035	0.05	0.49	1	0.484	0.335	0.139	1.141
total monthly income	0.007	0.003	5.369	1	0.02	1.407	1.001	1.813
highest level of education	0.055	0.098	0.315	1	0.575	0.557	0.372	1.28
Duration of treatment	0.211	0.123	1.953	1	0.086	0.235	0.971	1.572
Distance to facility	0.567	0.838	0.459	1	0.498	0.763	0.342	9.104
No. of drugs	0.148	0.308	13.933	1	0.00	2.152	1.725	5.758
Adverse effects on the drugs	0.003	0.015	0.05	1	0.822	0.803	0.974	1.033
Co-morbidity	-0.01	0.009	1.361	1	0.243	0.99	0.972	1.007
smoking cigarettes	-	0.012	0.922	1	0.280	0.476	0.952	1
Taking alcohol	-	0.373	2.304	1	0.072	0.392	0.189	0.815
Knowledge	1.533	0.298	26.384	1	0.00	2.63	2.58	8.309
Hospitalization due to hypertension complications	- 0.535	0.314	2.895	1	0.089	0.586	0.316	1.085
Doctor advice on HBP medication	- 0.038	0.036	1.11	1	0.292	0.963	0.897	1.033



The logistic regression results depict a statistically significant associations between adherence to hypertension medication with sex (p value=0.024); number of drugs (p value=0.000); knowledge on hypertension and its treatment (p=0.000) and total monthly income (p=0.002).

Female respondents were found to be 1.69 times more likely to be adherent to hypertension treatment than the male ones while those who took one or two antihypertensives were about 2.2 times more adherent than those who took three or more antihypertensives. Participants found to be knowledgeable about hypertension and its treatment were about 2.6 times more likely to be adherent to their treatment compared to those found to be non-knowledgeable. Respondents with a total monthly income of more than Ksh 30,000 were 1.4 times more likely to be adherent than those who earned less than Ksh 30,000 in a moth.

### **5.5 Hypothesis Testing.**

**1. Null Hypothesis:** Patient related factors are not associated with adherence to hypertension medication. Using level of significance as 5% and Chi-square tests, the findings were as follows: Sex ( $X^2=5.133$ ,  $p=0.023$ ), monthly income ( $X^2=12.382$ ,  $p=0.015$ ), knowledge on hypertension ( $X^2=52.757$ ,  $p=0.000$ ) and alcohol intake ( $X^2=11.919$ ,  $p=0.001$ ). Thus, the above null hypothesis is rejected based on the p values that are less than 0.05

**2. Null Hypothesis:** Disease related factors are not associated with adherence to hypertension treatment. Findings: co morbidity ( $X^2=12.769$ ,  $p=0.002$ ), hospitalization due to hypertension complications ( $X^2=7.702$ ,  $p=0.006$ ). This null hypothesis is rejected due to p values < 0.05

**3. Null Hypothesis:** Medication related factors are not associated with adherence to hypertension treatment. Findings: number of pills ( $X^2=45.708$ ,  $p =0.000$ ). Based on this finding with a p value < 0.05, the null hypothesis is rejected.

**4. Null Hypothesis:** Organizational factors are not associated with adherence to hypertension treatment. The study found an association between adherence counseling by clinicians and adherence to treatment ( $(X^2=21.861$ ,  $p=0.000)$ ). This null hypothesis is also rejected due to p value of less than 0.05

