

**PHYSICAL ACTIVITY, DIETARY PRACTICES AND NUTRITION STATUS OF
HYPERTENSIVE PATIENTS ATTENDING KIAMBU DISTRICT HOSPITAL,
KIAMBU COUNTY, KENYA**

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**A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF
SCIENCE IN FOODS NUTRITION AND DIETETICS IN THE SCHOOL OF
APPLIED HUMAN SCIENCES, KENYATTA UNIVERSITY**

NOVEMBER, 2017

DECLARATION

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

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DEDICATION

This thesis is dedicated to my husband Lawrence and our three lovely children Collins, Alicia and Ethan for their support and encouragement throughout my studies.

ACKNOWLEDGEMENTS

First and foremost I thank the Almighty God for granting me the strength and spirit to complete this research. I give my sincere gratitude to my supervisors, Dr. Peter Chege and Dr. Ann Munyaka both of Kenyatta University for their guidance, support and expertise contribution for the successful completion of this work. I also thank other members of the Department of Food Nutrition and Dietetics, Kenyatta University who in one way or another contributed to the success of this work.

My great appreciation also goes to Kiambu District Hospital for allowing me conduct the study in their institution. Additionally I thank all the respondents who found time from their busy schedule to participate in the study without which there would have been no research findings. I also thank Ms. Faith the hospital nutritionist for her support and guidance. Special thanks to Ms. Halima, Ms. Mwangi and Ms. Ednah who helped me through data collection. Also importantly I wish to thank and acknowledge Mr. Muthamia and Mr. Karanja for helping me through data analysis.

I recognize with appreciation my fellow students Ms. Nicolleta Muthoni and Ms. Agnes Mwendia for the remedial and prompt encouragement throughout this academic journey. Last but not least I thank my family members for offering me both moral and financial support throughout this work.

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LIST OF ABBREVIATIONS AND ACRONYMS

BMI	:	Body Mass Index
CHO	:	Carbohydrates
CVD	:	Cardiovascular Disease
DBP	:	Diastolic Blood Pressure
FAO	:	Food and Agriculture Organisation
FFQ	:	Food Frequency Questionnaire
IDDS	:	Individual Dietary Diversity Score
KCAL	:	Kilocalories
KNBS	:	Kenya National Bureau of Statistics
KNH	:	Kenyatta National Hospital
METs	:	Metabolic Equivalent
SBP	:	Systolic Blood Pressure
SPSS	:	Statistical Package for Social Sciences
USA	:	United States of America
USDA	:	United States Department of Agriculture
WHO	:	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Blood pressure level - Described in two values; systolic which is the blood pressure when the heart muscles contract recorded as the top value and diastolic pressure which is the pressure when the heart muscles rest recorded as the lower value.

Dietary diversity- the total number of food groups consumed by an individual in a day. The following food groups were used to calculate dietary diversity in this study;- cereals, oil and fat, milk and milk products, other fruits, other vegetables, legumes, nuts and seeds, dark green leafy vegetables, eggs, flesh meat, vitamin A rich fruits, white tubers, vitamin A rich vegetables and tubers, organ meat and fish.

Dietary practice – the type and number of meals consumed by an individual over a referenced period of time. In the study it covers dietary diversity, dietary intake & frequency of food consumption.

Hypertensive patients - An individual with SBP greater than 140 mm Hg and a DBP greater than 90 mm Hg.

Hypertension control- Respondents with SBP 140 mm Hg and DBP 90 mm Hg were considered to have hypertension control.

Nutrition status - one's body weight as reflected by the body mass index.

Obesity – A BMI greater than 30.

Physical activity – Bodily movement that results in energy use.

ABSTRACT

Globally, uncontrolled hypertension is a health priority since it raises the risk for the onset of renal failure, heart disease and diabetes. Hypertension complications contribute to high rates of morbidity and mortality. Optimal blood pressure can be achieved by putting in place strategies that encourage routine physical activity engagement and intake of health diets among hypertensive patients. Patient related factors which include unhealthy dietary practices, poor nutrition status and physical inactivity have been identified to be main hindrances in hypertension management. Minimal information exists on the relationship between dietary practices, physical activity and nutrition status among hypertensive patients. These causes are researched and documented in developed countries but not in developing countries. This research aimed at determining the dietary practices, physical activity level and nutrition status of hypertensive patients in a developing country set up to fill this research gap. Cross-sectional analytical research design was adopted; the respondents were selected using systematic random sampling method. The study was conducted on a sample of 134 hypertensive patients attending Kiambu District Hospital in Kiambu County. Dietary practices were established by use of a 24-hour dietary recall and a seven day food frequency questionnaire. The World Health Organisation global physical activity questionnaire was used to measure the physical activity level. Anthropometric parameters were used to assess the nutrition status. A pretested questionnaire was used to collect demographic and socio-economic status data. Data analysis was done by use of statistical package for the social science. The respondent's dietary practices, physical activity level, nutrition status, demographic and socio-economic characteristics of the study population were described by use of descriptive statistics. Chi-square test was used to determine the association between categorical variables like demographic, socioeconomic status and dietary practices and nutrition status. The relationship between non-categorical variables including physical activity level, dietary practices and nutrition status was determined by use of Pearson correlation test. A p-value of <0.05 was used as a criterion for statistical significance. The results were presented in the form of graphs and frequency tables. The study population had poor nutrition status as revealed by the high prevalence of overweight and obesity at 82.1%. Majority of the study participants had unhealthy dietary practices with intake of diets high in sugar, cholesterol, energy dense snacks and low in vitamins and minerals. Of the 134 respondent 79.1% had uncontrolled blood pressure. Low physical activity level was reported by most (63.0%) participants. Dietary practices were significantly associated with nutrition status. A positive significant relationship was found between dietary intake of carbohydrate ($r=0.683$, $p<0.001$) and cereals ($r=0.229$, $p=0.008$), and nutrition status. On the other hand a negative significant relationship was found between dietary intake of dark green vegetables ($r=-0.210$, $p=0.015$) and nutrition status. The predictors of being overweight or obese were determined to be dietary intake of carbohydrates, protein, meat, dark green vegetables and physical inactivity. Physical activity was significantly related with nutrition status at ($p<0.001$). The odds of being physical inactivity and obese in women was found to be 0.28 times while in men it was 3.50 times compared to physically active individuals. Based on these findings measures that would lead to better dietary practices and increased physical activity among hypertensive patients should be put in place for better hypertension management. The Ministry of Health and other agencies working in the sector for the control and management of hypertension may find the information collected in this study useful.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Uncontrolled hypertension is the primary cause of cardiovascular disease occurrence which in most cases lead to fatality worldwide (Kayima et al., 2013; Wang et al., 2013). According to WHO (2011), heart diseases are the second cause of death in Africa. Research data show 54% of stroke and 47% of coronary artery disease incidences globally are as a result of hypertension (Elperin et al., 2014; Musinguzi & Nuwaha, 2013). The management of hypertension in Africa remains a challenge due to limited resources. The prevalence of hypertension in Africa continues to increase while its control remains a challenge (Gaziano et al., 2009). According to Vijver (2014), most individuals in Kenya are unaware that they have the disease with research statistics indicating that in every ten people one has hypertension. According to Mohan et al. (2013), hypertension prevalence is expected to rise in the coming years with projections showing that by 2025 in Africa almost three out of every four people will have hypertension. The rising hypertension prevalence trend is linked to urbanisation that has led to changes in lifestyle, and longer life expectancy (Opie & Seedat, 2005).

Different factors have been identified as the main contributors of uncontrolled hypertension including sedentary lifestyle and poor dietary practices (Kayima et al., 2013; Nicol & Henein, 2010). Acharya & Chalise (2011) in their study on 100 hypertensive patients attending Tribhuvan University Teaching Hospital reported that most (89%) of hypertensive patients were non-vegetarians with 13% being alcoholic. The study also found that hypertensive patients never followed dietary advice and instead followed medication regimens. Antonio et al. (2006) observed that regular physical activity was

beneficial to hypertensive patients since it decreased blood pressure. The risk of cardiovascular diseases is lowered with optimal blood pressure (Mutua et al., 2014). For effective hypertension control understanding the factors that hinder achievement of optimal blood pressure levels is critical (Weber et al., 2014). Putting together this data, hypertension related complications may be avoided thus improving the quality of life for hypertensive patients and better intervention strategies being put in place.

Lifestyle modifications have been identified as preventive and management measures against hypertension (Gaziano et al., 2014; WHO, 2013). According to Alsairafi (2013), physical inactivity increases the risk of uncontrolled hypertension 8.34 times. Lifestyle modifications enhance antihypertensive drug efficacy and lower cardiovascular risk (Wilson et al., 2014). For individuals, health lifestyle modifications are beneficial in the control of blood pressure (Viera et al., 2008). Weight reduction, limited alcohol consumption, increased physical activity; dietary changes and reduction of salt intake have been identified as some of the lifestyle modification for optimal blood pressure (WHO, 2013). Hypertensive patients have challenges in including the lifestyle modifications in their day to day life (Hajjar et al., 2006). It is important to maintain optimal blood pressure levels in hypertensive patients to avoid damage of vital body organs. This can be achieved by lifestyle modification of improved diets, regular exercise for better nutrition status. However, there is paucity of data in Kenya on the relationship between dietary practices, physical activity and nutrition status among hypertensive patients. This study therefore may provide baseline data for a future intervention study and an insight on the relationship between this lifestyle factors and blood pressure control.

Among hypertensive patients worldwide, only 31% have optimal blood pressure levels (Vijver, 2014). The Kenya Stepwise Survey Report (2015) indicates the prevalence of uncontrolled hypertension among hypertensive patients in Kenya is at 24%. Many hypertensive patients regularly attend hospital due to health complications caused by the disease (Mutua et al., 2014). In Kiambu County rise in hypertension prevalence is observed. According to Ministry of Health Kenya, in 2012 Kiambu County was leading in the Country with hypertension cases being 126,754. Kiambu Hospital records indicate that the disease is ranked seventh and fifth in causing fatality and hospital admission. From the hospital records uncontrolled hypertension contributed to 193 hospital admissions and 27 deaths in 2011, and 328 hospital admissions and 40 deaths in 2012.

1.2 Problem Statement

The prevalence of hypertension in Kenya is expected to double by 2025; the disease remains a public concern with inadequate control (Vijver, 2014). The Government has put in place policies and strategies aimed at early screening and intervention for optimal blood pressure achievement among hypertensive patients. However, despite this efforts research findings have consistently revealed that uncontrolled hypertension prevalence is growing in Kenya. This shows that there is a problem and a gap that exists in achievement of optimal blood pressure levels among hypertensive patients in Kenya. This study therefore sought to fill this knowledge gap.

Intake of foods high in sugar, salt and physical inactivity has been linked to the growing hypertension prevalence in Kenya. Their exist insufficient knowledge on how this factors affect blood pressure level among hypertensive patients in Kenya. National Nutrition

Action Plan of 2012-2017 attributes insufficient hypertension control in Kenya to limited data & screening, lack of knowledge and financial handicaps to manage hypertension. In Kenya many studies have been done examining medication adherence and blood pressure control but none has attempted to focus on how lifestyle factors affect hypertension control. It was on this strength that this study aimed at documenting physical activity, dietary practices and nutrition status of hypertensive patients. The information generated in this study may contribute in the development of effective intervention strategies for optimal blood pressure achievement.

Hypertension has enormous effects on human life including significant morbidity and mortality in adult population (Mundan et al., 2013; Ogedegbe et al., 2013). According to Kenya Health Policy of 2012-2030, heart diseases contribute to significant number of sickness and death. The policy reported that in 2009 CVDs led to 60% of hospital admissions in Kenya. Hypertension will be a leading contributor to high disease burden in the country by 2030 causing major disability and even death (Kenya Health Policy of 2012-2030). Uncontrolled hypertension damages cells lining coronary vessels resulting in inflammation, vascular weakness and scarring, blood clots, blocked arteries and plaque formation (Ferdinand, 2008; Radhika et al., 2007). Prolonged periods of uncontrolled hypertension affect heart functions by weakening heart muscles and enlarging the heart which may lead to death (Farah et al., 2016; Low et al., 2015). Strategies to achieving optimal blood pressure will lower heart diseases occurrence (Mutua et al., 2014). However, trends in hypertension management do not show any reduction in hypertension related complications (Al-Ansary et al., 2013). To mitigate the current trends, continuous research to enhance an understanding of the factors affecting hypertension management is critical.

1.3 Purpose of the Study

This study sought to establish physical activity levels, dietary practices, nutrition status and their relationship to blood pressure among hypertensive patients attending Kiambu Hospital.

1.4 Objectives of the Study

The objectives of this study were to;

1. Establish the demographic and socio-economic characteristics of hypertensive patients attending Kiambu District Hospital.
2. Determine the physical activity level of hypertensive patients attending Kiambu District Hospital.
3. Establish the dietary practices of hypertensive patients attending Kiambu District Hospital.
4. Assess the nutrition status of hypertensive patients attending Kiambu District Hospital.
5. Determine blood pressure level of hypertensive patients attending Kiambu District Hospital.
6. Determine the relationships among physical activity, dietary practices and nutrition status, and blood pressure level among hypertensive patients attending Kiambu District Hospital.

1.5 Hypotheses of the Study

H₀₁: There is no significant relationship between demographic and socio-economic factors, dietary practices and nutrition status among hypertensive patients attending Kiambu District Hospital.

H₀₂: There is no significant relationship between physical activity and nutrition status among hypertensive patients attending Kiambu District Hospital.

H₀₃: There is no significant relationship between dietary practices and nutrition status among hypertensive patients attending Kiambu District Hospital.

H₀₄: There is no significant relationship between demographic and socio-economic factors, physical activity, dietary practices, nutrition status and blood pressure level among hypertensive patients attending Kiambu District Hospital.

1.6 Significance of the Study

Documentation of information on hypertension and factors associated with hypertension is vital. The information generated from this study may aid in putting in place interventions for optimal blood pressure maintenance thus reducing time spent in hospital visits and consequently improving productivity, longevity and quality of life. The Ministry of Health and other agencies working in the sector for the control and management of hypertension may find the information generated in this study useful. Findings from this study may address the lifestyle challenges faced by hypertensive patients henceforth lowering hypertension complications thus reducing the financial cost of managing hypertension. The research findings of the study will also contribute to academic knowledge in the field of nutrition and add to ongoing research efforts on hypertension.

