RURAL URBAN PREVALENCE AND ASSOCIATED FACTORS OF OVERWEIGHT AND OBESITY IN ADULT PATIENTS SEEKING HEALTHCARE: A CASE OF PCEA KIKUYU HOSPITAL, KENYA

By

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Declaration

This Dissertation is my original work and has not been presented in any other university.

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Dedication

This dissertation is dedicated to Sam, my husband, for his love, support and encouragement throughout the study period.

Acronyms and Abbreviations

BMI	Body Mass Index
BMR	Basal Metabolic Rate
CDC	Center for Disease Control
CHD	Coronary Heart Disease
CVD	Cardiovascular Disease
DHS	Demographic Health Survey
EUFIC	European Food Information Council
GPPAQ	General Practice Physical Activity Questionnaire
IASO	International Association for the Study of Obesity
IOTF	International Obesity Task Force
KDHS	Kenya Demographic Health Survey
NHMRC	National Health and Medical Research Council
NIH	National Institute of Health
NSP	Non-Starch Polysaccharides
OPD	Out Patient's Department
RA	Research Assistant
RMR	Resting Metabolic Rate
SO	Specific Objective
WC	Waist Circumference
WHO	World Health Organization
WHR	Waist Hip Ratio

Operational Definition of Terms

Adult	Any person aged 18 years and above
BMI	in this study BMI was computed by dividing an individual's weight in kilograms by the square of his/her height in meters to identify overweight and obesity among study participants.
Obesity	in this study obesity was considered as a condition in which the body is above a standard acceptable weight (BMI>29.9).
Overweight	in this study overweight was considered a condition in which the body is above a standard acceptable weight (BMI>24.9).
Rural urban	in this study rural urban was used to refer to the study location which is outside the city but has areas that are densely populated and others that are sparsely populated.
Income	in this study income referred to how much money the respondent receives from wages, salaries or other investments made.
Education	in this study education was used to refer to the highest level of schooling the respondent has reached.

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Abstract

Obesity is now of such epidemic proportions that its impact threatens the capacity of health services in the richest countries. The main objective of the study was to investigate the prevalence and associated factors of overweight and obesity among adult patients seeking healthcare at a level 4 health facility in Kenya. The study was conducted at PCEA Kikuyu Hospital, in Kiambu County, between February 2014 and March 2014.

The study design was cross-sectional, descriptive and analytic in nature. The study population comprised 275 outpatients aged above 18 years (excluding those with physical deformities) seeking health care at PCEA Kikuyu Hospital. Data was collected on socio demographic characteristics (age, sex, marital status, education, occupation, individual monthly income, and wealth status), nutrition status (Body Mass Index, Waist Circumference and Waist hip ratio), meal and food consumption frequency and level of physical activity. The sampling procedure was purposeful sampling of PCEA Kikuyu Hospital and exhaustive sampling in selection of respondents.

The overall prevalence of overweight and obesity was 67.2%, with the specific prevalence of overweight being 36.7% (n=101) and obesity 30.5% (n=84). The prevalence of overweight and obesity was higher in females (71.9%, n=84) than in males (62%, n=101). There was a significant difference in mean Body Mass Index between males and females (p=0.001). The factors that were significantly associated with overweight and obesity included sex (p=0.021), education (p=0.001), wealth (p=0.003), marital status (p=0.004) and age (p=0.000). Meal and food consumption frequency and physical activity level were not significantly associated with overweight and obesity (p>0.05).

Over half (54.5%) of the overweight and obese respondents did not consume the main meals regularly (breakfast, lunch and dinner). The average daily energy intake was high at 3505 kilocalories. In addition, majority (58.9% n=109) of the overweight and obese respondents were engaged in physical activity but not as per the WHO recommendations. Logistic regression analysis picked age (18-37 years) and sex as the predictors of overweight/obesity, among the participants. The null hypothesis for this study was rejected that there is no significant association between socio demographic characteristics and overweight and obesity as results show that there was a significant association.

In conclusion, there was a high prevalence of overweight and obesity found in this study, sex and age being the most predictive factors of being overweight and obesity. Food and meal frequency and physical activity levels were not associated with overweight and obesity. Recommendations from this study is the need for nutrition and health education by health professionals among patients at PCEA Kikuyu hospital on ensuring frequent meal consumption of all meals and engaging in physical activity on a regular basis within recommended time and intensity levels. In addition more research is needed on obesity in Kenya for informed timely interventions.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Globally, nearly one billion people are classified as overweight, 300 million of them being clinically obese (WHO, 2002). Nearly one third of the adult American population is obese, while in South Africa, more than one in two adult women are overweight or obese. In Morocco, 40% of the population is overweight (Lichtarowicz, 2004). The Kenya Demographic and Health Survey of 2009 show that the national prevalence rate of overweight and obesity for women (15-49 years old) is 23% (KDHS, 2009).