## 6.0 DISCUSSION OF FINDINGS

### 6.1 Adherence to hypertension medication.

The study established that 62.4% of the respondents were fully adherent to their hypertension medication (95% confidence interval: 56.6%, 67.6%) while 48.3% had their BP controlled. A similar study carried out in Kenyatta National Hospital found out that only 32% of the study population was fully adherent to treatment while only 26% had their BP controlled (Achieng et al, 2008). This variance could be because KNH is a tertiary health care facility where its clientele constitute of referrals from the lower level health care facilities thus a different subset of population as compared to the one done at Kiambu District Hospital. Health awareness has also been created over the years on the emergence of non-communicable diseases hence improved health seeking behavior and compliance to treatments. Aberu et al (2012) established that 64.6% of the study participants in Ethiopia were fully adherent to their hypertension treatment while 77% of hypertensive American population was found to be fully adherent to treatment (Larissa et al, 2012) . In Iraq, 54.6% of hypertensive patients were fully adherent to their treatment (Samin et al, 2010). Adherence in developed countries could be higher than in developing countries probably due to their effective and efficient health care system that guarantees universal health care to their citizens.

A contingency table analysis between adherence and BP control in this study showed a statistically significant association between adherence and BP control ( $X^2=31.15$ ,  $P < 0.05$ ). This finding is similar to one from a study done in KNH (Angela et al, 2008). Adequate adherence to hypertension medication would ensure reduction of high BP thus attaining an optimal BP levels in hypertensive patients.

### 6.2 Patient related factors

A statistically significant association was found between adherence to hypertension medication and sex, where female respondents were more adherent than their male counterparts ( $p=0.024$ ). A Similar finding was found by Samin et al (2010) in Iraq while assessing compliance of hypertensive patients to management in Duhok Governorate. National Health and Nutrition Examination Survey (NHANES, 1999-2002) also found out that male hypertensive patients were less adherent to medication than the female patients. A study carried out to establish adherence to antihypertensive treatment and associated factors

among patients on follow up at University of Gondar Hospital in Ethiopia found sex to be amongst the independent predictors of adherence (Abere et al, 2012). Several other studies have not found sex to be an independent predictor of adherence to antihypertensive medication. A study carried out in Indiana to determine characteristics associated with drug adherence among patients with hypertension found only age and marital status as the independent predictors of adherence (Andrew et al, 2006).

Total monthly income was also found to be an independent predictor of adherence to hypertension treatment ( $p=0.02$ ). Those who earned Ksh 30,000 and above in a month were more adherent than those earning less. Eighty percent (80%) of those earning more than Ksh 30,000 and above were fully adherent compared to 57% of those who earned below Ksh 30,000 in a month. 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 an association between low adherence to hypertension medication and low income. In the case of Kiambu District Hospital, hypertension drugs were offered at a cost-sharing basis where the patient would pay about Ksh 200 for one month's prescription per drug for those drugs supplied by KEMSA. It was noted that most of the hypertension drugs were perennially out of stock or were not supplied by KEMSA at all where the patients would 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 significant statistical significance was found between adherence to hypertension medication and respondent's knowledge to hypertension and its treatment ( $p=0.000$ ). Using 10 questions to assess knowledge on hypertension and its treatment as adopted from Susan et al (2005), it was found that 45.3% of the respondents were knowledgeable. Majority of those knowledgeable were found to be adherent to treatment (83.8%) compared with 44.7% of those who were non-knowledgeable but adherent to treatment. A similar study in Ethiopia to establish adherence to antihypertensive treatment and associated factors also identified patient's knowledge to hypertension and its treatment as one of independent predictors of adherence (Abere et al, 2012). Patients who are more knowledgeable about hypertension and its treatment would understand better the importance of maintaining optimal BP and

therefore would be more compliant to their treatment as compared to those who are less knowledgeable.

Age in this study was not found to have any association with adherence to hypertension treatment ( $p > 0.05$ ). This finding is in contrast to a finding of a similar study carried out in Indiana which found out that increase in age was associated with better adherence (Andrew et al, 2006). NHANES survey of 1999-2002 in America also found out that younger age was associated with poor adherence to hypertension treatment.

There was no statistically significant association between adherence to hypertension treatment and highest level of education attained by respondents in this study ( $p > 0.05$ ). This is in contrast to a finding in a similar study carried out in Iraq which found out that low level of education was associated with good adherence (Samin et al, 2010).