1.7 Delimitation of the Study

The study was carried out at Kiambu District Hospital among hypertensive patients only. Hence the findings may be applicable to settings with similar characteristics.

1.8 Limitations of the Study

The study was cross sectional hence data gathered did not reflect the contribution on long term effects of identified parameters on blood pressure level. The study relied on self-reported information from the respondents which may have caused recall and social desirability bias.

1.9 Assumptions of the Study

The assumption of the study was that the hypertensive patients attending the hypertensive clinic were willing to participate in the study.

1.10 Conceptual Framework

The conceptual framework (Figure 1.1) identifies demographic and socio-economic status as influencers of dietary practices and physical activity level which when unhealthy result in poor nutritional status affecting hypertension control.

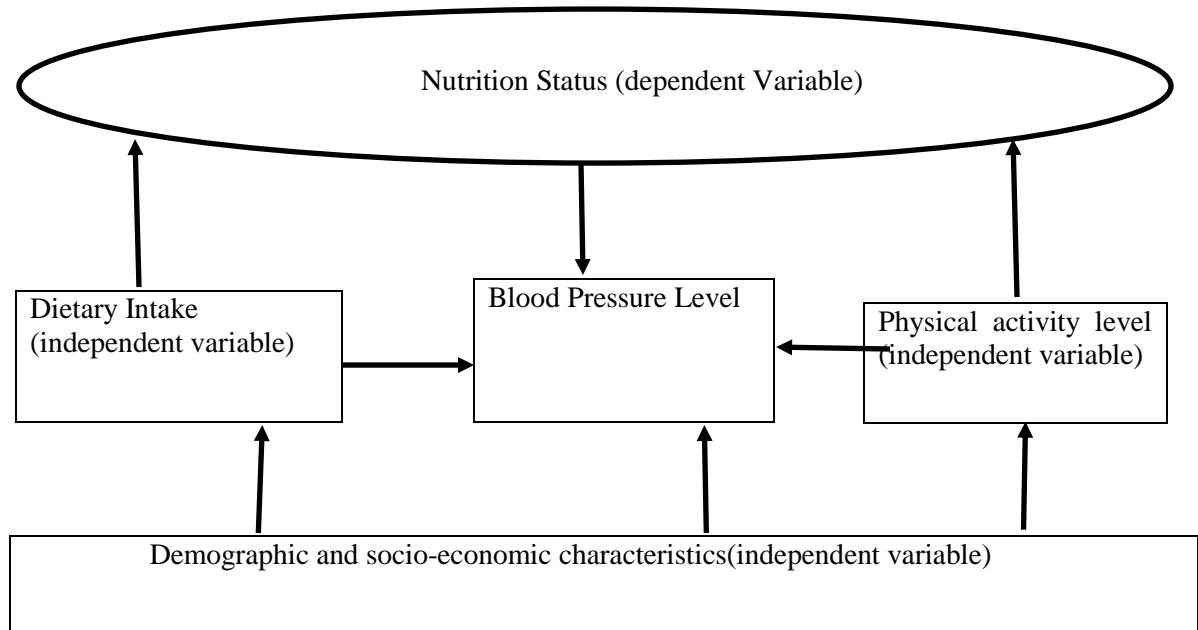


Figure 1.1 Conceptual framework on factors affecting hypertension control

Source: Adapted and modified from (WHO, 2013).

Demographic and socio-economic factors affect one's eating habits and physical activity engagement patterns. Physical inactivity and inappropriate dietary practices lead to obesity which increases the risk of uncontrolled hypertension (Yehia et al., 2015). Dietary intake of foods low in vitamins, minerals and high in sugar and fat affect nutrition status resulting in overweight and obesity hence increased blood pressure levels. Over consumption of processed foods that are energy dense with low dietary fiber has contributed to increased prevalence's of uncontrolled hypertensive cases (Nguyen et al., 2013). Sedentary lifestyle has been directly linked to increased risk of hypertension (Kearney et al., 2005). Physical inactivity in hypertensive patients has been associated to lack of time, safe places for recreation activities and expensive gyms (Weber et al., 2007). Demographic and economic factors of age, gender, education and health seeking behavior are also known to influence

nutrition status of an individual. In the study demographic and socio-economic characteristics directly affect physical activity level, dietary intake and practices. On the other hand unhealthy dietary intake, dietary practices and physical inactivity leads to onset of obesity and overweight a major contributor of uncontrolled hypertension.

CHAPTER TWO: LITERATURE REVIEW

2.1 Hypertension Overview

Hypertension accounts for 10% of health care spending globally (Campbell et al., 2015). It is a modifiable risk factor for renal disease and cardiovascular disease (Chataut et al., 2012). Hypertension is defined as a systolic blood pressure (SBP) greater than 140 mm Hg and a diastolic blood pressure (DBP) greater than 90 mm Hg based on the average of two or more correct blood pressure measurement taken by a health care provider (Weber et al., 2014). WHO (2000) has classified blood pressure as shown in Table 2.1.

Table 2.1 Classification of blood pressure

Category	Systolic (mmHg)	Diastolic (mmHg)
Normal	< 130	< 85
High Normal	130-139	85-89
Hypertension		
Stage 1 (mild)	140-159	90-99
Stage 2 (moderate)	160-179	100-109
Stage 3 (severe)	180-209	110-119
Stage 4 (very severe)	>210	>120

Source: (WHO, 2000)

According to Mills et al. (2016), in a review article on hypertension prevalence in 90 countries reported that by 2014, 31.1% and 31.5% of the world adult population had hypertension in high income countries and low income countries respectively. In Africa hypertension prevalence has been reported to be 46% of adult population (Nulu et al., 2016). A review article on hypertension prevalence by Kayima et al. (2013) reported 43.1% hypertension prevalence in adults in Kenya.

Upon onset of hypertension lifestyle modifications have been identified as appropriate intervention to control blood pressure (Al-Wehedy, 2014; Nicoll & Henein, 2010). Lifestyle modifications that aid in optimal blood pressure achievements include reduced dietary salt intake, healthy diets, increased physical activity and weight loss (De Rivas et al., 2010; O'donnell et al., 2015). De Rivas et al. (2010) in a study involving 375 hypertensive patients in Spain reported that many hypertensive patients never adopted the recommended lifestyle modifications despite their full awareness.

Physical activity interacts with blood pressure mechanism in several ways. Physical inactivity raises the risk of uncontrolled hypertension by increasing stimulation of sympathetic system and levels of plasma catecholamine that increase blood pressure level (Andersson et al., 2015). A study by Soroush (2013) in Sweden reported that physically inactive people were at a higher risk of uncontrolled blood pressure than active people. Lack of exercise contributes to weight gain which raises risk of blood pressure (Kearney et al., 2005). Physical activity has been reported to lower blood pressure level by 5-10 mmHg (Pradeepa, 2013). Another study by Börjesson et al. (2016) on relationship of physical activity and BMI reported a 5 mmHg decrease in blood pressure in hypertensive patients regularly engaging in exercise.

Obesity increases the risk of heart failure since excess weight raises cardiac output lowering peripheral resistance (Narkiewicz, 2006). Studies have indicated that the risk of developing hypertension independent of physical inactivity and unhealthy diets is increased 3 times in overweight people (Narkiewicz, 2006; WHO, 2017). Consumption of foods high in fat and sugar has been associated with increased prevalence of hypertension.

A study by Kearney et al. (2005) reported a reduction in blood pressure level following a 9% weight loss. Another study by Duman (2013) in Turkey found a decrease in blood pressure level following cessation of consumption of diets high in fat. It is important to sensitize hypertensive patients on the benefits of behaviour change and put in place measures that encourage adoption of healthy practices (Diaz & Shimbo, 2013). Hindrances to hypertension management including lack of knowledge and lack of motivation to adopt lifestyle changes remain a main concern in Kenya hence the need for the study.

Uncontrolled hypertension can result in several complications including blindness, memory loss, kidney and heart failure (Lemogoum, 2014). Majority of hypertensive patients develop stroke and die prematurely of heart and renal disease (Schmieder & Ruilope, 2008). The most appropriate predictor of heart disease event has been reported to be blood pressure level (Mehrabani et al., 2016). According to Cushman and Basile (2006), maintenance of optimal blood pressure significantly lowers cardiovascular disease risk. According to Benetos et al. (2013), blood pressure control level directly affects mortality and disease patterns of hypertensive patients. Hypertension is a major risk factor of kidney failure (Schmieder & Ruilope, 2008). Hypertension damages the kidneys by weakening and narrowing blood vessels affecting renal functions (Ferdinand, 2008). A study by Flack et al. (2010) reported that low socio-economic status and uncontrolled hypertension contribute to a significant number of kidney related mortality and morbidity. Hypertension complications present an economic burden to the nation in terms of increased hospital visits and non-productive workforce hence the justification of the study.

2.2. Blood Pressure Control among Hypertensive Patients

Several studies have reported unsatisfactory blood pressure control levels in hypertensive patients. According to Yoon et al. (2014) blood pressure control rate in Canada is at 30%. A study by Olomu et al. (2016) reported 32% blood pressure control rates among hypertensive individuals in the USA. Similar studies have been conducted in Africa. A 20.2% hypertension control rate was reported in Nigeria (Ekwunife et al., 2010). A study by James (2006) in Uganda found hypertension control rate of 27.3%. Achieng et al. (2009) reported a blood pressure control rate of 26% among hypertensive patients attending KNH, Kenya. A similar study at Nyeri Provincial General Hospital, Kenya revealed that hypertension control rate was 33.4% (Mutua et al., 2014). This control rate levels are very low compared to WHO recommendation of at least 50% (WHO, 2013). The reported sub-optimal blood pressure control rates have been blamed on economic transition that has resulted in unhealthy lifestyles (Mensah & Bakris, 2011; Musinguzi & Nuwaha, 2013). Failure to follow lifestyle recommendations of healthy diet and regular physical activity has been identified as a contributing factor to uncontrolled hypertension (Lemogoum, 2014; Weber, 2012). According to Rockwood & Howlett (2011) non-compliance is connected to low socio-economic status.

2.3 Demographic, Socio-economic Factors and Hypertension

Patients demographic and socio economic factors have been identified as appropriate predictors of hypertension control. Demographic and socio-economic factors affect health seeking behaviour, adherence to medicine regimens and day to day activities including dietary choices and physical activity engagements (Cushman & Basille, 2006; Sengul et

al., 2013). The mentioned factors play a role in hypertension onset and if not well addressed present a challenge in hypertension management (Wang & Vasani, 2005).

Increased hypertension prevalence in health populations has been observed with increased age (Cohen et al., 2012; Svetkey et al., 2005). Advanced age impairs the function of the heart by altering the vascular structure (Babiker et al., 2013; McEniery et al., 2007) leading to arterial stiffness that decreases buffering raising blood pressure (Hajjar et al., 2006; Rockwood & Howlett, 2011).

The number of clinic visits has been found to influence blood pressure level of hypertensive patients (Nakano et al., 2014; Redan, 2016). A study by Nakano et al. (2014) at Kansai Medical University Hirakata Hospital on 150 hypertensive patients found that sub optimal blood pressure was positively correlated to few clinic visits. A study by Shima et al. (2016) in Japan on 518 hypertensive patients reported that uncontrolled blood pressure was more evident with reduced outpatient visits. Another study by Guthmann et al. (2005) in USA found better BP control among hypertensive patients with increased hospital visits. A similar study by Song et al. (2015) in China on blood pressure variation upon hospital visits among 271 hypertensive patients found a relationship between blood pressure level and hospital visits. Song et al. (2015) reported that the patients who honoured their hospital appointments had better blood pressure control compared to those who did not. Hospital visit frequency by hypertensive patients is therefore vital since it is known that such patients are more informed on their dietary requirements, expected physical activity engagement and the need for optimal body weight (Fontil et al., 2015).

Achievement of optimal blood pressure levels by hypertensive patients requires medical follow up that comes with a cost including travel to honour hospital appointments, purchase of drugs and health foods (Sliwa et al., 2016). Patient's socio-economic status therefore greatly influences hypertension control (Paulsen et al., 2012). Education, occupation and income are some of socio-economic factors that affect nutrition status, physical activity level and health (Wang et al., 2013). In the past, hypertension was considered a disease of the affluent, but currently the poor are also affected. Due to rise in urbanisation the burden of lifestyle disease has also shifted to the poor since in most instances they lack the knowledge and finances to adopt to appropriate health lifestyles (Cai et al., 2017). According to Su et al. (2015) low socio-economic status contributes to uncontrolled hypertension. Su et al. (2015) reported that low education levels and house hold income is associated with overweight and obesity. A study by Wang et al. (2013) in China on factors associated with hypertension control established that access to health care is a major determinant of blood pressure control.

2.4 Dietary Practices and Hypertension

Dietary practices are influenced by demographic and socio-economic status, and environment (Perkovic et al., 2007). Many hypertensive patients have been found to have unhealthy dietary practices. A study by Suliburska et al. (2012) in Poland involving 308 hypertensive patients revealed that a majority of the patients consumed diets high in fat, low in fruits and vegetables and had inadequate physical activity. Ogedegbe et al. (2014) reported that most hypertensive patients had high dietary salt intake. In a study by Wyka et al. (2012) it was reported that development of heart diseases was connected to inadequate consumption of vitamin C, calcium and fibre. A study by Okwuoni et al. (2014) in Nigeria

involving 252 hypertensive patients found that 80% of the patients consumed unhealthy foods high in sodium, fat and low in dietary fibre. In addition, another study by Leon-Munoz et al. (2012) on dietary habits of hypertensive patients in Spain found that 60% of the patients were not following dietary recommendations. Findings from another study by Yehia et al. (2015) in Gaza on 120 hypertensive patients indicated that 65.1% of the patients never honoured dietary change advice in their food intake. The study further blamed the low levels of compliance to diet recommendations on patient's ignorance and socio-demographic factors.

According to Viera et al. (2008), dietary intake of high sodium diets contributes to 30% of hypertension cases. According to Edward and Farquhar (2015) excess dietary intake of salt affects heart functions by enlarging the left ventricular wall resulting in hypertrophy. A surge of sodium levels in the blood result in water retention which raises the degree of aldosterone a hormone associated with uncontrolled hypertension (Laatikainen et al., 2016; Perez & Chang, 2014). A reduction in salt intake by 1 gram (g) without any weight loss is reported to lower blood pressure by 2.63/1.72 mmHg (Karmacharya, 2015). Another study by O'Donnell et al. (2015) reported that lowering sodium intake by 1.76 g led to a 4.2/2.1 mmHg blood pressure reduction.