The proportion of overweight and obese women is higher in urban areas than in the rural areas, with Nairobi having the highest prevalence (41% and 39%) (KNBS, 2010). Numerous factors lead to overweight and obesity. Key among them is urbanization which brings with it a reduction in daily energy expenditure through reduction of physical activity and a shift to a higher caloric content diet (BeLue, et al., 2009). According to Kenyan medical experts, Kenyans today are eating an oilier diet than ever before, even as they rely more on personal and public vehicles to move even the shortest of distance. In urban areas, conveniences such as lifts and escalators have become a standard feature in all shopping malls making it unnecessary to walk up and down the stairs (Kimani and Okwemba, 2007).

The current obesity pandemic reflects the profound changes that have taken place in the society over the last 20-30 years that have created an environment that promotes a sedentary lifestyle and the consumption of a high fat, energy dense diet (Popkin, 2006) and (WHO, 2003). Worldwide, more than 60% of adults do not engage in sufficient levels of physical activity which is beneficial to their health. Lack of physical activity in leisure time, which leads to people

spending increasing amount of time on sedentary behaviors such as television viewing, computer use, and excessive use of "passive" modes of transport (cars, buses and motorcycles) has also contributed (albeit partly) to problem of overweight and obesity (WHO, 2003). Physical inactivity is more prevalent among women, older adults, individuals from low socio-economic groups (especially in developed countries), and the disabled (WHO, 2003).

Urbanization has accelerated the spread of rapid motorization and the development of road networks in densely population urban areas. Developments of highly concentrated residential areas with little open spaces for people to engage in physical activity (Morisugi, 1992). White collar workers have more sedentary jobs than blue collar workers which could increase their risk of obesity (Kirk and Rhodes, 2011).

Obesity, recognized as a disease for more than 60 years, is now of such epidemic proportions that its impact threatens the capacity of health services even in the richest countries. Obesity accounts for 2-6% of total health care costs in several developed countries; some estimates put the figure as high as 7%. The true costs are undoubtedly much greater as not all obesity-related conditions are included in the calculations (WH0, 2004).

Although indirect costs to society can be substantially higher, they are often neglected. They relate to income lost from decreased productivity, reduced opportunities and restricted activity, illness, absenteeism and premature death (IOTF, 2010). In addition, there are high costs associated with the numerous infrastructure changes that societies must make to cope with obese people i.e. reinforced beds, operating tables and wheel chairs; enlarged seats in sports-grounds, and modifications to transport safety standards (IOTF, 2010).

Excess weight gain is ranked the third greatest risk factor after smoking and high blood pressure for all premature deaths and disabilities in the affluent world (IASO, 2010). Yet the situation is even worse in poorer countries: widespread fetal and childhood malnutrition increases the impact of even modest weight gain on the development of diabetes and other chronic diseases. Poorer nations have 4-5 times more adults with overweight-induced illness than the Western world. The result is catastrophic medical costs for hundreds of millions. The epidemic of obesity in children is affecting every continent. The resulting social handicaps, inferior academic and employment prospects, and early medical complications are increasingly evident (IASO, 2010).

Overweight and obesity lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. The non-fatal, but debilitating health problems associated with obesity include respiratory difficulties, chronic musculoskeletal problems, skin problems and infertility. The more life-threatening problems fall into four main areas: CVD problems; conditions associated with insulin resistance such as type 2 diabetes; certain types of cancers, especially the hormonally related and large-bowel cancers; and gallbladder disease (WHO, 2003).

Overweight and obesity in developing countries has been neglected as most attention is concentrated on famine and under nutrition or malnutrition of children [(Popkin, 2006); (Schmidhuber, 2005); (WHO, 2000)]. If preventive measures are not put in place, the problem may escalate and overburden the health care system in these areas. Hence there is need to put measures in place to arrest the problem of overweight and obesity and prevent the negative consequences.

1.2 Statement of the Problem

Overweight and obesity is becoming one of the main public health problems in Kenya. Most of the data available is on women with limited data on other groups. The Kenya Demographic and Health surveys show that the national prevalence rate of overweight and obesity for women is 23% (KDHS, 2009). The proportion of overweight and obese women is higher in urban areas than in the rural areas, with Nairobi having the highest prevalence of 41% (KDHS, 2009). Through the development of various diseases caused by obesity, being overweight reduces life expectancy and shortens lifespan by three to seven years for an individual aged 40 and with a BMI of 30 or more (Fontaine, 2003.)The global burden of the diseases that are related to overweight and obesity makes it a priority.