Respondent's marital status in this study did not have any association with adherence to hypertension treatment ( $p > 0.05$ ). A contrary finding was found in a similar study conducted in Indiana where being married was an independent predictor of adherence (Andrew et al, 2006).

## **6.2 Medication related factors**

Number of hypertension drugs the respondents were taking also was identified as one of independent predictors of adherence to treatment ( $p=0.000$ ). Respondents who took one or two antihypertensives were more adherent than those who took three or more drugs. This is in contrast with a finding of a study carried out in Pakistan to establish determinants of adherence to hypertension medication (Hashmi et al, 2007). Monotherapy was associated with poor adherence in that study. Inkster et al (2006) in a study to determine adherence to antihypertensive medication and association with patient and practice factors also found no significant association between adherence and number of antihypertensives taken. Those taking more than three antihypertensives would be more likely to develop adverse effects from the drugs, which would affect compliance to that treatment as some patients opt to discontinue the drugs or skip them for a while. Higher numbers of antihypertensives also mean higher cost for the drugs thus affecting on respondent's supply of drugs and adherence.

### **6.3 Disease related factors**

Respondents who suffered from other chronic illnesses apart from hypertension were more likely to be adherent to hypertension medication than those suffering from hypertension only ( $X^2=12.769$ ,  $p=0.002$ ). Similar finding was identified in a study carried out in America to establish predictors of first fill adherence for patients with hypertension (Nirav et al, 2009). A contrary finding was identified in a study in America where patients with depression were found to be more likely to become non-adherent (Leonelo et al, 2012). Those hypertensive patients with other chronic illnesses most of whom would have diabetes mellitus would perceive the combined danger of the two or more diseases and probably become more adherent than those suffering from hypertension only.

Study participants who reported to have been hospitalized due to hypertension complications in the previous one year were more likely to be adherent than those who had not been hospitalized ( $X^2=7.702$ ,  $p=0.006$ ). The perceived danger of hypertension following its complication warranting hospitalization and enhanced interaction between the patient and clinicians in the hospital may impact positively on the patient's adherence to medication.

Duration of hypertension treatment has also been found to be associated with adherence to hypertension medication in contrast to a finding in this study ( $p > 0.05$ ). A study done in America to establish predictors of poor adherence to hypertension treatment found that those diagnosed with hypertension less than ten years ago were significantly associated with poor adherence (Amanda et al, 2007).

### **6.4 Organizational factors**

Those respondents who reported to have been counseled by their clinicians on adherence were more likely to be adherent than those who said they had not been counseled ( $X^2=21.861$ ,  $p=0.000$ ). This was in congruence to a finding in a study conducted in Tunisia where compliance to antihypertensive therapeutic regimens was found to be related to a good doctor-patient relationship (Ghannem et al, 2002). Adherence counseling by clinicians makes patients well informed about their medical conditions and their treatment hence may improve on adherence

## **7.0 CONCLUSION AND RECOMMENDATIONS.**

### **7.1 Conclusion**

Adherence to hypertension treatment is critical in the management of hypertension as it ensures controlled BP with reduced morbidities and mortalities associated with high BP. It was found that 62.4% of the respondents were fully adherent to treatment while 48.3% had their BP optimally controlled.

Sex, total monthly income and knowledge of hypertension and its treatment were found to have significant statistical association with adherence to treatment. Female respondents, those earning monthly income of more than Ksh 30,000 and respondents who were knowledgeable on hypertension were more likely to be adherent to treatment than their counterparts.

Number of antihypertensive pills had statistical association with adherence to treatment. Respondents who took one or two hypertension pills were more likely to be adherent than those taking three or more pills.

None of the disease related factors was found to be an independent predictor of adherence to hypertension medication. However, co morbidity and previous hospitalization due to hypertension complications were found to be associated with better adherence to hypertension treatment.