Potassium is a nutrient that regulates blood pressure by balancing out the negative effects of sodium. Deficiency in dietary potassium intake raises sodium levels in the blood resulting in fluid retention increasing blood pressure (Opie & Seedat, 2005). Potassium and calcium work together to regulate blood pressure, increased potassium and adequate calcium intake lowers blood pressure (Houston, 2011). Potassium aids in achievement of

optimal sodium levels in the cells (Houston, 2011; Opie & Seedat, 2005). According to Houston (2011) a daily dietary intake of 0.6 g of potassium lowers systolic blood pressure by 1.0 mmHg and diastolic blood pressure by 0.52 mmHg. Inadequate calcium intake has been found to increase blood pressure by constricting arteries due to excessive adrenal gland activity (Gupta & Guptha, 2010; Houston & Harper, 2008). According to Van-Mierlo et al. (2006) calcium supplementation lowers blood pressure.

Alcohol is another substance that influences blood pressure. The risk of heart disease is increased with alcohol overindulgence (Rehm et al., 2016). Alcohol increases blood pressure by raising triglycerides levels that activate the adrenergic nervous system in constricting blood vessels (Brill, 2011). The type of dietary fat consumed also influences blood pressure and nutrition status. Blood pressure is raised by excess consumption of saturated fats and transfats since they increase low density lipoproteins (Larstorp & Tonstad, 2016). Consequently a fatty plaque is formed that reduces arteries flexibility thus increasing blood pressure (Baumer, 2007; Hall et al., 2015). Carbohydrates can also influence blood pressure in that overconsumption of carbohydrates results in overproduction of insulin, a hormone that stimulates conversion of excess glucose to body fat resulting in overweight and obesity (Howard et al., 2008; Kayima et al., 2015).

Trace element zinc is important in nutrition status and blood pressure regulation. Deficiency in zinc intake raises blood pressure by altering salt taste resulting in additional dietary salt intake (Carpenter et al., 2013). Zinc affects the breakdown of macronutrients and also plays a role in appetite regulation (Payahoo et al., 2013). Inadequate dietary intake of zinc impairs glucose tolerance and causes obesity (Payahoo et al., 2013). Studies have

reported a negative relationship between zinc intake and serum leptin (Suliburska et al., 2014; Suarez-Varela et al., 2015). In the presence of obesity increased levels of leptin are produced which then raise blood pressure level by triggering sodium retention (Afridi et al., 2010). A study by Marcinek et al. (2015) reported a negative relationship between zinc intake and obesity. Another study by Mohammadzadeh & Zarghami (2013) also found a negative relationship between dietary zinc intake and obesity and observed that zinc had a role in glucose metabolism and insulin synthesis. Animal food sources including red meat, eggs and fish are the best sources of dietary zinc.

Dietary fiber plays a protective role in heart functions. β -glucan, the main soluble fiber component in dietary fibre lowers plasma cholesterol and triglyceride levels contributing to weight loss which in turn reduces blood pressure level (Pal and Radavelli, 2012). A study by Jiménez et al. (2008) on 34 hypertensive patients reported that antioxidant fiber lowered total cholesterol by 9% and decreased SBP and DBP by 6% and 5% respectively. Another study by Solà et al., in 2010, on hypercholesterolemia individuals reported that daily dietary fiber intake significantly lowered blood pressure level. A study by Lee et al. (2009) on overweight adults reported that ingestion of high fiber diet reduced SBP by 3 mm Hg in overweight men and women.

2.5 Nutrition Status and Hypertension

Obesity is known to impact cardiovascular health globally. An estimated 27% people in Kenya are overweight or obese (Stepwise, 2015). Obesity is associated with 16% stroke related deaths (Kowal et al., 2012). Overweight and obesity is related to uncontrolled hypertension. According to Alsairafi et al. (2013), 62% of hypertensive patients are either

overweight or obese. A study by Deji et al. (2014) on 340 hypertensive patients found that 78.2% were obese or overweight. Another study by Ijarotimi and Keshinro (2008) on 452 hypertensive patients found 50.3% were obese. A study by Achieng et al. (2009) on 783 hypertensive patients in Kenyatta National Hospital, Kenya found 78.4% of the patients to be obese. The study by Achieng et al. (2009) found that cardiovascular disease risk occurrence was 57.4% times more likely in obese hypertensive patients compared to patients of normal body weight. All the aforementioned studies concurred that blood pressure level is influenced by nutrition status.

Brill (2011) in a study in the USA reported that a 5% weight gain was associated with a 20% to 30% increase in the risk of being hypertensive. On the other hand, weight reduction has been found to lower blood pressure in obese people. A study by Wrobel et al. (2011) in USA on relation of physical activity and body weight, established that a 10 kilograms weight reduction among overweight and obese patients lowered blood pressure by 5 mm HG. Another study by Johnsen and Bekkelund (2014) on 250 hypertensive patients reported that weight loss lowers blood pressure. As demonstrated by the findings of these studies its critical to have in place strategies that aid in achievement of ideal body weight.

2.6. Physical Activity and Hypertension

Physical activity has potential positive effect on blood pressure; reduces depression risk and improves cognitive function in turn achieving optimal blood pressure levels in hypertensive patients (Naser et al., 2016; Roberts & Barnard, 2005). Regardless of physical activity benefits, inadequate physical activity engagement has been observed a situation that has been blamed on urbanization and industrialization (WHO, 2011). According to

WHO (2011), about a third of adults globally are physically inactive. Sedentary lifestyle is an independent risk factor for increased blood pressure, diabetes mellitus and heart diseases (Asgedom et al., 2016; Gordon-larsen et al., 2009). Sedentary lifestyle is associated with 30% cases of hypertension (Viera et al., 2008). Globally physical inactivity contributes to 1.9 million deaths yearly (WHO, 2011). Sedentary lifestyle jointly with high energy intake contributes to weight gain leading to obesity (Aziz, 2016; Naser et al., 2016). Most hypertensive patients are sedentary. A study by Okwuoni et al. (2014) found that 87% hypertensive patients had low physical activity levels. A study by Alsairafi et al. (2013) also reported that 75% of hypertensive patients were sedentary.

Regular engagement in physical activity lowers blood pressure by 15% independent of weight loss (Chase and Sui, 2009). A study by Bento (2015) reported that regular aerobic exercise lowered blood pressure in previously inactive individuals. Antonio et al. (2006) reported that regular exercise reduced SBP by 7.5 mmHG and DBP by 6.7 mmHG. In another study by Padilla (2005) it was reported that accumulated physical activity of 8 hours lowered SBP by 8.6 mmHG in hypertensive & pre- hypertensive adults. Regular physical activity improves blood pressure control in hypertensive patients (Grezzana et al., 2014; Martins et al., 2009). Aburto et al. (2013) reported a reduction of SBP in hypertensive patients who engaged in physical activity. A similar study by Vaziri et al. (2015) found that regular physical activity engagement lowered both SBP and DBP.

2.7 Relationship between Demographic and Socioeconomic Characteristics, Physical Activity, Dietary Practices and Nutrition Status of Hypertensive Patients.

Some study findings have reported no significant relationship between demographic, socio-economic factors and physical activity, dietary practices and nutrition status among hypertensive patients (Elbanna and Fouad, 2012; Ferra et al., 2012; Gupta et al., 2012). However other studies have reported the reverse, that there is an association between demographic, socio-economic factors and physical activity, dietary practices and nutrition status among hypertensive patients (Laxmaiah et al., 2015; Leng et al., 2015).

The study findings by Ijarotimi and Keshiro (2008) revealed a significant relationship between dietary intake, physical activity and BMI, and blood pressure level among hypertensive patients. Similar findings have been reported by (Dua et al., 2014; Gupta and Kapoor, 2010; Sharman et al., 2015) who observed that exercise, nutrition status influenced blood pressure levels. Papathanassiou et al. (2015) also reported a significant relationship between physical activity, nutrition status and blood pressure control. A study by Alhalaq et al. (2017) on 312 hypertensive patients found that as BMI increased blood pressure also increased. There is paucity of published research findings on the relationship between demographic and socioeconomic characteristics, physical activity, dietary practices and nutrition status of hypertensive outpatients in Kenya hence this study focused on their correlation.

2.8 Summary of Literature Review

In summary, the literature review has shown that hypertensive patients have sub-optimal blood pressure levels. Despite hypertension being a disease of global public health concern

its prevalence continues to grow. Current literature review confirmed the existence of complications arising from effects of uncontrolled hypertension. Uncontrolled hypertension was linked to physical inactivity, unhealthy dietary practices and poor nutrition status among hypertensive patients. In this study, literature review further revealed that there was limited data in Kenya in regard to demographic and socio-economic characteristics, dietary practices, physical activity and nutrition status of hypertensive patients. This study therefore sought to fill this knowledge gap.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

Cross-sectional analytical research design was adopted in this study to gather information on dietary practices, physical activity level and nutrition status. In cross-sectional type of research, design, data is collected at only one point in time (Mugenda & Mugenda, 1999).

3.2 Study Variables

Demographic & Socio-economic characteristics, dietary practices and physical activity level were the independent variables while nutrition status and hypertension status were the dependent variables.

3.3 Study Area

The study was carried out at Kiambu District Hospital in Kiambu County. Kiambu District Hospital is a referral hospital in the county that serves the neighbouring towns including Thika and Ruiru. The hospital was purposively sampled since it attends to a many patients offering both outpatient and inpatient services. The hospital has an outpatient hypertensive clinic. Bookings are done once weekly with an average of 30 hypertensive patients bookings.

3.4 Target Population

The target population was hypertensive out- patients aged between 18 years and above attending the outpatient clinic at Kiambu District Hospital. Studies have reported that people aged 18 years and above have the highest risk of uncontrolled blood pressure among hypertensive patients (Asgary et al., 2016; Dave et al., 2013; Pharm et al., 2016). The

identified patients were on regular medical checkups and follow up at the hospital based on their blood pressure levels.

3.4.1 Inclusion Criteria

Hypertensive patients on follow up at the hospital above 18 years of age and willing to participate in the study.

3.4.2 Exclusion Criteria

Hypertensive patients attending the hypertensive clinic for the first time, expectant women and those with health complications including diabetes, kidney and heart diseases were excluded from the study. Those patients who were unwilling to have a follow up at their homes for 24-hour recall data were excluded from the study.

3.5 Sample Size

The sample size was arrived at by use of Cochran (1963) formula $n = Z^2pq/e^2$ where n=the desired sample size, Z=the standard normal deviate at 95% confidence level (1.96), p=blood pressure control level among hypertensive patients, q=1-p and e = the desired level of precision (0.05). $(1.96)^2 (0.24) (0.74) / (0.05)^2 = 272$. Blood pressure control level in Kenya is reported to be 24% (Kenya Stepwise Survey Report, 2015). Finite population correction was then done to produce a sample size that is proportional to the population using the formula below since the population is less than 10,000:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Whereby, n_o = desired sample size, N = the estimate of the population size of hypertensive patients without health complications which is about 237 (Mutua et al., 2014).

$$= \frac{272}{1 + \frac{(272-1)}{237}} = 127$$

The sample size was 127 hypertensive patients from the calculations. A 10% of the sample was added to the sample to cater for non-response to make 140; however data collection was successfully carried out on 134 hypertensive patients.

3.6 Sampling Technique

Participants were identified by use of systematic sampling technique. Data collection was carried out for three months to obtain the sample size of 134. This was done by obtaining records of all hypertensive patients free of co morbid conditions who were expected to visit the medical outpatient clinic on the clinic day at the hospital. Respondents were then identified by dividing the estimated population size ($N= 237$) by the sample size ($n=140$) $237/140 = 2$. The first respondent was picked randomly and the subsequent patients at every second interval. The estimated number of patients who were expected to visit on the clinic day was 30 hence theoretically it was expected 15 patients would have been interviewed. This was not possible due to non-response and some patients not honouring their bookings hence an average of 12 patients were interviewed per week. This exercise was repeated on clinic days until the sample size of 134 patients was met. To ensure patients were interviewed only once, a record of the patient file number was entered in the questionnaire and the information shared with all the research assistants.

3.7 Research Instruments

A structured questionnaire (Appendix C) divided into different sections was used to collect data. Section A and B collected data on demographic and socio-economic characteristics. Section C of the questionnaire was used to collect anthropometric data of weight and height that determined nutrition status of respondents. Section D was used to collect blood pressure measurements. Section E and F were used to collect data on dietary practices and dietary intake respectively. This was done by use of a seven day food frequency questionnaire and 24-hour dietary recall as recommended by Shim et al. (2014). Section G of the questionnaire was used to gather data on physical activity level using the GPAQ (WHO, 2012).

3.8. Pre-testing of Instruments

To ensure accuracy the research instruments were pre-tested and adjustments were made. The pretesting was done at Ruiru Hospital by taking 10% (13 hypertensive patients) of the determined sample size of the population and administering the questionnaire to them. The hospital has similar characteristics to Kiambu Hospital in terms of hypertension management, care and patients attending the hospital in reference to their demographic and socio-economic attributes.

3.8.1. Reliability of Research Instrument

Test and retest method was used to establish consistency of the questionnaire in producing the same results. Interviews were done twice to the pre-test participants in a span of one week interval to ensure reliability. The interviews that were done twice included demographic and socio-economic characteristics, seven day food frequency questionnaire

and 24-hour dietary recall. The results that were obtained from both interviews were then compared and appropriate adjustments made on the questionnaire. Reliability was further improved by adequate training and supervision of research assistants this enabled them ask questions in a standard manner. Cronbach correlation formula was then used to determine the correlation coefficient, research instruments were then accepted since the coefficient was 0.81 (Murphy & Davidshofer, 2005).

3.8.2 Validity of Research Instrument

The research instruments were pretested to ascertain clarity of information. Standardization was then done on data collection and recommendations reflected in the final questionnaire. Research assistants engaged in the study were also trained to ensure standard procedures were used when gathering information. To ensure validity the procedures of the research process were strictly followed. Standard instruments that were already validated were also used an example the WHO GPAQ.