Chronic diseases have been noted to strain household incomes as families in Kenya bear the burden of caring for loved ones ailing from non-communicable diseases. They further contribute to household poverty, as less income is channeled to investment, thereby stifling economic growth. This is compounded by the lack of social health insurance as well as lack of access to adequate health infrastructure, to care for those affected by non-communicable diseases (Chuma and Maina, 2012). Understanding factors associated with obesity is crucial for informing and developing effective prevention efforts, nutrition education and proper planning. The choice of a hospital setting is because of the chronic diseases that patients present which could be attributed to overweight and obesity.

1.3 Justification of the Study

Overweight and obesity are risk factors for a variety of chronic conditions which lead to increased burden and mortality (WHO, 2003). In Kenya and Africa in general, there is limited up-to-date data on prevalence of overweight and obesity as priority has always been on under

nutrition. Studies that have been done have largely been concentrated in the capital and major cities while neglecting other urban settlements (Amegah, et al., 2011).

With recent statistics putting Kenya's urban growth rate at 21 percent, with nearly one out of every four Kenyans now living in urban areas (Barasa, 2007), there is need to address the issues that accompany such changes, lifestyle change being one of them. Failure to do so would mean that no action might be taken in the near future, thus the problem is likely to escalate. Tackling the problem in its early stages may lead to reduction in its occurrence thus reducing the costs eventually. This can only be achieved if data is available to quantify the magnitude of the problem, hence the need to carry out the study.

1.4 The Aim of the Study

The study aimed at contributing towards improved understanding of overweight and obesity in rural urban Kenya.

1.5 The Purpose of the Study

The purpose of the study was to generate data on the prevalence and associated factors of overweight and obesity in Kiambu County, Kenya. The information can be used to plan for interventions for prevention of obesity and overweight in rural urban Kenya.

1.6 Objectives of the Study

1.6.1. General objective

To investigate the prevalence and associated factors of overweight and obesity among a rural urban population in Kiambu county, Kenya.

1.6.2 Specific objectives

1. To determine the socio-demographic characteristics of adult patients seeking healthcare in PCEA Kikuyu Hospital.
2. To determine the prevalence and associated factors of overweight and obesity among adult patients seeking healthcare in PCEA Kikuyu Hospital.
3. To determine the food and meal consumption frequency of adult patients seeking healthcare in PCEA Kikuyu Hospital.
4. To determine the physical activity level of adult patients seeking healthcare in PCEA Kikuyu Hospital.

1.7 Study hypothesis

Overweight and obesity is associated with socio demographic characteristics, irregular food and meal consumption frequency and low physical activity levels.

CHAPTER TWO: LITERATURE REVIEW

2.1 Definition of overweight and obesity

Overweight and Obesity is defined as a condition of abnormal or excess fat accumulation in adipose tissue and its distribution within the body, to the extent that health may be impaired (WHO, 2000).

When a person's caloric intake exceeds his/her energy expenditure, the body stores the extra calories in the fat cells present in adipose tissue. These adipose cells act as energy reservoirs, and they enlarge or contract depending on how people use this energy. If people do not balance energy input and output by adopting healthy eating habits and regular exercise, then fat builds up, and they may become overweight and eventually obese (Schlenker and Long, 2007).

2.2 Measurement of overweight and obesity

2.2.1 Methods of measuring overweight and obesity

There are various methods to measure and estimate body composition and the distribution of fat. These range from the simple, useful and practical anthropometric measurements such as weight and height, from which the Body Mass Index is derived, waist circumference, waist /hip ratio, skin fold thickness to the more sophisticated measurements such as Hydro Densitometry, Magnetic Resonance Imaging (MRI), Computerized Tomography (CT), Dual Energy X-ray Absorptiometry (DEXA), Bioelectric Impedance Analysis (BIA) and Air Displacement Plethysmography used in research (WHO, 2002). The current study made use of the BMI, the waist circumference measurement, and the waist hip ratio as the indicators to estimate the prevalence of overweight and obesity of the study population (WHO, 2002).

2.2.2 Body Mass Index

BMI is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as weight in kilograms divided by the square of the height in meters (kg/m2) (WHO, 2000). BMI cut-offs for adults have been identified on the basis of associations between BMI and chronic disease and mortality. The classification adopted by the World Health Organization, shown in the table 1 below, is based on the international standards developed for adult people of European descent.