Amongst the independent predictors of adherence to hypertension medication, none was organizational related. However, adherence counseling was found to be associated with adherence. Respondents who reported to have been counseled on adherence were more likely to be adherent to their treatment compared to those who said were never counseled.

## 7.2 Recommendations

Adherence to hypertension treatment is key in reduction and averting morbidities and mortalities associated with hypertension. Some of the recommendations on how to scale up adherence levels as informed in this study are as follows.

1. Male patients were more likely to be less adherent to treatment. The hospital clinicians should formulate interventions tailored to suit them to scale up their compliance to treatment. This may include enhanced adherence counseling on the male hypertensives.
2. Low-income earners were found to be at risk of low adherence. The hospital management should put in place an effective waiver system to identify needy clients who should be waived to ensure a constant supply of their antihypertensives.
3. Knowledge to hypertension medication and its treatment was found to be an independent predictor of adherence. Hospital clinicians should ensure routine health education focusing more on hypertension risk factors, prevention, treatment options both drug, dietary and lifestyle modifications, importance of compliance to treatment and its complications.
4. Those respondents who took three or more antihypertensives were at higher risk of poor adherence. Clinicians in the hospital should adequately consider treatment regimens before prescribing the antihypertensive drugs considering their potency, availability, cost, adverse effects and drug interactions. Fixed dose combinations for hypertension may also be considered to ease pill burden on the patients.
5. Those participants who reported lack of adherence counseling by their clinicians were at a higher risk of low adherence. Clinicians should ensure that they routinely counsel their patients on the importance of compliance to their treatment.
6. Majority of the respondents reported that hypertension drugs were not readily available in the hospital. The hospital management should therefore ensure that all the antihypertensive medication prescribed in the institution is well stocked and affordable to their clientele.

7. Finally, further studies on the impact of interventions targeting those subgroups noted to be at higher risk of poor adherence to hypertension medication e.g. males, low-income earners, those taking more than two drugs and those not knowledgeable on hypertension is recommended. I also recommend further studies on the organizational factors (not well covered in this study) associated with adherence to hypertension medication.



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## 9.0 APPENDICES

### 9.1 Work Plan

**Objective-**To carry out a descriptive study on adherence to hypertension treatment in adult patients in Kiambu County.

**Goal-**To assess factors associated with adherence to hypertension treatment in patients followed up at Kiambu District Hospital.

#### Work plan

Activity	Timeframe	Resources	Responsible person	Indicators
Development of proposal	July 2012-Dec-February,2013	Stationery Journals Publications Medical books Internet	-Principal investigator -Supervisors	Research proposal in place
Submission of proposal to KNH/UON Ethics Committee	February, 2013	Proposal fee	Principal investigator	An approved research proposal.
Feedback from KNH/UON Ethics Committee	February-March,2013	None	Principal investigator	Approval from the committee
Approval by hospital administration	April,2013	Transport	Principal investigator	Approval granted
Training research assistants	May, 2013	Stationery Lunch allowances	Principal investigator	Research assistants familiar with the study objectives, procedures and questionnaires.
Pretesting of the questionnaires	May, 2013	Stationery Manpower Allowances Transport and accommodation	Principal investigator	Data from the questionnaires
Data collection	May-July, 2013	Stationery Instruments Manpower Wages Transport and accommodation	-Principal investigator -Supervisors	Data available
Data entering, processing and analysis	May-August, 2013	Data Computer SPSS PACKAGE	Principal investigator	Data processed and analyzed. Study findings and conclusions in place
Presentation of the report and dissemination.	September, 2013-October 2014	Study report	Principal investigator	Thesis presented and disseminated.