3.9 Recruitment and Training of Research Assistants

Prior to data collection, three research assistants were recruited and trained for three days on the study objectives, data collection tools and anthropometry measurement equipment's and the GPAQ in order for them to familiarize themselves with the study. The research assistants recruited had completed o-level education, were pursuing their diplomas in clinical nutrition and were fluent in both English and Kiswahili languages. The recruited research assistants were doing their internship at the hospital. They underwent training involving discussions, demonstration and practical exercises. They were also guided on how to administer the questionnaires and take the required measurements.

3.10 Data Collection Procedure

Prior to data collection the study objectives were explained to the participants by the researcher and research assistants. Only those respondents who gave informed consent of thumb print or signature were recruited to the study. The researcher and the research assistants administered the questionnaires and also took anthropometric measurements. Demographic and socio-economic data of age, marital status, parity, gender, household size, education level, monthly income and occupation was collected from respondents by the research assistants.

The 24-hour dietary recall, helped determine the nutrient intake. In the 24- hour dietary recall the respondent were asked what they consumed the previous day from morning to evening. Respondents were then requested to indicate the exact time the meals and snacks were consumed. Various measuring kitchen equipment's including cups, spoons, plates and glasses were used to estimate the amount of food consumed. This helped the respondents to give accurate measures of quantities of foods consumed. In addition, the researcher purchased fruits and vegetables that were in season to help respondents estimate portion sizes. Probing was done to help the participants remember what they consumed and to reveal details of ingredients and quantities of foods consumed.

Adequacy of dietary intake of the hypertensive patients was determined by use of a 24-hour dietary recall that was analyzed by use of nutrisurvey software. The Kenya food composition tables were incorporated in the nutrisurvey software to complement the South Africa food composition tables found in the software. The findings were then compared to RDA in accordance with gender requirements and physical activity level (WHO/FAO,

2003). Energy intake requirements are influenced by nature of physical activity an individual is engaged in (USDA, 2010). An average of the respondent's energy requirements was taken depending on the three levels of physical activity i.e. of sedentary, moderately active and active. The energy requirement for men was 2500 kcal and women 2,000 kcal. The nutrient intake of the respondents for the nutrients including carbohydrates, protein, fat, dietary fiber, cholesterol, saturated fatty acids, PUFA, MUFA, sodium, potassium, calcium and vitamin C was determined from the 24-hour dietary recall. Data from the 24-hour recall was input in the Nutrisurvey software that had both the South Africa and Kenya food composition tables. It was then analysed and means obtained of the specific nutrients and compared to RDA as recommended by FAO. Further analysis was done for comparison purposes by use of SPSS.

A seven day food frequency questionnaire that was based on 14 food groups was administered to aid in establishing the dietary practices of the respondents. Variety of foods from various food groups were read out to the study group who in turn stated the number of times they had consumed the foods in the preceding seven days and an average taken.

Individual dietary diversity score (IDDS) was used to determine the quality of diet for the hypertensive patients. IDDS is described as the number of food groups or food items consumed over a length of time (Jayawardena et al., 2013; Sanusi et al., 2010). Dietary diversity was determined from the 24-hour dietary recall, each food group consumed was assigned a point, and the total points calculated and classified based on fourteen food groups as recommended (FAO, 2011). The levels of classification were described as

follows high (10-14 food groups), medium (5-9 food groups) and low (1-4 food groups) (Sanusi et al., 2010).

The WHO (2012) GPAQ was used to determine the physical activity level. The questionnaire was found to be appropriate since it captures physical activity engagement in different settings of recreational activities, travel to and from places and activities at work. The questionnaire also captures the aspects of sedentary behaviour. The average physical activity level was described by use of metabolic equivalents (METs). METs are amount of oxygen consumed by an individual when sitting at rest (WHO, 2017). Physical activity was then classified into three levels according to WHO (2017) i.e. high (>6 METs), moderate (3-6 METs) and low (<3 METs).

Anthropometry data was collected by use of anthropometric parameters of height and weight followed by calculation of BMI. The respondents stood straight with minimum clothing with no shoes for the height to be taken using a stadiometer and a wooden head board. Height was measured to the nearest 0.5 centimetres using SECA 213 height metre board. A weighing machine SECA 704 calibrated to zero was used to measure weight recorded to the nearest 0.05 kilogram. The measurements were taken thrice and the average calculated. BMI was then categorized according to WHO body mass index cut off points, underweight (BMI<18.5), normal weight (BMI; 18.5–24.9), overweight (25–29.9) and obesity (BMI>30).

Data on blood pressure measurement reading of the previous visit and clinic day was collected from the medical records of the participants and recorded on the questionnaire.

An average was then calculated and blood pressure levels then categorized using WHO cut off points (Table 2.1).

3.11 Data Analysis and Presentation

Before data entry the filled questions were coded, checked and cleaned for consistency. The data was then entered into the computer for analysis. Statistical package for the social science (SPSS) version was used to analyze data from the 24- hour dietary recall, food frequency questionnaire, physical activity level, blood pressure level and anthropometry. Nutrisurvey software was used to calculate the nutrient content of the diet. Physical activity was categorized into high intensity, moderate intensity or sedentary levels (WHO, 2017).

Dietary practices, physical activity level, nutrition status, demographic and socio-economic characteristics of the study population were described by use of descriptive statistics. Some of the descriptive statistics used included frequencies, percentages, mean and standard deviation. To compare the relationship of men and women t-test was done. The variables of BMI, age, and individual dietary diversity score were subjected to the t-test. Chi square test was performed to determine the association between gender, marital status, occupation, income and dietary practices, and nutrition status. Pearson correlation coefficient test established the relationship between age, parity, monthly income and dietary practices, and nutrition status. Relationship between dietary intake of selected nutrients, food groups, individual dietary diversity score, physical activity and nutrition status was determined by use of Pearson correlation coefficient test. Predictors of obesity and odds of being obese were established by logistic regressions. A p-value of <0.05 was used as a criterion for

statistical significance. Data was then analysed and presented in the form of graphs, frequency tables and pie charts.

3.12 Logistical and Ethical Considerations

Research approval was sought from Kenyatta University Graduate School. Ethical clearance was obtained from Kenyatta University Ethical Review Committee. A research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Permission was also sought from Kiambu Hospital management to access the medical records of the patients. Respondents participated in the research based upon their informed consent and assurance of confidentiality by the researcher.

CHAPTER FOUR: RESULTS

4.1 Demographic and Socio-economic Characteristics of Hypertensive Patients

Majority (69.4%) of the respondents were women and only 30.6% were men. The age group with the largest number of respondents 38.8% was 50-57 years old. In this study it was observed that majority (60.4%) of the respondents were married with only 2.2% of the respondents being divorced or separated (Table 4.1). In regard to number of members in a household, 50.7% of the respondents came from households with 3 persons.

In this study the socio-economic characteristics of the respondents was determined by looking at education, occupation and monthly income levels of the respondents as indicated in Table 4.1. Education levels of respondents ranged from lack of formal education to tertiary education. A big proportion (47.0%) of the study participants had primary level education while a significant number (35.8%) of the respondents lacked formal education and only 17.2% had tertiary education. In regard to occupation most (41.0%) of the respondents were engaged in business and only 6.7% were in formal employment. Income levels varied with a majority (53.0%) of respondents having a monthly income of less than Kshs. 5,000 and only 6.0% had an income of more than Kshs. 20,000.

Table 4.1. Demographic & Socio-economic Characteristics of Respondents

	Male		Female		Total	
	n	%	n	%	n	%
Age in Years						
18-25	6	14.6	14	15.1	20	14.9
26-33	5	12.2	9	9.7	14	10.4
34-41	5	12.2	20	21.5	25	18.7
42-49	10	24.4	13	14.0	23	17.2
50-57	15	36.6	37	39.8	52	38.8
Marital status						
Married	32	78	49	52.7	81	60.4
Widowed	4	9.8	25	26.9	29	21.6
Single	5	12.2	16	17.2	21	15.7
Divorced/separated	0	0	3	3.2	3	2.2
Parity						
No children	9	22	18	19.4	27	20.1
1-3	10	24.3	20	21.5	30	22.4
4-6	14	34.1	43	46.2	57	42.5
7 and above	8	19.6	12	12.9	20	15.0
Education						
None	11	26.8	37	39.8	48	35.8
Primary	23	56.1	40	43.0	63	47.0
Tertiary	7	17.1	16	17.2	23	17.2
Occupation						
Business	17	41.5	38	40.9	55	41.0
Farmer	15	36.6	29	31.2	44	32.8
Casual laborer	8	19.5	6	6.5	14	10.4
Unemployed	6	14.6	32	34.4	38	28.4
Formal employment	4	9.8	5	5.4	9	6.7
Monthly Income (Kshs.)						
<5,000	18	43.9	53	57.0	71	53.0
5,001-10,000	14	34.1	18	19.4	32	23.9
10,001-15,000	3	7.3	11	11.8	14	10.4
15,001-20,000	2	4.9	7	7.5	9	6.7
> 20,001	4	9.8	4	4.3	8	6.0

4.2. Dietary Practices of Respondents

Dietary practices were assessed by use of a seven day food frequency questionnaire, nutrient adequacy by use of 24-hour dietary recall and diet quality by use of individual dietary diversity score.

4.2.1. Frequency of Consumption of Different Foods by Respondents

A seven day food frequency questionnaire was used to assess the dietary intake and practices of respondents and the results are presented in Table 4.2. The foods were grouped into 14 food groups as follows; cereals, oil and fat, milk and milk products, other fruits, other vegetables, legumes, nuts and seeds, dark green leafy vegetables, eggs, flesh meat, vitamin A rich fruits, white tubers, vitamin A rich vegetables and tubers, organ meat and fish. The findings of this study indicate cereals were consumed daily by all respondents. Foods that are essential for the provision of micronutrients were least consumed by the respondents. Dark green vegetables were being consumed 1-2 days in a week by (66.4%) of respondents. Vitamin A rich fruits, other fruits, vitamin A rich vegetables & tubers, organ meat, flesh meat and fish were rarely consumed by the respondents. Majority (75%) of the respondents consumed two meals a day while only 13% consumed one meal a day. Only (29.1%) of the respondents were consuming alcohol. The findings of this study indicate that most respondents consumed snacks that were high in sugar and fat content. Some of the frequently consumed snacks included cakes (57%), soft drinks (53%) and mandazi (47%) with few participants eating healthy snacks such as fruits (23%).

Table 4.2. Respondents Dietary Intake based on 7-day FFQ

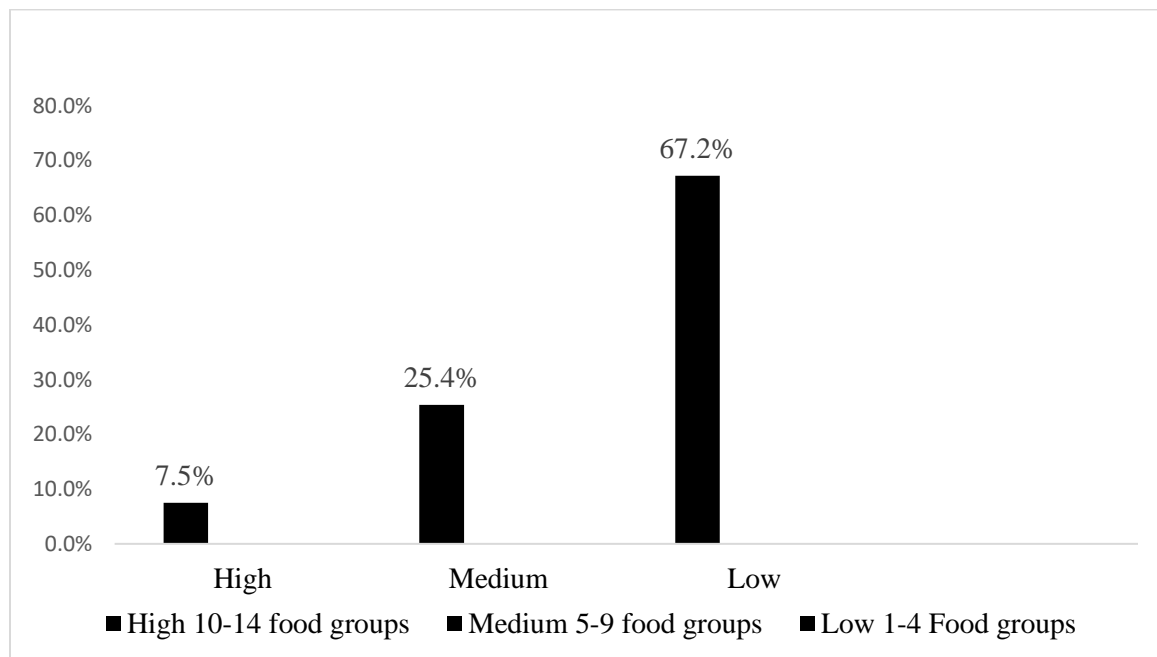
Food group	Frequency of consumption				
	Never	1-2 days	3-4 days	5-6 days	everyday
Cereals	0	0	0	0	134 (100.0)
Oil and fat	16 (11.9)	8 (6.0)	9 (6.7)	29 (21.6)	72 (53.7)
Milk and milk products	19 (14.2)	18 (13.4)	13 (9.7)	44 (32.8)	40 (29.9)
Other fruits	83 (53.0)	20 (14.9)	17 (12.7)	14 (10.4)	0
Other vegetables	58 (43.3)	41 (30.6)	16 (11.9)	0	19 (14.2)
Legumes, nuts and seeds	12 (9.0)	25 (18.7)	7 (5.2)	11 (8.2)	79 (59)
Dark green leafy vegetables	24 (17.9)	89 (66.4)	21 (15.7)	0	0
Eggs	103 (76.9)	24 (17.9)	0	0	7 (5.2)
Flesh meat	110 (82.1)	18 (13.4)	0	0	6 (4.5)
Vitamin A rich fruits	99 (73.9)	14 (10.4)	9 (6.7)	0	12 (9.0)
White tubers	74 (55.2)	57 (42.5)	0	0	3 (2.2)
Vitamin A rich vegetables & tubers	87 (64.9)	26 (19.4)	9 (6.7)	6 (4.5)	6 (4.5)
Organ meat (iron rich)	127 (94.8)	4 (3.0)	3 (2.2)	0	0
Fish	130 (97.0)	4 (3.0)	0	0	0

4.2.2 Dietary Diversity Score

In this study data from the 24-hour dietary recall was used to determine the IDDS and the results are presented in Table 4.3. Food groups were used to determine IDDS rather than food items since food groups have been established to be better predictors of diet quality (Mehrabani et al., 2016). Each food group consumed was assigned a point, the total points calculated and classified based on fourteen food groups as recommended (FAO, 2011). The most consumed food groups by the respondents in the last 24-hours were cereals (100%), oil and fat (88.8%), legumes, nuts and seeds (87.3%) and, milk and milk products (75.4%). Majority (67.20%) of the respondents had low dietary diversity score (Figure 4.1)

Table 4.3. Individual Dietary Diversity Score

Food Group	Consumption last 24-hours f (%)
Cereals	134 (100)
Oil and fat	119 (88.8)
Legumes, nuts and seeds	117 (87.3)
Milk and milk products	101 (75.4)
White tubers	67 (50.0)
Other vegetables	19 (14.2)
Vitamin A rich vegetables & tubers	17 (12.7)
Dark green leafy vegetables	13 (9.7)
Other fruits	12 (9.0)
Flesh meat	10 (7.5)
Vitamin A rich fruits	8 (6.0)
Organ meat (iron rich)	7 (5.2)
Eggs	2 (1.5)
Fish	1 (0.7)

**Figure 4.1. Dietary Diversity Score**

4.2.3 Dietary Intake Based on 24-hour Dietary Recall

Majority (40.4%) of the respondents consumed 2000 to 2500 kilocalories. Comparing intake by gender, most (63.4%) of the women were meeting their energy requirements cumulatively while only (21.9%) of the men were meeting their energy requirements. The total energy intake was about 99% of the RDA. The males were consuming more energy, fats and carbohydrates compared to the women though there was no significant difference in the consumption of the three nutrients between the two genders. Contribution of fat to caloric intake was slightly higher than the RDA (<30%) for both groups with men getting 31.6% of calories from fat while women obtained 31.1% of their calories from fat. The percent of calories intake from carbohydrates was 51.6% for men and 59.1% for women which was close to RDA of at least 60%. The intake of cholesterol and saturated fatty acids for both the men and women was above the RDA.