Table 1: Classification of adults according to BMI

Classification	**BMI**	**Risk of co morbidities**
Underweight	<18.50	
Normal range	18.50-24.99	Average
Overweight:	Classification	
Pre obese	25.00-29.99	Increased
Obese class I	30.00-34.99	Moderate
Obese class II	35.00-39.99	Severe
Obese class III	≤40.00	Very Severe

2.2.3 Waist Circumference

Waist circumference is used to measure abdominal fat deposition. It is generally agreed that fat deposited around the waistline increases the risk of mortality because fatty tissue in this area secretes cytokines, hormones and metabolically active compounds that can contribute to the development of chronic diseases, particularly CVD and cancers. Many studies have demonstrated a close relationship between body fat distribution and the occurrence of the

metabolic syndrome; an excess of abdominal adipose tissue, especially intra-abdominal visceral fat, leads to obesity-related complications (Kimani and Okwemba, 2007).

Waist circumference is a convenient and simple measurement that is unrelated to height, correlates closely with BMI and WHR and is an approximate index of intra abdominal fat mass and total body fat (WHO, 2000). Table 2 presents sex-specific waist circumference measurements and associated complications for a random sample from the Netherlands of 2183 men and 2698 women aged 20-59. These figures only act as a guide and have not been validated in an African population (WHO, 2000). These figures were adapted for the study to classify overweight and obesity.

Table 2: Sex-specific waist circumference and associated risk factors

Risk of metabolic complications	**Waist circumference (cm)**	
	Men	Women
Ideal	>94	<80
Increased	≤94-101.90	≤80-87.90
Substantially increased	≤102	≤88

(Source: WHO, 2000).

2.2.4 Waist hip ratio

It has been accepted that a high WHR (>1.0 in men and >0.85 in women) indicates abdominal fat accumulation (Han et al., 1997). Some experts consider that the hip measurement provides additional valuable information related to gluteofemoral muscle mass and bone structure (WHO, 2008)

2.3 Types of obesity

Body fat distribution can be used to identify overweight and obesity. The quantity and location of fat in the body, as well as how much can predict health risks. Some people store fat in upper body areas while others hold fat lower on the body. These two patterns give rise to two patterns of obesity, namely: android obesity and gynoid obesity. Android obesity is the type of obesity in which fat is stored primarily in the abdominal area; defined as a waist circumference greater than 102 cm in men and greater than 88 cm in non-pregnant women (IOTF, 2004). It is more associated with males. It is a public health concern because of its association with disease states such as hypertension, insulin resistance, breast cancer, stroke, diabetes and CVDs (Janssen et al. 2004).

Gynoid obesity is the typical female pattern where excess fat stores accumulate in the periphery, specifically hips, thighs and bottom (EUFIC, 2006). In the current study, abdominal fat deposition was assessed by taking the waist circumference measurements of the study population.

2.4 Prevalence and trends of overweight and obesity

Over recent years, rates of overweight and obesity have escalated rapidly in many parts of the world to epidemic proportions. More than 1.1 billion people are estimated to be overweight, of whom around 320 million are now estimated to be obese (IOTF, 2010). Contrary to popular opinion, the obesity epidemic is not restricted to industrialized societies; in developing countries, it is estimated that over 115 million people suffer from obesity related problems (WHO, 2002).

The burden of disease in developing countries has traditionally been characterized by under nutrition and infectious diseases. However, lifestyle in many developing countries now parallels

that in the developed world, with increasing prevalence of overweight and obesity (Eckhardt, et al., 2008). Wide disparities in levels of overweight and obesity are found in this region with the highest rates in South Africa, where mean BMI values for men and women are 22.9 kg/m2 and 27.1 kg/m2 respectively, but levels of central obesity among women have been assessed at 42%.

The South Africa Health Review of 2000 indicated obesity rates from 8% among black men to 20% among white men, but among women the rates range from 20% for Indian/Asians to 30.5% for black women. In parts of sub-Saharan Africa obesity often exists alongside under-nutrition (IOTF, 2010). The prevalence of overweight and obesity among South African women almost doubles that of urban women in the Gambia and Tanzania (Feachem et.al., 1991) The Cameroon burden of disease survey, a cross sectional study conducted in 4 urban districts of Cameroon found high prevalence of overweight and obesity particularly over 35 years of age and among women. Based on BMI, over 25% of men and almost half of women were either overweight or obese with 19.5% of women in the obese category (Kamadjeu, 2006).