## 9.2 Estimated budget

<b>S/No</b>	<b>Subject</b>	<b>Amount(Ksh)</b>
1	4 Research assistants allowances @ Ksh 1,500 per day for 20 days	120,000
2	Travel and accommodation	75,000
3	Stationery	40,000
4	Purchase of equipments	17,000
5	Data management and analysis	50,000
6	Contingency (10 %)	30,200
	<b>Total</b>	<b>332,200</b>

### **9.3 Consent form**

**Study Topic:** Factors associated with adherence to antihypertensive treatment in Kiambu District Hospital.

#### **Principal Investigator**

Dr Boniface M.Kimuyu,  
School of Public Health,  
College of Health Sciences,  
University of Nairobi.

**E-mail:** bonifacemulinge@yahoo.com  
**Mobile No.** 0721-680-768

**Good morning/afternoon,**

My name is Boniface M.Kimuyu, a Master of Public Health student at the University of Nairobi, School of Public Health. I wish to carry out a study on the factors associated with antihypertensive treatment in those patients followed up here in Kiambu District Hospital.

**Purpose of the study:** Optimal adherence to hypertension treatment is associated with optimal control of blood pressure and consequently reduced ill health and deaths due to hypertension. The findings of the study will establish a benchmark on adherence to hypertension treatment by clients from this hospital so as to propose strategies on how to improve on adherence by addressing those factors found to hinder adherence and scaling up those promoting adherence. This study is also a part of fulfillment for award of my master's degree at the University of Nairobi.

**Procedure:** The study is expected to be carried out within three months time from May to July 2013. Those hypertensive clients who agree to participate in this study will be required to give some information about them and also answer several questions which will be used to

estimate their adherence to hypertension treatment. Blood pressure will also be measured during the interview. You will be required to participate only once during the entire period of this study.

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

**Benefits:** Participants in this study will not benefit directly in terms of monetary or material gain. However, findings from this study will inform on better strategies to employ in improving adherence to hypertension treatment. Improved adherence to treatment will ensure better blood pressure control with reduction in ill health and deaths due to hypertension and thus an improvement in quality of life.

**Confidentiality:** The names of the participants will not be used but only serial numbers for each one of them. All the information provided by participants will be kept confidential to the principal investigator and the research assistants and will not be shared with anybody else including the health care providers in this hospital.

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

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

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

Participant's signature-----Date-----

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Investigators signature-----Date-----

---

**NOTE:** Any issues regarding this study can be raised to me through open discussions or through my mobile number 0721-680-768 or my e-mail [bonifacemulinge@yahoo.com](mailto:bonifacemulinge@yahoo.com) as well as through Kenyatta National Hospital/University of Nairobi Ethics and Review Committee using contacts below.

1. Kenyatta National Hospital,

P.O BOX 20723-00202,

Tel. (254)020 726300 Ext.44102, 44355

2.University of Nairobi,

College of Health Sciences,

P.O Box, 19676-00202,

Tel. (254)020 2726300,



#### **9.4 Morisky Medication Adherence Scale template.**

1. Do you sometimes forget to take your High Blood Pressure (HBP) pills?

(0.No, 1.Yes)

2. People sometimes miss taking their medication for reasons other than forgetting. Thinking over the past two weeks was there any days when you did not take your HBP medication?

(0.No, 1.Yes)

3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?

(0.No, 1.Yes)

4. When you travel or leave home, do you sometimes forget to bring along your HBP medication?

(0.No, 1.Yes)

5. Did you take your HBP medication yesterday?

(0.No, 1.Yes)

6. When you feel like your HBP is under control, do you sometimes stop taking your medication?

(0.No, 1.Yes)

7. Taking medicine everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your HBP treatment plan?

(0.No, 1.Yes)

8. How often do you have difficulty remembering to take your medication?

(0.Never/rarely, 1.Once in a while, 2.Sometimes, 3.Usually, 4.All the time)

**Source: Morisky DE, Ang A, Krousel-Wood H: *Predictive validity of a medication adherence measure for hypertension control. Journal of Clinical Hypertension 2008; 10(5):348-354.***