The percent of calories from protein for the men was 14.9% which was within the recommended value (10-15%) and 8.8% for the women which were slightly lower than the RDA of 10-15%. Following further probing it was evident that men preferred foods that were high in sugar and fat hence more caloric intake. The majority of the men preferred to eat ugali with eggs or red meat. It was also notable that most of the men drank soft drinks after their meals. The RDA for sodium, potassium, calcium and vitamin c was not met by the respondents. The males had conspicuously very low intake of potassium, calcium and vitamins C compared to the females. This resulted in poor dietary intakes with majority not meeting the RDA as recommended by WHO/FAO, 2003) of vitamins and minerals (Table 4.4).

Table 4.4. Respondent's estimated dietary intake based on 24-hour dietary recall

Nutrient	Male		Female	
	Mean	RDA	Mean	RDA
Carbohydrates (g)	329.2 ± 105.5		295.8 ± 39.8	
% of total KCal	52.6 %	60%	59.1 ± 61.3	60%
Fats	87.8 ± 9.9		69.3 ± 11.1	
% of total KCal	31.6	< 30%	31.1	< 30%
Protein (g)	93.7 ± 10.8	56	44 ± 8.5	46
% of total KCal	14.9	10-15 %	8.8	10-15 %
Total energy intake	2481.0 ± 304.5	2500	1982.9 ± 343.7	2000
Intake of KCal as % of RDA	99.2 ± 14.3		99.1 ± 14.6	
Dietary fiber (g)	28.6 ± 13.16	25	29.7 ± 13.57	30
Cholesterol (mg)	312.13 ± 221.04	< 200	405.18 ± 340.63	< 200
Saturated fatty acids (g)	17 ± 8.7	5-10	16.7 ± 8.5	5-10
PUFA (g)	11.51 ± 13.23		12.16 ± 10.06	
MUFA (g)	18.2 ± 13.4		18.1 ± 13.2	
Na (mg)	1085 ± 89.6	2300	1367 ± 660	2300
K (mg)	696 ± 15.6	2000	1216 ± 750	2000
Ca (mg)	163 ± 53.7	800	497.3 ± 306	800
Vitamin C (mg)	36.3 ± 33.4	75	38.7 ± 32.6	60

Energy intake	n	Male		Female		Total	
		n	%	n	%	n	%
<500	3	3	7.3	5	5.3	8	5.9
501-1000	7	7	17.0	6	6.5	13	9.7
1001-1500	4	4	9.7	13	14.0	17	12.6
1501-2000	16	16	39.0	14	15.0	30	22.5
2001-2500	9	9	21.9	45	48.4	54	40.4
> 2501	2	2	4.8	10	10.8	12	8.9

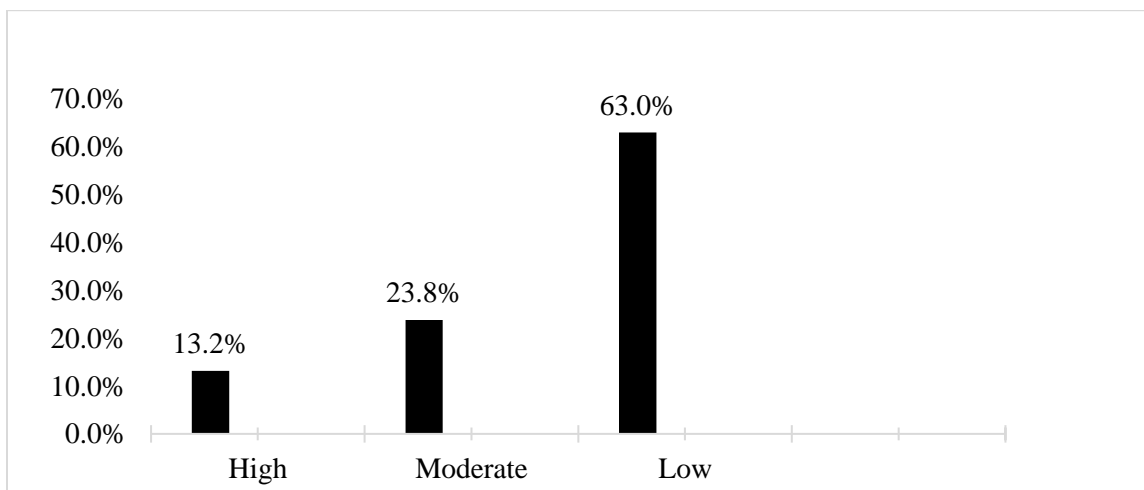
Majority of the respondents had adequate dietary intake of calories, proteins, carbohydrates and fat as per RDA. The RDA for dietary fiber and vitamin C was not met by both groups, with only 31.7% and 5.4% of the men and women respectively with adequate dietary fiber intake. Majority of the men 85.4% and women 81.7% were not meeting the RDA for vitamin C. Chi-square test revealed significant difference across gender in RDA for energy and vitamin C. More women than men had adequate intake of energy (p=0.014) and vitamin C (p=0.017) Table 4.5.

Table 4.5. Adequacy of Nutrient Intake

Nutrient Intake	Male Meeting RDA n (%)	Not meeting RDA n (%)	Female Meeting RDA n (%)	Not meeting RDA n (%)	Chi-square P-value
Energy (kcal)	29 (70.7)	12 (29.3)	82 (88.2)	11 (11.8)	0.014*
Protein (g)	40 (97.6)	1 (2.4)	92 (98.9)	1 (1.7)	0.549
Carbohydrates (g)	38 (92.7)	3 (7.3)	74 (71.6)	19 (20.4)	0.059
Dietary fiber (g)	13(31.7)	28 (68.3)	5 (5.4)	88 (94.6)	0.195
Fat (g)	23 (56.1)	18 (43.9)	63 (67.7)	30 (32.3)	0.917
Vitamin C (mg)	6 (14.6)	35 (85.4)	17 (18.3)	76 (81.7)	0.017*

4.3. Physical Activity Level

The WHO global physical activity questionnaire was used to assess physical activity level of the study population. The questionnaire collected data on type, frequency, duration and intensity of physical activity during work, transportation and leisure time of respondents. This study revealed that majority (63.0%) of the respondents had low levels of physical activity (Figure 4.2).

**Figure 4.2: Physical activity levels of respondents**

4.4. Nutrition Status of the Respondents

Nutrition status of the study subjects was determined by use of WHO (2004) BMI cut off points. The average BMI of the study respondents was 27.63 ± 1.12 . The study findings indicated that majority (59.0%) of the respondents were overweight, while 23.9% were obese (Figure 4.3).

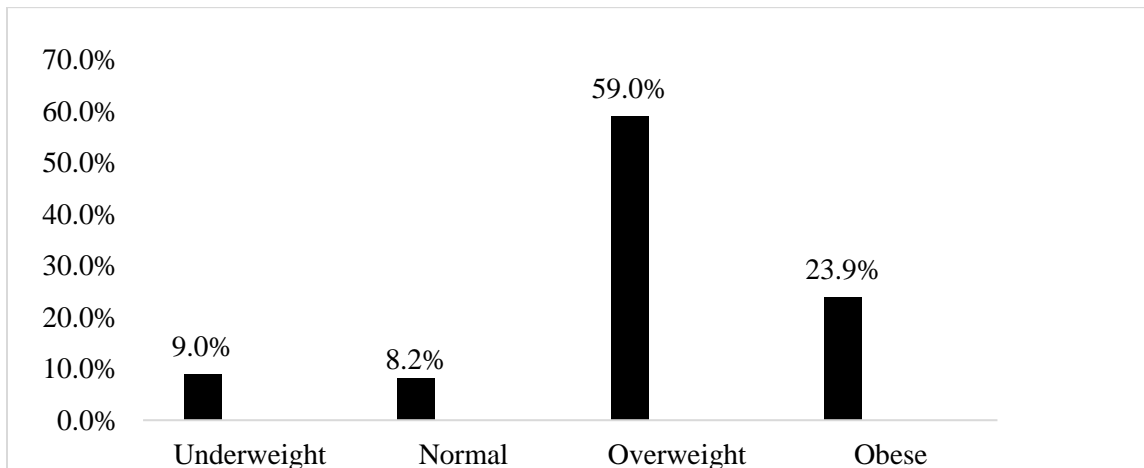


Figure 4.3: Nutrition status of respondents

4.5. Blood Pressure Level & Hypertensive Characteristics of Respondents

Approximately 79.1% of respondents had a SBP equal to or greater than 140 mmHg while 72.4% had a DBP equal to or greater than 90 mmHg (Table 4.6). Overall 76.1% of the respondents had been diagnosed with hypertension in less than 5 years with majority (64.2%) visiting the hypertensive clinic for the second time.

Table 4.6. Blood Pressure Level & Hypertensive Patients Characteristics

Hypertensive Characteristics						
Length of illness						
< 5 years	25	61.0	77	82.8	102	76.1
5-10 years	14	34.1	9	9.7	23	17.2
>10 years	2	4.9	7	7.5	9	6.7
No. of Clinic Visits						
2 times	27	65.9	59	63.4	86	64.2
3-4 times	8	19.5	19	20.4	27	20.1
>5 times	6	14.6	15	16.1	21	15.7
Systolic Blood Pressure						
< 140 mmHg	16	39.0	12	12.9	28	20.9
>=140 mmHg	25	61.0	81	87.1	106	79.1
Diastolic Blood Pressure						
< 90 mmHg	15	36.6	22	23.7	37	27.6
>=90 mmHg	26	63.4	71	76.3	97	72.4

4.6. Relationships among Physical Activity, Dietary Practices and Nutrition Status and Blood Pressure Level among Hypertensive Patients Attending Kiambu District Hospital.

4.6.1 Relationship between Nutrition Status, Dietary Practices, Blood Pressure and Demographic Characteristics

Chi square test revealed a significant association ($\chi^2 = 6.833$, $p = 0.032$) between gender and nutrition status, with more women than men being obese and overweight (Table 4.7).

Table 4.7: Respondents Relationship between Nutrition Status and Selected Demographic Characteristics

Demographic characteristic	Chi square test at $p < 0.05$		
	χ^2	P-value	df
BMI			
Marital status	10.759	0.293	9
Gender	6.833	0.032*	3
Dietary practices			
Marital status	1.961	0.923	6
Gender	4.384	0.112	2

In this study positive significant relationship ($r= 0.627$, $p=0.001$) was observed between age and nutrition status (Table 4.8). This meant that BMI increased with age. A negative significant relationship ($r=-0.772$, $p=0.028$) was observed between nutrition status and SBP (Table 4.8). When cross tabulation was done to compare BMI and age, the results showed that majority (33) of the overweight respondents were in the 50-57 years age group (Table 4.9). There was significant relationship ($p=0.032$) between mean BMI and gender with the male having a lower (27.95) BMI compared to the female 28.06 (Table 4.9).

Table 4.8: Relationship between selected variables using Pearson correlation test

Relationship	r	p- value
BMI and age	0.627**	0.001
BMI and parity	-0.125	0.150
BMI and monthly income	-0.020	0.821
BMI and SBP	-0.772*	0.028
BMI and DBP	0.444	0.849
BMI and No. of Hospital visits	-0.028	0.746

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Table 4.9: Comparison of BMI & Age

BMI	Age in Years					Total
	18-25	26-33	34-41	42-49	50-57	
Underweight	2	0	1	0	9	12
Normal	6	0	2	1	2	11
Overweight	8	11	12	15	33	79
Obese	4	3	6	5	14	32
Gender	n	Mean BMI	Significance			
Male	41	27.95±0.97	t _{89,253} =27.63, p= 0.032			
Female	93	28.06±0.73				

4.6.2 Association between Nutrition Status, Dietary Practices, Blood Pressure and Socio-Economic Characteristics

This study established a significant association between education, dietary practices and nutrition status. Respondents who had low education levels were found to consume foods high in fat and sugar compared to those who had higher education levels. Those with higher levels of education did less snacking compared to those with low levels of education. Chi-square test showed a significant association $p=0.022$ between education and nutrition status. Obesity and overweight was more prevalent in respondents who lacked formal education or had only primary school education (Table 4.10). In this study no significant relationship was found between BP level and socio-economic characteristics of education and income level.