The problem is even more complicated in the poor and developing countries, as they now have to deal with the 'double burden of malnutrition'. Kenya, for example, is still dealing with food insecurity, yet overweight and obesity are gradually becoming health problems to contend with. A study found high rates of overweight and obesity in Kenya with a prevalence of overweight (BMI > or = 25) (39.8% vs. 15.8%) and obesity (BMI > or = 30) (15.5% vs. 5.1%) which was highest in the urban vs. rural population (Christensen et al., 2008).

2.5 Factors associated with overweight and obesity

Overweight and obesity are influenced by a number of factors including hereditary tendencies, environmental and behavioral factors, ageing and pregnancies. Obesity is not always simply a

result of overindulgence in highly palatable foods or a lack of physical activity as is often thought. However, dietary factors and physical activity patterns strongly influence the energy balance equation and they are also the major modifiable factors (EUFIC, 2000; WHO, 2000). Socio-economic factors, physical activity levels and food and meal frequency are the three main areas that this study focused on.

2.5.1 Demographic and Socio-economic factors

Studies have repeatedly shown that high socio-economic status is negatively correlated with overweight and obesity in developed countries, particularly among women but positively correlated with it in populations of developing countries (Endomwonyi and Osaigbovo, 2006) and (Kamadjeu, 2006). In developing countries, the lower overweight and obesity rates observed in the populations of lower socio-economic status are associated with poverty and overweight and obesity are perceived as signs of affluence (Popkin, 2003).

Increase in income tends to be associated with increased away-from-home consumption of high-fat food items (WHO, 2000). As people acquire higher incomes, their food preferences also change. While formerly they ate grain-based diets high in fiber and low in fat content, they begin to eat more fats, more sweeteners and more refined CHOs (Popkin, 2006). A study in a Beninese urban setting found that the risk of obesity increased significantly with rising socio-economic status (Sodjinou, et al., 2008).

Longitudinally, evidence suggests that marriage predicts weight gain in both men and women, whereas marital termination (through divorce or widowhood) predicts weight loss (Crawford and Ball, 2010). There exists a positive relationship between the marital status and weight gain. Entry

into marriage is associated with weight gain while exit from marriage results in weight loss, but of a lower magnitude (Ulijaszek, 2007).

Overweight and obesity impacts more on women than men and a number of physiological processes are believed to contribute to an increased storage of fat in females. Females have a tendency to channel extra energy into fat storage while males use more of this energy for protein synthesis. This pattern in females contributes to further positive energy balance and fat deposition (WHO, 2000). Women generally have higher percentage of body fat than men, and there are indications that the basal fat oxidation is lower in females as compared to men, thereby contributing to a higher fat storage in women (Blaak, 2001). This may explain why women have a more difficult time losing fat in general, and from the hips and thighs in particular (Blaak, 2001). Furthermore, women rely on fat stores more than men for reproduction.

A study conducted in four urban districts of Cameroon found out that irrespective of age or measure used, women always had a higher prevalence of overweight and obesity than men. According to the study, prevalence of obesity was five times higher in females compared to men (Kamadjeu, 2006). Another study conducted in the U.S that tracked weight in a large population sample over a 10-year period found that major weight gain (BMI >5 kg/m2) was twice as common in women (5.3%) as in men (2.3%) (Andajani-Sutjahjo, et al., 2004). Society has partly contributed to the trend as fat women are often viewed as attractive in Africa (WHO, 2000).

2.5.2 Physical activity

Adequate physical activity has been shown to have many health promoting properties and has a direct, independent role in reducing CVDs mortality. Inactivity on the other hand is one of the most important factors that have been known to fuel overweight and obesity. The amounts of physical exercise have been decreasing as a result of the high degree of urbanization that has

been occurring across the African continent (Feachem et.al., 1991) In urban settings, for example, public transport replaces the traditional pattern of walking long distances, and urban employment usually entails far less physical labour than rural employment or other activities of daily living, such as chopping wood, carrying water, or tilling the fields. In cities, higher levels of crime prevent people from moving about freely. In addition, in the poorest rural-urban settings, inhabitants watch television more frequently than their rural counterparts do, contributing further to the problem of overweight and obesity (Feachem et.al., 1991)

The environment fosters physical inactivity. Life requires little exertion and hence reduced physical activity. Modern technology has further reduced physical activity at home, at work, and in transportation. Watching television, playing video games and using the computer may contribute most to physical inactivity. The more time people spend on these sedentary activities the more likely they are to be overweight (Blaak, 2001). These sedentary activities contribute to weight gain in several ways. First, they require little energy beyond the RMR. Second, they replace time spent in more vigorous activity. Watching TV also influences food purchases and correlates with between meal snacking on the high fat foods most heavily advertised, hence people may be obese not because they eat too much but because they move too little (Blaak, 2001).