## 9.5 Respondents Questionnaire

Questionnaire ID No. -----Name of interviewer-----

### Respondent's socio-demographic factors

1. Gender Male  Female
2. What is your age (In completed years)? \_\_\_\_\_ Date of birth-----
3. What is your current marital status?  
(1.Never married, 2.Married, 3.Divorced/separated, 4.Widowed)
4. Where do you currently live? Rural  Urban
5. What is your employment status?  
(1.Formaly employed, 2.Unemployed, 3.Self employed, 4.Pensioner)
6. What is your total monthly income (Ksh)?  
(1. Up to Ksh 10, 000, 2. Ksh 10,000-30, 000, 3.Ksh 30,000-50, 000, 4.Ksh above 50,000)
7. What is the highest level of education that you attained?  
(1.No formal education, 2.Primary level, 3. Secondary level, 4.Post Secondary)
8. Do you currently smoke cigarettes? Yes  No
9. If yes how many sticks in a day? \_\_\_\_\_
10. Do you currently take alcohol? Yes  No
11. If yes how many units in a week? \_\_\_\_\_
12. BP in mm Hg (average of 2 readings) \_\_\_\_ / \_\_\_\_

### Respondent's disease related factors

13. For how long (in years) have you been on treatment for hypertension? \_\_\_\_\_
14. Do you suffer from any other chronic ailment(s)? Yes  No
15. If yes which one(s)? \_\_\_\_\_
16. Have you been hospitalized due to complications from hypertension in the last one year?  
Yes

17. If yes what was the complication? \_\_\_\_\_

18. How many antihypertensive drugs are you on? List the drugs \_\_\_\_\_

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**Respondent's drug related factors**

19. How many antihypertensive drugs are you on? List the drugs \_\_\_\_\_

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20. Have you ever noted any adverse effects on the drugs you are taking? Yes  No

21. If yes which ones? \_\_\_\_\_

**Respondent's organizational factors**

22. What is the average fare in Ksh from your residence to the hospital? -----

23. What is the average cost of your hypertension medication per month? Ksh-----

24. Are those drugs readily available in the hospital pharmacy? Yes  No

25. Have you ever been told by your Doctor the importance of taking your HBP medication?

Yes  No

**Assessment of respondent's adherence status**

26. Do you sometimes forget to take your High Blood Pressure (HBP) pills?

(0.No, 1.Yes)

27. People sometimes miss taking their medication for reasons other than forgetting. Thinking over the past two weeks was there any days when you did not take your HBP medication?

(0.No, 1.Yes)

28. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?

(0.No, 1.Yes)

29. When you travel or leave home, do you sometimes forget to bring along your HBP medication?

(0.No, 1.Yes)

30. Did you take your HBP medication yesterday? (0.No, 1.Yes)

31. When you feel like your HBP is under control, do you sometimes stop taking your medication?

(0.No, 1.Yes)

32. Taking medicine everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your HBP treatment plan?

(0.No, 1.Yes)

33. How often do you have difficulty remembering to take your medication?

(0.Never/rarely, 1.Once in a while, 2.Sometimes, 3.Usually, 4.All the time)

**Assessment of respondent's knowledge on hypertension and its treatment.**

34. What does the term Hypertension mean?

Raised BP  Raised blood suga  Increased stress  don't know

35. How dangerous is Hypertension to your health?

Extremely  Somehow  Not at all  Don't Know

36. Would lowering HBP improve a person's health?

Yes  No  Somehow  Don't kno

37. What do the two numbers reported for BP mean?

Top No. ----- Don't know

Bottom No. ----- Don't know

38. Which measure(s) is (are) more important?

Top  Bottom  Both  Don't know

39. What should normal BP levels be?

Top----- Don't know

Bottom----- Don't know

40. Can people do things to lower their HBP?

Yes  No  Don't know

41. Can lowering BP even a little bit improve health?

Yes  No  Don't know