Table 4.10: Association between BMI, Dietary Practices and Socio-Economic Characteristics

Socio-economic characteristic	Chi square test at $p<0.05$	χ^2
BMI		
Occupation	P=0.633 df =18	15.412
Education	P=0.022* df =6	14.831
Dietary practice		
Occupation	P=0.543 df =12	10.837
Education	P<0.001 df =6	12.765

4.6.3. Relationship between Dietary Practices and Nutrition Status

The mean IDDS of respondents in this study was 2.486 ± 0.62 . There was significant relationship between mean IDDS and gender with the female having a lower (2.51) dietary diversity score compared to the male 2.78 (Table 4.11).

Table 4.11. Relationship between IDDS and Gender

Gender	n	Mean IDDS	SD
Male	41	2.78	0.52
Female	93	2.51	0.65

$t_{94,130}=2.486, p= <0.001$

Comparing mean IDDS and BMI, many (57) of the overweight individuals had low IDDS though no significant relationship was observed between IDDS and BMI ($r=0.003$, $p=0.969$).

There was significant positive relationship ($r=0.683$, $p<0.001$) between the estimate amount of carbohydrates intake and nutrition status in that as dietary intake of carbohydrates increased BMI also increased (Table 4.12).

Table 4.12: Relationship between Dietary intake and BMI

	Men		Women		Total	
	<i>r</i>	<i>p</i> - value	<i>r</i>	<i>p</i> - value	<i>r</i>	<i>p</i> - value
Energy (kcal)	0.085	0.597	0.053	0.617	0.077	0.380
Carbohydrates(g)	0.596**	<0.001	0.394**	0.003	0.683**	<0.001
Fats (g)	0.173	0.280	-0.148	0.157	-0.023	0.791
Protein (g)	-0.299	0.058	-0.133	0.204	-0.210	0.065
Dietary fiber (g)	0.066	0.682	-0.186	0.074	-0.072	0.411
Cholesterol (mg)	0.134	0.402	-0.005	0.964	0.064	0.461

**Correlation is significant at the 0.01 level (2-tailed).

When Pearson test was conducted cereals were found to significantly influence nutrition status ($r=0.229$, $p=0.008$). A negative significant relationship was found between dietary intake of dark green leafy vegetables and BMI ($r=-0.210$, $p=0.015$) (Table 4.13).

Table 4.13: Relationship between Selected Food Groups and BMI

Food group	<i>r</i>	p-value
Legumes, nuts and seeds	0.059	0.498
Oil and fat	0.041	0.636
Milk and milk products	-0.064	0.464
Fruits	0.134	0.123
Dark green leafy vegetables	-0.210*	0.015
Cereals	0.229**	0.008
Meat	0.344	0.082
Relationship between IDDS and BMI	0.003	0.969

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

4.6.4 Relationship between Physical Activity and Nutrition Status

As shown in Table 4.14 a negative significant relationship was found between physical activity and nutrition status ($r=-0.356$, $p<0.001$).

Table 4.14: Relationship between Physical Activity and Nutrition Status

Physical Activity	<i>r</i>	p-value
Nutrition status	-0.356**	<0.001

**Correlation is significant at the 0.01 level (2-tailed).

Logistic regressions were performed to determine the odds of being overweight and obese; the logistic model explained 78.9% of the variance and correctly classified 89.6% of overweight and obese cases. This was done to explain physical inactivity as a risk factor for overweight and obesity. In women, the odds were that someone who was physically inactive was 0.28 times likely to be obese than the individuals who were physically active while in men, the odds were 3.50 times (Table 4.15).

Table 4.15. Respondent's odds of being obese

Gender	Factor	obesity Odd ratio	<0.05	P-value	% of prediction	R ²
Male	Physical inactivity	3.50	0.150, 0.940	0.036	89.6	78.9
Female	Physical inactivity	0.28	2.787, 27.107	0.000		

4.6.5 Predictors of Overweight and Obesity among Hypertensive Patients

To determine the relationship between dietary practices, physical activity and nutrition status multiple linear regression analysis was done. The independent variables were dietary intake and physical activity while dependent variable was body mass index. In the analysis the demographic and socio-economic characteristics were not included since they are known to influence both the dietary practices BMI and this would have given the wrong relationship. According to Falk and Miller (1992) a good R square value should be equal to or greater than 0.10, therefore the R² values that were less than 0.10 were not considered significant in the current study.

In this study predictors of overweight and obesity were established to be intake of carbohydrates, protein, meat, dark green leafy vegetables and physical activity. Consumption of little amounts of vegetables (R²= 0.252; p= 0.008) contributed to increased prevalence of obesity and overweight. An increase of physical activity led to a decrease in BMI by 0.469. Results summarised in table 4.16.

Table 4.16 Predictors of overweight and obesity (multiple regressions)

Predictor variable	β	Nutrition status	
		p	R ²
Dietary intake in the last 7 days			
Legumes nuts and seeds	0.272	0.809	0.074
Oil and fat	0.088	0.312	0.008
Milk and milk products	0.204	0.018	0.042
Fruits	0.138	0.112	0.019
Legumes nuts and seeds	0.078	0.372	0.006
Dark green leafy vegetables	-0.339	0.008*	0.252
Meat	0.384	0.000*	0.147
Physical activity	-0.469	0.000*	0.631
24-hour recall			
CHO	-0.714	0.000*	0.509
Fats	0.045	0.609	0.002
Protein	0.515	0.000*	0.265
Dietary fiber	-0.280	0.001*	0.078
Cholesterol	0.296	0.001*	0.087

*All of the models R2 were significant at (P<0.001)

4.7. Relationship between Physical Activity, Dietary Practices, Nutrition Status and Blood Pressure Level

The results on the relationship between physical activity, dietary practices and nutrition status are shown in Table 4.17. In this study a positive significant relationship ($r=0.231$, $p=0.014$) was observed between dietary intake of energy and BP level. This implied that BP rose with increased energy intake. There was a significant positive relationship ($r=0.199$, $p=0.021$) between frequency of cereals intake and BP level. Physical activity was found to be negatively correlated to blood pressure, as physical activity increased blood pressure level decreased ($r=-0.211$, $p=0.012$). When Pearson test was conducted BMI was found to significantly influence BP level ($r=0.194$, $p=0.025$).

Table 4.17. Relationship between Selected Variables and BP Level

Variable	<i>r</i>	p-value
Dietary Intake and BP Level		
Energy (kcal)	0.231*	0.014
Carbohydrates(g)	0.069	0.426
Fats (g)	0.080	0.355
Protein (g)	0.107	0.218
Dietary fiber (g)	-0.086	0.322
Cholesterol (mg)	0.161	0.363
Dietary Practice and BP Level		
Legumes, nuts and seeds	0.020	0.816
Oil and fat	0.112	0.196
Milk and milk products	0.006	0.945
Fruits	0.063	0.471
Dark green leafy vegetables	-0.114	0.191
Cereals	0.199*	0.021
Meat	0.026	0.766
BMI and BP Level	0.194*	0.025
Physical activity and BP Level	-0.211*	0.012

*Correlation is significant at the 0.05 level (2-tailed).

CHAPTER FIVE: DISCUSSION

5.1.1 Socio-demographic Characteristics of Hypertensive Patients

Age is both a risk factor for onset of hypertension and uncontrolled hypertension. In this study majority of the respondents were in the age group of 50-57 years. Blood pressure level increases with age (Eshkoor et al., 2016; Mungreiphy et al., 2011; Pinto, 2007). A study by Joubert and Bradshaw (2006) in South Africa reported that hypertension prevalence was high in populations aged 50 years and above. In the current study age was found to influence nutrition status establishing a trend of increased weight with age, findings that are in agreement with those reported by Babiker et al. (2013) in Sudan that linked weight gain to age. Another study by Mungreiphy et al. (2011) in India on association between BMI, blood pressure, and age reported that BMI increased with age. Sakhuja et al. (2014) in a study based in the USA reported a positive relationship between age, dietary practices and nutrition status.

Majority (69.4%) of the current study respondents were women. The dominance of females in this study is similar to a study by Joyner et al. (2016) in USA involving 310 hypertensive patients. Joyner et al. (2016) reported that 65.5% of the study population were women explaining that women tend to attend hospital more regularly compared to men. Research data on hypertension reveals that hypertension is more common in men than women before the age of 45 years (Boscatto, 2013; Doumas, 2013). However with the onset of menopause that is common after the age of 45 years, the prevalence of hypertension increases in women (Crawford & Jeffrey, 2005). A study on gender differences in hypertensive patients in India found that older females had significantly high blood pressure compared to the males (Ghosh et al., 2016). Reeves et al. (2008) in a review

article reported that the women had experienced heart disease related symptoms unlike the males. Another study involving 4,891 hypertensive patients reported that most women than men had previous history of hypertension prior to hospital visit (Dagenais et al., 2005). The current study found the prevalence of overweight and obesity to be more common in women than men which could largely be explained by the biological differences between them. Women are known to add more weight than men due to childbirth (Crawford & Jeffrey, 2005). In addition, the women were found to be more physically inactive than men.

Overall majority of the study participants came from households with 3 persons, majority were married and had 4-6 children. These findings are comparable with KNBS (2013) report that a majority of Kiambu households consist of 1-3 members. This study did not find any relationship between marital status and nutrition status, contrary to the findings by Morris et al. (2006) who reported that marital status influenced nutrition status. In contrast to previous reports (Ke et al., 2016; Méjean et al., 2010; Yang et al., 2016) that marital status determined dietary practices, this study found no significant relationship between marital status and dietary practices.

5.1.2 Socio-economic Characteristics of Hypertensive Patients

In the current study, education level was found to influence nutrition status. The current study findings in regard to education are consistent with previous reports that indicated that hypertension is more prevalent in individuals who are less educated (Kishore, 2016; Xiaojun & Xuerui, 2013). A study by Clausen et al. (2005) in Botswana found a significant relationship between education level and dietary practices.

The current study did not find an association between income, dietary practices and nutrition status. This finding is contrary to a previous study by Manasa et al. (2010) on hypertensive patients that found a significant relationship between income, dietary practices and nutrition status.

5.1.3 Physical Activity Level of Hypertensive Respondents

Physical inactivity has been linked to overweight, obesity and uncontrolled hypertension (Castro et al., 2015). Overall the current study population had low levels of physical activity with more women than men being physically inactive. These findings are in agreement with those of previous studies that found majority of female hypertensive patients to be physically inactive compared to male patients (Alsairafi et al., 2013; Okwuoni et al., 2014).

In the current study physical activity level was evaluated to determine its relationship with nutrition status and hypertension. In this study a statistically significant negative association was found between physical activity and nutrition status similar findings have been reported by (Hankinson et al., 2010; Pandey & Lamonte, 2017). A study by Burger et al. (2009) in Netherlands reported a relationship between BMI and physical activity in a hypertensive population of 130 patients. Abid (2014) in a study in Pakistan involving 179 hypertensive patients reported that physical inactivity resulted in obesity. Another study by Deji et al. (2014) on nutrition status of 124 hypertensive patients in Nigeria reported a relationship between physical activity and nutrition status. A similar study by Tesfaye et al. (2007) reported that physical inactivity led to raised blood pressure levels in

hypertensive patients. In addition the aforementioned authors reported that BMI increased with decreased physical activity level.

5.1.4 Dietary Practices of Hypertensive Respondents

The most consumed food group in this study was cereals (100.0%) which are comparable to a study by Torheim et al. (2010) that reported 99.7% of hypertensive patients consumed cereals. Sanusi et al. (2010) reported that 92.1% of a hypertensive population consumed cereals daily. A diet rich in cereals is known to hinder micronutrient absorption since it contains phytates (Suarez-Varela et al., 2015; Viera & Jameson, 2007).

Animal foods were consumed rarely by the respondents as evidenced by low consumption levels of organ meat and fish. Animal foods are sources of trace elements including zinc that have an antioxidant role (Brandes, 2014). Antioxidants improve endothelial function by binding free radicals that would otherwise cause organ damage (Brandes, 2014; Dharmashankar, 2010). Of concern in this study was the high consumption of plant foods which in most instances have high phytates content that bind micronutrient absorption.

In regard to snacks consumption, cakes and soft drinks were the most consumed while fruits were eaten by the minority of the respondents. This finding is comparable to Mehrabani et al. (2016) in Iran that reported majority of hypertensive patients were taking energy dense snacks. A similar study by Awosan et al. (2014) in Nigeria found that half of hypertensive patients were taking energy dense snacks such as carbonated drinks and cakes.

Dietary variety and the nature of foods consumed affect nutrition status of hypertensive patients. The mean IDDS obtained in this study was 2.49 which are lower than 3.58 reported by Mehrabani et al. (2016) in cardiac patients. In this study no significant relationship was found between IDDS and BMI. These finding is in contrast to a study by Vandevijvere et al. (2010) that reported a significant relationship between IDDS and BMI. A significant relationship was found between gender and IDDS which is consistent to research finding reported in a study by Zhang et al. (2017).

The main micronutrients known to influence blood pressure levels include sodium, potassium, calcium and vitamin C since they affect endothelial function that regulates vascular and renal function (Houston & Harper, 2008). A defective endothelial function causes vascular inflammation and high vascular oxidative stress increasing blood pressure (Brandes, 2014). This study therefore focused on the four micronutrients potassium, sodium, calcium and vitamin C.

The study population was not meeting the RDA for various minerals; sodium, potassium and calcium. More men than women had inadequate dietary intake of vitamins and minerals in this study a finding that contradicts reports by (Ijarotimi & Keshinro, 2008; Torheim et al., 2010) that indicated that micronutrient deficiency was common in women than men. Intake of high amounts of sodium in hypertensive patients has been found to raise blood pressure level. Large amounts of dietary sodium stimulate sympathetic nervous system leading to increased plasma insulin levels that raise blood pressure level due to sodium retention (Dharmashankar & Michael, 2010). The findings of the current study indicated that hypertensive patients were not meeting RDA of sodium which is in contrast

to report by (Perez & Chang, 2014) that reported high intake of sodium in hypertensive patients. Another study by Gonçalves et al. (2016) involving 112 hypertensive patients reported a correlation between sodium and hypertension prevalence. The low consumption of sodium in this study could be explained by the fact that respondents were receiving dietary advice hence had reduced their salt intakes. The low sodium intake could also be attributed to the fact that the respondents were not consuming salty snacks and processed foods.