With nutrition transition and lifestyle changes, physical activities have been reduced as the drive to reduce difficult, dangerous and strenuous activities at work increases (Popkin, 2006). With the availability of cars, the increase in electronic home appliances, and more involvement in office work, life has become more sedentary and the pattern of practicing exercise has diminished steeply (Musaiger, 2004 and Popkin, 2006).

2.5.3 Dietary intake

Dietary intake has been cited as one of the leading forces in the development of overweight and obesity. Over the years, the diets of populations have been changing towards diets that favor the weight gain as traditional diets are gradually replaced with modern diets (Popkin, 2006).

According to Popkin (2006), civilization has enhanced the diets. The populations have gone through many stages and have shifted from very simple diets to much more complex ones. The added spices and flavorings along with the added fats from vegetable and animal origins have assisted in the process of weight gain and obesity (Popkin, 2006). Globally, the diet of many is increasingly energy-dense and sweeter, with high fiber foods being replaced by processed versions. Water and milk appear to be replaced by calorically sweetened beverages (Popkin, 2006).

In populations undergoing rapid socio-economic improvement, with better access to foods and shifts in diets, NCDs now appear with greater frequency. Data from China, the Arabic Republic of Egypt, India, Mexico and Philippines and South Africa reveal a marked shift over the last 20 years towards diets high in saturated fats, sugar and refined foods, while the share of cereals, legumes, pulses and nuts remained stable or declined.

The shift towards obesity and chronic diseases in many developing countries invites the misconception that diets are moving away from problems of constraints towards problems of excesses. However, whereas energy is increasingly available in these contexts, it tends to come from energy-dense, micronutrient poor sources such as added sugars and edible oils (Eckhardt et al., 2008). Intake of micronutrient- rich foods such as fruits, vegetables and high quality animal-source foods often remain low, thus even while obesity and related chronic diseases emerge as

serious health problems in developing countries, micronutrient malnutrition is likely to remain highly prevalent. For example in Mexico where the prevalence of overweight and obesity is particularly high among women, the prevalence of iron deficiency among women is also high (Eckhardt et al, 2008). It is likely that micronutrient deficiencies and overweight and obesity coexist not just within countries, but within households and individuals as well, owing to the obesogenic and micronutrient poor diets of countries in transition.

2.6 Co morbidities of overweight and obesity

Overweight and obesity are independent risk factors for premature death, but are also strongly associated with a number of other serious medical conditions (WHO, 2000). Abdominal obesity especially is central to the metabolic syndrome and is strongly related to polycystic ovary syndrome in women. Obese women are particularly susceptible to diabetes and CVD and have an increased risk of several major concerns in women, especially post-menopausal breast cancer and endometrial cancer (Schlenker and Long, 2007).

Overweight and obesity are independent risk factors for diabetes and insulin resistance among different populations; for each increase in BMI, the risk of diabetes increases by 12%. The distribution of fat around the trunk region or central obesity is also a strong risk factor for diabetes (Feachem et.al., 1991) Type 2 Diabetes is three times more likely to develop in an obese person than in a non-obese person. Furthermore, the person with Type 2 diabetes often has central obesity. Central body fat cells appear to be larger and more insulin resistant than lower body fat cells.

Diabetes and hyperlipidaemia are strongly associated with excess weight especially in the abdominal region. Considerable evidence has suggested that excessive weight gain is the most

common cause of arterial hypertension. This association has been observed in several populations, in different regions of the world. Obesity hypertension, a term that underscores the link between these two conditions, is an important public heath challenge, because of its high frequency and concomitant risk of cardiovascular and kidney diseases (Francischetti and Genelhu, 2007). The prevalence of obesity and hypertension is even higher in urban areas owing to changes in lifestyle (dietary habits and physical activity). A study done in Tanzania (Kuga, et al., 2002) concluded that an urban population in Tanzania had higher levels of mean BMI and blood pressure and a higher prevalence of obesity and hypertension than rural populations. Similar findings were found in a Beninese urban adult population (Sodjinou, et al., 2008).