Potassium balances the amount of sodium in the body preventing water retention hence optimal blood pressure (Mendez et al., 2006). According to Houston (2011) consumption of diets high in potassium lowers blood pressure level by inhibiting sodium reabsorption in proximal renal tubes. Aburto et al. (2013) reported that blood pressure level was significantly reduced in hypertensive patients on potassium supplementation. Respondent's potassium intake in this study was found to be below RDA. A study by Leon-Munoz et al. (2012) found that a hypertensive population was not meeting their RDA for potassium, calcium and vitamin C a finding consistent with the current study. Another study by Yehia et al. (2015) also reported a low intake of potassium, calcium and vitamin C among hypertensive patients.

Inadequate dietary intake of calcium increases adrenal gland activity resulting in muscle contractions raising blood pressure (Gupta & Guptha, 2010). Calcium works together with sodium for ionic balance of vascular membrane regulating blood pressure (Hall et al., 2015). Consumption of calcium by respondents in this study was very low. These finding is in agreement with past studies that found a majority of hypertensive patients were

consuming diets low in calcium. A study by Wyka et al. (2012) reported low calcium consumption amongst hypertensive patients. A study by Okwuoni et al. (2014) in Nigeria reported that hypertensive patients were not meeting their calcium RDA.

Optimal intake of dietary fiber is important to increase nutrient density, healthy lipid profiles and for normal gastrointestinal function (Block et al., 2008; Langsted et al., 2008). The sources of dietary fiber are plant based foods. In the current study respondents were rarely eating fruits and vegetables hence the observation that they were not meeting their vitamin C and dietary fiber RDA. Vitamin C has antioxidant properties and protects endothelial function by increasing intracellular concentrations of cells which raise bioactivity of nitric oxide lowering blood pressure (McNulty et al., 2007). Juraschek et al. (2012) reported that vitamin C lowers blood pressure. In the current study it was observed that respondents were not meeting their vitamin C RDA and more women than men had adequate dietary intake of vitamin C. Consumption of unhealthy diets high in sugar, salt, fat and physical inactivity are major contributing factors for poorly managed hypertension (Awosan, 2014). Fat intake of the current study population was slightly higher than the RDA, a finding that was similar to (Suliburska et al., 2012) who reported optimal fat intake among a Nigerian hypertensive population. In this study the respondents had a high RDA for dietary intake of cholesterol and saturated fatty acids. This finding could be explained by the fact that many of the respondents were consuming energy dense snacks.

In this study the respondents consuming alcohol were few, which is comparable to a finding by Kimuyu (2014) that found a majority of hypertensive patients were not taking alcohol. Dietary practices of hypertensive patients from the current study were established to be of

intake of foods high in sugar, low in vitamin and minerals. The most consumed foods were plant based including cereals, legumes, nuts and seeds while organ meat and fish were least consumed. From the findings it's evident that there is need for hypertensive patients to improve on their dietary intake.

5.1.5 Nutrition Status of Study Population

Nutrition status is important in hypertensive patients for maintenance of optimal blood pressure levels. Obesity affects the rennin-angiotensin aldosterone system increasing absorption of renal sodium which results in elevated blood pressure (John et al., 2006). Obesity is also known to cause insulin resistance leading to sodium retention (Abid, 2014; Landsberg et al., 2013). Sodium retention raises sympathetic nervous system activity leading to hypertension (Mishra et al., 2006). In this study, 82.9% of the respondents were both overweight and obese, a value comparable to the 78.4% reported by Achieng et al. (2009) on 783 hypertensive patients in Kenyatta National Hospital. A study by Diaz and Shimbo (2013) found that obesity was significantly more frequent in hypertensive individuals. The relationship between hypertension and obesity has been documented globally with (Lelong et al., 2015; Shook, 2016) reporting significant relationship between obesity and hypertension. Another study by (Haan et al., 2015) on 250 hypertensive patients reported a significant relationship between BMI and blood pressure levels. The aforementioned author also found a significant relationship between dietary habits and nutrition status. The predictors of obesity and overweight in this study were established to be dietary intake of carbohydrates, protein, meat, dark green leafy vegetables and physical activity.

Unlike in a study by Méjean et al. (2010) that reported a relationship between BMI, income and occupation the current study findings didn't link BMI to income levels and occupation. More women than men were obese and overweight in the current study a finding in agreement with Christensen et al. (2008) who found females to be more overweight and obese than males. A study by Czernichow et al. (2012) reported that women were more obese than men. The aforementioned author also reported that women were more prone to obesity due to their sedentary lifestyles.

5.1.6 Blood pressure Level & Hypertensive Characteristics of Respondents

Hypertensive patients have been found to have uncontrolled blood pressure levels (Achieng et al., 2009; Mutua et al., 2014). A study by Goverwa et al. (2014) involving 354 hypertensive patients in Zimbabwe reported a 32.8% blood pressure control rate. Another study by Lulebo et al. (2015) in Congo reported a 15.6% control rate. In the current study 79.1% of the respondents had uncontrolled blood pressure a value that is far above earlier reported rates. The reported high rate of uncontrolled blood pressure control could be explained by the patient's indication that they skipped medication on the day since they were attending clinic. These findings could also be further explained by the sedentary lifestyle and consumption of unhealthy foods of the respondents. The study population was consuming diets low in minerals and vitamins which largely explains the higher number of respondents who were overweight and obese and in turn with high blood pressure levels. Overall 76.1% of the respondents had been diagnosed with hypertension in less than 5 years with majority (64.2%) visiting the hypertensive clinic for the second time.

Health seeking behaviour affect blood pressure level in hypertensive individuals, patient's hospital visit patterns is important since this influences adherence to medication, dietary guidelines, and routine exercise (Das, 2013; Motlagh et al., 2016). A study by Das (2013) in India on 116 hypertensive patients reported that 66 respondents with good health seeking behaviour had normal blood pressure while 50 with poor health seeking behaviour had sub optimal blood pressure. Another study by Turchin et al. (2010) reported that patients who had honoured their monthly clinic had optimal blood pressure levels compared to those who did not. A study by Mcmanus et al. (2014) in UK on 552 hypertensive patients reported better blood pressure levels in patients with regular clinic visits. A study by Kawai et al. (2012) in Japan on 143 patients reported that patient's number of hospital visits was correlated to blood pressure. Another study by Yokota et al. (2013) found a significant relationship between clinic visits and hypertension control. In addition the aforementioned author reported that duration between clinic visits had a role in patient's behaviour in terms of dietary habits and physical activity engagement. Shima et al. (2016) reported a positive relationship between clinic visit frequency and hypertension control. He further observed that a patient with frequent hospital visits was more health conscious.

5.1.7. Relationship between Physical Activity, Dietary Practices, Nutrition Status and Blood Pressure Level

The first hypotheses that stated there is no significant relationship between demographic factors and socio-economic factors, dietary practices and nutrition status among hypertensive patients attending Kiambu District Hospital, was rejected since statistical test results showed education, age and gender was significantly associated with nutrition status.

The hypotheses that stated there is no significant relationship between physical activity level and nutrition status among hypertensive patients was rejected since a significant relationship was found between physical activity and nutrition status. The findings of this study demonstrated that hypertensive patients with low physical activity levels had a significant influence on odds of being overweight and obese.

Dietary practices and nutrition status were found to be significantly related hence the third hypothesis that stated there is no significant relationship between dietary practices and nutrition status among hypertensive patients was rejected.

The fourth hypothesis that stated there is no significant relationship between physical activity, dietary practices, nutrition status and blood pressure level was rejected since a positive significant relationship was observed between dietary intake of energy, cereals, BMI and BP level. Physical activity was found to be negatively correlated to blood pressure, as physical activity level increased blood pressure level decreased.

Conclusion can therefore be drawn that hypertensive patients at Kiambu District Hospital had low levels of physical activity, poor nutrition status and unhealthy dietary practises. In this study dietary intake of carbohydrates and cereals was correlated with increased BMI and BP while intake of dark green vegetables resulted in low BMI levels. Increase in physical activity engagement was found to lower blood pressure level in this study. The modification of dietary practices by hypertensive patients is important to prevent the risk of developing obesity and for the maintenance of optimal blood pressure levels. In this study the predictors of obesity were established to be dietary intake of carbohydrates,

protein, meat, dark green leafy vegetables. These results indicate the need to put in place measures that encourage increased vegetable consumption and engagement in physical activities, low protein, cereals, carbohydrate intake and better or wise food choices among hypertensive patients.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

This research was aimed at establishing the physical activity level, dietary practices, nutrition status and blood pressure level of hypertensive patients attending Kiambu District Hospital. This chapter summaries the objectives, methodology, major findings, conclusion and recommendations for further research.

6.1.1 Demographic and Socio-Economic Characteristics

In this study gender and age were found to be significantly associated with nutrition status. More women than men were obese while nutrition status deteriorated with advanced age. Parity and marital status were found to have no significant association with nutrition status. This study did not find any relationship between demographic factors and dietary practices.

The current study found a significant relationship between education, dietary practices, and BP and nutrition status. Respondents who had low education levels were found to consume energy dense snacks, foods high in fat and sugar compared to those who had higher education levels. Obesity and overweight were more prevalent in respondents who lacked formal education or had only primary school education. Patients with high BP had high BMI levels. Occupation and monthly income of respondents was found to have no influence on nutrition status, dietary practices and blood pressure level in this study. In this study no significant relationship was found between education and blood pressure level.

6.1.2 Physical Activity Level of Hypertensive Patients

Majority of the hypertensive patients had low levels of physical activity. The males had a higher level of physical activity compared to the females. This was mainly explained by the difference in nature of work between the two genders. Many of the males engaged in work that required physical effort while the women were engaged in work that required them to sit for long periods over the day.

6.1.3 Dietary Practices of Hypertensive Patients

Most of the study respondents had poor dietary intakes and practices. Majority of the respondents were not meeting the RDA for micronutrients. Dietary intake of calcium, potassium and vitamin C was inadequate as revealed by the seven day food frequency consumption questionnaire and 24-hour dietary recall. These micronutrients are known to influence blood pressure levels. Overall the study population was found to be consuming diets high in sugar, cholesterol and saturated fatty acids while carbohydrates and energy intake was within the RDA.

6.1.4 Nutrition Status of Hypertensive Patients

Body mass index measurements revealed that majority of the study participants were overweight and obese. The prevalence of overweight and obesity was also found to be more common in women than in men. The study found that education, age, gender, dietary practices and physical activity level influenced BMI. On the other hand the study did not link BMI to income level and occupation. A significant relationship between dietary intake of various nutrients and nutrition status was established in the study. The amount of energy, cholesterol, fat, dietary fiber and protein, and IDDS were not significantly related to BMI.

However there was a significant relationship between the frequency of carbohydrates intake and nutrition status. Consumption of dark green vegetables and cereals were found to influence BMI in this study. The predictors of being overweight or obese in this study were established to be high dietary intake of carbohydrates, protein and meat, low intake of dark green vegetables and physical inactivity.

6.1.5 Blood Pressure Level of Hypertensive Patients

Majority of the respondents in the current study had sub optimal blood pressure level. The consumption of cereals and energy giving foods were found to influence blood pressure level in this study. Physical activity was found to be negatively correlated to blood pressure in this study.

6.2 Conclusion

In this study foods of plant origin were most consumed with cereals being consumed by all the respondents. Majority of the respondents had low IDDS. From BMI measures in the current study most of the respondents were found to be overweight. The RDA for sodium, calcium and Vitamin C was not being met by majority of the hypertensive patients. Dietary intake of saturated fatty acids and cholesterol was above the RDA. Majority of the respondents in this study had low levels of physical activity and had high levels of uncontrolled hypertension.

In this study BMI was influenced by age, gender, education level, physical activity level and dietary intake. In the current study various factors were found to influence blood pressure level of hypertensive patients. Blood pressure level increased with increased BMI.

Increased dietary intake of energy and cereals also led to an increase in BP level. Significant negative relationship was found between physical activity and blood pressure level. In conclusion therefore demographic and socio economic characteristics, dietary practices, physical activity influence nutrition status and blood pressure level of hypertensive patients.

6.3 Recommendations

To overcome demographic and socio-economic barriers to hypertension management there is need for health professionals to consider involving patients in recommendations for ease of adoption. A patient that is aware of hypertension complications is more likely to modify their lifestyle compared to one without knowledge. The Ministry of Health may consider developing targeted health education programmes for hypertensive patients. Relevant government agents may develop interventions considering diverse demographic and socioeconomic status of hypertensive patients for better hypertension management.

Health professionals should encourage hypertensive patients to engage in physical activity with special attention being drawn on the influence of physical activity to nutrition status and blood pressure level. In the current study inadequate consumption of minerals and vitamins was observed. Reinforcing the need for healthy dietary intake and strategies for having it as a reality for hypertensive patients is crucial. The need to emphasize reduced dietary intake of carbohydrates, protein and increased consumption of fruits and vegetables, foods that are rich in micronutrients and dietary fiber is important. In this light, the role of health professionals in providing adequate dietary advice to hypertensive patients is well captured.

High prevalence of overweight and obesity was observed in the current study. A range of factors were found to influence nutrition status including demographic, socio-economic, physical activity patterns, both dietary practices and dietary intake. This indicates the urgent need for hypertensive patient's behavior overhaul to increased physical activity engagement and healthy dietary intake. Health professionals should consider early nutrition screening of hypertensive patients to prevent overweight and obesity.

6.3.1 Recommendations for Policy

Policies that aim at encouraging lifestyle modification by hypertensive individuals should be developed by relevant government ministries. Interventions policies for lifestyle modification among hypertensive patients that involve the various stakeholders including patients and health professionals should be put in place by the government. By doing this demographic and socio-economic disparities that hinder intake of quality diets and physical activity engagement in hypertensive patients will be reduced. Nutritionists should consider early nutrition screening of hypertensive patients attending the hospital this will help correct nutrition problems at an early stage.

6.3.2 Recommendations for Practice

Food choices are not only determined by personal preference but by other factors that include education level and nutrition status. The need to address the barrier to health dietary intake addressing the various factors influencing food choices is important for health professionals. This would aid in achievement of ideal nutrition status hence controlled hypertension. The current study observed disparities in nutrition status across gender therefore there is need for relevant government ministries to design education programmes

that are gender sensitive for improved outcomes. Combined factors were found to influence blood pressure level including physical activity, nutrition status and dietary practices. There is therefore need to put interventions that address these factors holistically. Hypertensive patients should be encouraged to engage in physical activity. This could be done by education programmes/health talks informing the patients of the benefits physical activity would have on their health. The health talks could be incorporated in the nutrition screening process by the hospital nutritionists.