Obesity is also associated with psychosocial problems, among them stigma and depression. A study (Murphy, et al., 2009) revealed that among the subjects who had experienced a major depressive episode, obese persons were five times more likely than none obese to overeat leading to a weight gain during a period of depression. They also experienced longer episodes of depression and were more preoccupied with death during such episodes. Other conditions associated with overweight and obesity include: strokes, gallstones, some cancers (such as breast and colon cancer), reproductive problems, mechanical problems (including osteoarthritis, chronic low back pain, breathlessness and sleep apnea), psychological problems among many others (Janssen et al. 2004) and (WHO, 2000).

Overall, obese people are three times more likely to die than their lean counterparts. A high BMI is strongly associated with higher blood pressure and risk of hypertension, higher total cholesterol, LDL-cholesterol levels. The overall risk of CVDs and stroke therefore increase substantially with weight gain and obesity (Swinburn, et al., 2011).

2.7 Assessing overweight and obesity – challenges

BMI as a measure has several limitations. Firstly, it does not distinguish fat mass from lean mass. This means that body fat calculated using BMI can be underestimated in older subjects, because of their differential loss of lean mass and decreased height, and overestimated in subjects with a muscular build. A second limitation is that BMI does not distinguish between weight associated with fat and weight associated with muscle mass. Hence, factors such as body build and proportions are not taken into account and therefore the same BMI may reflect variations in body composition other than in body fat. BMI cannot be used in a muscular person because as much as the weight of the muscular individual will be high, their fat mass may be low so classifying them as obese would be incorrect. BMI does not address the type of obesity, such as android or gynoid, which is known to be better determinants of current and future pathology of co-morbid diseases and does not necessarily reflect body fat distribution (WHO, 2000). Although BMI is widely used to assess obesity in populations, the fact that it can be influenced by different variations makes it a less useful measure when used alone in individuals, at least where BMI is less than 30 (WHO, 2000).

Waist circumference is a good measure of absolute risk but it is not such a good measure of relative change in body fatness; in some cases, weight losses are not reflected in waist circumference losses because fat is lost from parts of the body other than the waist. Similarly, other studies have shown that using waist circumference to predict both changes in visceral fat and improvements in cardiovascular risk factors during weight loss has limitations in overweight men and women (NHMRC, 2004). Combining BMI with a measure of waist circumference and waist hip ratio may help overcome some of the problems of using BMI alone in the clinical

situation. It is on this basis that the current study combined three measures of overweight and obesity namely: BMI, waist circumference and waist hip ratio to assess overweight and obesity.

2.8 Gaps in knowledge

Trends in obesity have only been documented in a few African countries or populations and most of these studies have relied predominantly on the Body Mass Index as an indicator of overweight and obesity. The studies have largely been concentrated in the capital and major cities of these countries whilst neglecting other urban settlements (Amegah, et al., 2011). In addition, very few studies on the physical activity patterns of people in sub-Saharan Africa have been published (Feachem et.al., 1991) Few have measured the Waist Circumference and Waist hip ratio. Dietary intake and physical activity are widely recognized as important factors in development of overweight and obesity yet there is limited data on the relationship between dietary intake and physical activity and overweight and obesity in Kenya.

Studies on overweight and obesity in Kenya have mainly focused on prevalence of overweight and obesity among women (Mbochi, 2012) and (KDHS, 2009), and children 10-15 years old (Kamau, et.al., 2011). In an effort to address the double burden of malnutrition, Kenya, like many other African countries, signed up (in 2012) to the Scaling up Nutrition (SUN) Movement (Republic of Kenya, 2008). In line with SUN's objectives, Kenya has drawn up a national nutrition action plan for 2012 to 2017 (Republic of Kenya, 2008b) that outlines 11 strategic objectives tackling both under and over-nutrition. To potentially achieve the objectives outlined in the national nutrition action plan 2012-2017, a budget of approximately KES 70 billion (US$ 824 million) was drawn. Kenya has committed to spending KES 6 billion (US$70 million) over five years to scale up nutrition interventions outlined in the action plan, shared across various

ministries (Republic of Kenya, 2008). Not much monitoring and evaluation has been done to assess the action taken.