6.3.3 Recommendations for Further Research

Studies should be conducted to determine the nutrition knowledge of hypertensive patients and determinants of their lifestyle behaviours. This would help in developing strategies that address barriers to healthy diets and physical activity. The study could be replicated in a larger hospital in Kenya and comparison done with the current study findings to determine if the same factors influence nutrition status among hypertensive patients. This would further aid in establishing the factors that contribute to uncontrolled hypertension. A similar study with lipid profiling of hypertensive patients could be done to determine how body fat distribution relates to dietary practices. A study with a wider range of micronutrients rather than the mentioned could be conducted to determine their influence on nutrition status.

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APPENDIX A: LETTER OF INTRODUCTION

Introduction

Dear Participants,

My name is Mbijiwe, Jane Gatwiri a postgraduate student at Kenyatta University pursuing a Master of Science Degree in Food, Nutrition and Dietetics. My study is titled 'Physical activity, dietary practices and nutrition status among hypertensive patients attending Kiambu District Hospital, Kiambu County, Kenya.

Purpose of the study

The purpose of this study is to establish the demographic and socio-economic characteristics, determine physical activity level, establish dietary practices and assess nutrition status of hypertensive patients attending Kiambu District Hospital. In addition, the study will establish whether a relationship exists between physical activity level, dietary practices and nutrition status.

Data collection procedures

A questionnaire will be administered to you where you will provide information on your demographic and social economic characteristics, 24 hour dietary recall where you will indicate the food you consumed the previous day and a seven day food frequency questionnaire. Your blood pressure measurements will be obtained from your medical records. Your nutrition status will be determined by anthropometric measures of weight and height. Remember all the information you provide will be confidential and you are free to ask any arising question. Participation is entirely voluntary and if at any point you don't wish to continue, you are free to withdraw.

Discomfort and Risks

The data collection procedures in this study pose no health risk but in case you experience any discomfort kindly inform the Research Assistant.

Benefits

The study will be beneficial to you since you will get to know your physical activity & dietary practices level and nutrition status. You will henceforth be advised accordingly on lifestyle modifications that will enable you to manage hypertension.

Confidentiality

Confidentiality will be strictly observed since the questionnaire will have a code hence your name will not appear anyway. Data gathered will be used for research purposes only.

Participation

Participation is entirely voluntary and if at any point you don't wish to continue, you are free to withdraw. Your honesty in answering the research questions will however, be appreciated and of benefit to the study.

Contact information.

If you have any question you may contact

Dr. Peter Chege on 0722642356 or

Dr. Ann Munyaka on 0712108087/ 0733850618 or

Kenyatta University Ethical Review Committee on kuerc@ku.ac.ke.

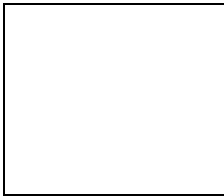
APPENDIX B: INFORMED CONSENT

Participant's statement

Kindly indicate your willingness to participate in this study.

Yes. ----- No. -----

Signature-----Date-----



Thumb print

Investigator's statement

I, the undersigned, have explained to the participant in a language he/she understands procedures to be followed, benefits and risks involved in the study

.

Name of interviewer-----

Interviewers signature

Date

APPENDIX C: QUESTIONNAIRE**ADMINISTRATIVE DETAILS**

Questionnaire Code. NO.....

Patient personal file NO.....

Name of interviewer.....

Date of interview..... Time started..... Time ended.....

Questionnaire checked by.....

Part A. Demographic characteristics

1. Age of respondent: -----

2. Marital status:

1. Married ()

2. Widowed ()

3. Divorced/separated ()

4. Single ()

3. Do you have children?

1. Yes ()

2. No ()

If yes indicate the number of children you have_____

4. Sex

1. Male ()

2. Female ()

5. How many people live in your house? -----

6. When were you diagnosed with hypertension?

- 1. Less than one year ago ()
- 2. One year ago ()
- 3. Two years ago ()
- 4. Three years ago ()
- 5. Four years ago ()
- 6. five years ago ()
- 7. More than five years ago ()

7. Kindly indicate the number of times you have visited the hypertensive clinic-----

8. Do you consume alcohol?

- 1. Yes ()
- 2. No ()

9. Do you skip your hypertension medication

- 1. Yes ()
- 2. No ()

10. If yes kindly indicate the reasons.....

Part B. Social –economic characteristics

11. Highest Education level of respondent

- 1. None ()
- 2. Primary ()
- 3. Secondary ()
- 4. College ()

Any other specify-----

12. Indicate your occupation? *(Tick ALL applicable responses)*

1. Unemployed ()
2. Business ()
3. Farmer()
4. Casual labourer ()
5. Formal employment ()

13. Kindly indicate your monthly income in Kshs.-----

Part C. Assessment of nutrition status

i. Anthropometric measurements

Measurement	Reading 1	Reading 2	Reading 3	Average
Height (m ²)				
Weight KGs				
Body mass index = weight in kilograms/ height in meters squared				

Part D. Blood pressure measurements (medical records)

	Previous clinic visit reading	Clinic day visit reading
Systolic blood pressure reading		
Diastolic blood pressure reading		

Part F. Seven day food frequency questionnaire

Indicate by ticking the most suitable response.

Food group	Example of food	Quantity	Number of times consumed in the last seven days
Cereals	Grain food like; Ugali, porridge, millet, sorghum, bread, biscuits		
Vitamin A rich vegetables and tubers	Sweet potatoes, carrots and pumpkins		
Dark green vegetables	Managu, terere, spinach, sukumawiki, pumpkin leaves		
Other vegetables	Eggplant, onions, tomatoes		
White tubers and roots	Green bananas, cassava		
Vitamin A rich fruits	Pawpaw, mangoes		
Other fruits	Oranges, pineapple, bananas		
Organ meat (iron Rich)	Liver, kidney, heart		
Eggs	eggs		
Fish	Tilapia, Nile perch, omena		
Flesh meat	Beef, pork, chicken, goat		
Legumes, nuts and seeds	Beans, lentils, macadamia, cashew nuts, peanut		
Milk and milk products	Yoghurt, cheese, fermented milk (lala)		
Oil and fat	Kimbo, kasuku, elianto, olive oil		
Kindly list the snacks you consumed over the week			

Part G. : Physical activity level

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

1. Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like [*carrying or lifting heavy loads, digging or construction work*] for at least 10 minutes continuously?

(Please circle the most appropriate response) **If no go to Q 4**

1. Yes ()

2. No ()

2. In a typical week, on how many days do you do vigorous-intensity activities as part of your work? Number of days -----

1. I don't engage in vigorous-intensity activities ()

2. I don't know ()

3. How much time do you spend doing vigorous-intensity activities at work on a typical day?

1. Minutes ()

3. Hours ()

4. I don't know ()

4. Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking [*or carrying light loads*] for at least 10 minutes continuously?) **If no go to Q 7**

1. Yes ()

2. No ()

3. I don't know ()

5. In a typical week, on how many days do you do moderate-intensity activities as part of your work? Number of days -----

1. I don't engage in moderate -intensity activities ()

2. I don't know ()

6. How much time do you spend doing moderate-intensity activities at work on a typical day?

1. Minutes ()

2. Hours ()

3. I don't know ()

Travel to and from places

The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship.

7. Do you walk or use a bicycle (*pedal cycle*) for at least 10 minutes continuously to get to and from places?) **If no go to Q 9**

1. Yes ()

2. No ()

8. In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places? Number of days-----

I don't walk ()

9. Do you do any vigorous-intensity sports, fitness or recreational (*leisure*) activities that cause large increases in breathing or heart rate like [*running or football*] for at least 10 minutes continuously? **If no go to Q 12**

1. Yes ()

2. No ()

10. In a typical week on how many days do you do vigorous-intensity sports, fitness or recreational activities? Number of days-----

I don't engage in recreational activities ()

11. How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a **typical day**?

- 1. Minutes ()
- 2. Hours ()
- 3. No time ()

12. Do you do any moderate-intensity sports, fitness or recreational (*leisure*) activities that causes a small increase in breathing or heart rate such as brisk walking (*cycling, swimming, volleyball*) for at least 10 minutes continuously?) **If no go to Q 14**

- 1. Yes ()
- 2. No ()

13. In a **typical week**, on how many days do you do moderate-intensity sports, fitness or recreational (*leisure*) activities? Number of days -----

- 1. I don't engage in moderate recreational activities ()

14. How much time do you spend doing moderate-intensity sports, fitness or recreational (*leisure*) activities on a **typical day**?

- 1. Minutes ()
- 2. Hours ()
- 3. No time ()

Sedentary behaviour

The following question is about sitting or reclining at work, home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping.

15. How much time do you usually spend sitting or reclining on a **typical day**?

1. Minutes ()

2. Hours ()

3. No time ()

**APPENDIX D: APPROVAL OF RESEARCH PROPOSAL
(GRADUATE SCHOOL)**



**KENYATTA UNIVERSITY
GRADUATE SCHOOL**

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

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School

DATE: 29th October, 2015

TO: Mbijwe Jane Gatwiri
C/o Food, Nutrition & Dietetics Department
Kenyatta University

REF: H60/CE/24381/10

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting of 14th October 2015, approved your Research Proposal for the M.Sc. Degree Entitled, "Physical Activity, Dietary Practices and Nutritional Status of Hypertensive Patients Attending Kiambu District Hospital, Kiambu County, Kenya".

You may now proceed with your data collection, subject to clearance with the Office of Director, Ethical Committee, Kenyatta University.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision tracking Forms per semester. The form has been developed to replace the progress report forms. The supervision Tracking forms are available at the University's Website under Graduate school webpage downloads.

Thank you.


ANNBELL MWANIKI
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Department of Food, Nutrition and Dietetics
Supervisors:

1. Dr. Peter Chege
C/o Department of Food, Nutrition & Dietetics
Kenyatta University
2. Dr. Ann Muniyaka
C/o Department of Food, Nutrition & Dietetics
Kenyatta University

AM/m

APPENDIX E: ETHICAL CLEARANCE



**KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE**

Email: chairman.kuerc@ku.ac.ke
secretary.kuerc@ku.ac.ke
 P.O. Box 43844 - 00100 Nairobi
 Tel: 5710901/12
 Fax: 5711242/8711875
 Website: www.ku.ac.ke

Our Ref: KU/R/COMM/51/607 Date: 18th January, 2016

Mbiye Jane Gatwiri,
 Kenyatta University,
 P.O Box 43844-00100,
 Nairobi

Dear Gatwiri,

RE APPLICATION NUMBER FKU/444/1349 – "PHYSICAL ACTIVITY, DIETARY PRACTICES AND NUTRITIONAL STATUS OF HYPERTENSIVE PATIENTS ATTENDING KIAMBU DISTRICT HOSPITAL, KIAMBU COUNTY, KENYA"

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic "Physical Activity, dietary practices and nutritional status of hypertensive patients attending Kiambu District Hospital, Kiambu County, Kenya" received on 11th November, 2015.

2. APPLICANT
Mbiye Jane Gatwiri, Department of Food, Nutrition and Dietetics

3. STUDY SITE
Kiambu District Hospital, Kenya.

4. DECISION
The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (Section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines AND APPROVED that the research may proceed for a period of ONE year from 18th January, 2016.

5. ADVICE/CONDITIONS

- i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
- ii. Serious and unexpected adverse events related to the conduct of the study are reported to this board immediately they occur.
- iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
- iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.




DR. TITUS KAHIGA
CHAIRMAN ETHICS REVIEW COMMITTEE

I, Jane Gatwiri.....accept the advice given and will fulfill the conditions therein.

Signature: JG..... Dated this day of 25th January..... 2016.

cc: Vice-Chancellor
DVC-Research Innovation and outreach

APPENDIX F: RESEARCH AUTHORIZATION (NACOSTI)



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318349
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Uthmaniyah
Uhuru Highway
P.O. Box 30023-00100
NAIROBI-KENYA

Ref. No: **NACOSTI/P/16/71760/9470**

Date:

23rd February, 2016

Jane Gatwiri Mbiijiwe
Kenyatta University
P.O Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Physical activity, dietary practices and nutritional status of hypertensive patients attending Kiambu District Hospital, Kiambu County, Kenya”* I am pleased to inform you that you have been authorized to undertake research in **Kiambu County** for a period ending **23rd February, 2017**.

You are advised to report to **the County Commissioner, the County Director of Education and the County Coordinator of Health, Kiambu County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

APPENDIX G: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MS. JANE GATWIRI MBIJWE
of KENYATTA UNIVERSITY, 0-100
Nairobi, has been permitted to conduct
research in Kiambu County

Permit No : NACOSTI/P/16/71780/9470
Date Of Issue : 23rd February, 2016
Fee Received :ksh 1000

on the topic: PHYSICAL
ACTIVITY, DIETARY PRACTICES AND
NUTRITIONAL STATUS OF
HYPERTENSIVE PATIENTS ATTENDING
KIAMBU DISTRICT HOSPITAL, KIAMBU
COUNTY, KENYA

for the period ending:
23rd February, 2017

Applicant's
Signature



Director General
National Commission for Science,
Technology & Innovation

APPENDIX H: RESEARCH AUTHORIZATION (COUNTY)

MINISTRY OF EDUCATION SCIENCE & TECHNOLOGY
State Department of Education

Telephone: Kiambu (office) 020-2044686
 FAX NO. 020-2090948
 Email: directoreducationkiambu@yahoo.com
 When replying please quote
 KBU/CDE/HR/4/11/(42)



COUNTY DIRECTOR OF EDUCATION
 KIAMBU COUNTY
 P. O. Box 2300
 KIAMBU
 29th April, 2016

JANE GATWIRI MBIJIWE
KENYATTA UNIVERSITY
P.O BOX 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Reference is made to the National Commission for Science, Technology and Innovation letter Ref. No. NACOSTI/P/16/71760/9470 dated 23rd February, 2016.

Authority has been granted to you to do research on "*physical activity, dietary practices and nutritional status of hypertensive patients attending Kiambu District Hospital, Kiambu County*" for a period ending 23rd February 2017.

Please accord her the necessary assistance.

COUNTY DIRECTOR OF EDUCATION
 KIAMBU COUNTY
 P.O. BOX 2300 (KBU)
 TEL: 020-2044686
 FAX: 020-2090948

EMILY MUKWANJIRU
 For: COUNTY DIRECTOR OF EDUCATION
KIAMBU COUNTY