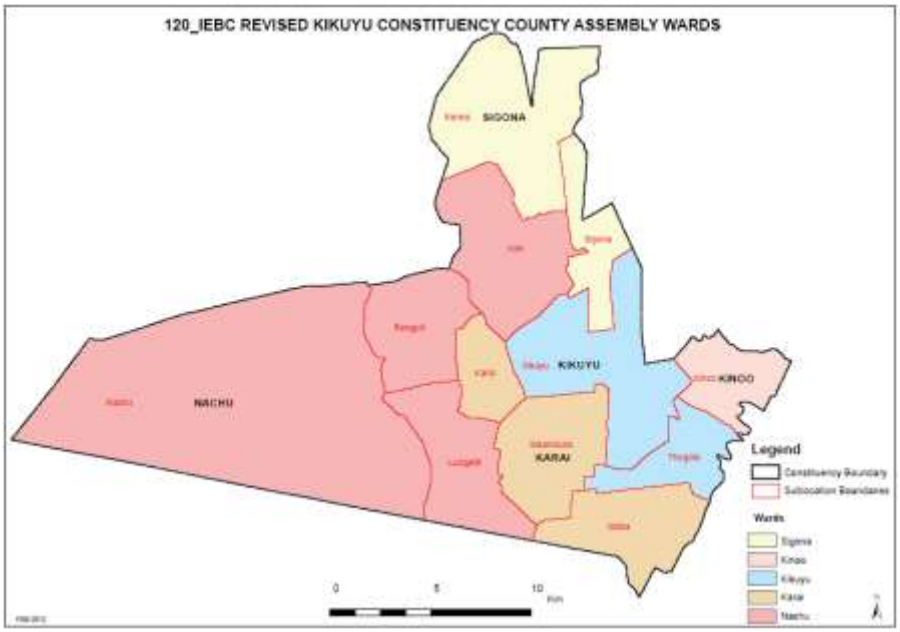
The current study sought to address these gaps by combining three methods of assessing overweight and obesity namely: BMI, waist circumference, and wait hip ratio, targeting both genders. In addition, the study was done in a rural urban population in a hospital setting since almost all studies done in Kenya on overweight and obesity have focused on women in urban areas, with prevalence of overweight and obesity in rural urban areas yet to be established.

CHAPTER THREE: METHODOLOGY

3.1. Study Setting

3.1.1 Study location

The study location was kikuyu Sub County which is one of the 12 sub counties of Kiambu County. Kiambu County covers an area of 2,449.2 km^2. The county lies between latitudes $0^0$75' and $1^0$20' South of equator and longitudes 36^0 85' East. According to the Kenya population and housing census 2009, the population of Kiambu County was 1,623,282. Out of this, 806,609 (49.4%) were males and 820,673 (50.6%) were female (KNBS, 2010).



Source: IEBC, Revised Kikuyu Constituency, 2008

3.1.2 Study site

The study was carried out in PCEA Kikuyu Hospital. It is one of the oldest hospitals in Kenya and was founded in 1908 by Scottish missionaries, spearheaded by Dr. Arthur. The hospital is located about 25 kilometers from Nairobi City Centre and approximately 3 kilometers from Kikuyu Town. The hospital is situated within Kikuyu Sub County in Kiambu County. Initially,

the aim of the establishment of PCEA Kikuyu Hospital was to serve as training and educational ground for young boys and girls as healthcare workers among other objectives. It started as a small aid centre and has gradually grown over the years to become a fully fledged hospital offering almost all the health services.

In 1975, the hospital received medical staff from the government, then under the Late President Jomo Kenyatta. The first ophthalmic work was also done in the same year. The Eye unit therefore came into being in 1975 and serves patients across East and Central Africa as well as training medical personnel in eye care. This has increasingly made it popular not only in Kenya but also across the East and Central African borders. In 1993, an orthopaedic unit was also built which has now been expanded to a comprehensive rehabilitation centre for non-trauma related orthopaedic problems. To meet the increasing demand for dental care, the Dental unit was established in 2006 with the support of the First Presbyterian Church of the United States.

Since 1956, PCEA Kikuyu Hospital is now owned and run by the Presbyterian Church of East Africa, and has stood the test of time to become one of the most community friendly hospitals in the region. Now marking 106 years since it was founded in 1908, the hospital has grown to offer a wide range of services to patients in Kikuyu Sub County, all over Kenya and beyond. The hospital offers both in-patient and out-patient services. The services offered include casualty/emergency, laboratory services, ante-natal and post natal, maternity services, renal services, theatre, eye care, dental, radiology, physiotherapy, palliative and mortuary services. In addition, it offers chaplaincy services to both staff and patients. The hospital also offers HIV/AIDS services under the ART programme.

The in-patient unit has a 218 ward bed capacity which accommodates both male and female patients. These also include maternity, paediatric and private wards for isolated cases. The hospital medical staff includes medical doctors, nurses, clinical officers and medical interns/students. In addition, specialized medical officers include a general surgeon, paediatrician, urologist, gynecologist, ophthalmologist, Ear, Nose and Throat (ENT) specialist and gastro-entologist. Most of the specialists are on a part-time basis. Medical conditions common in the general unit include malaria, pneumonia, tuberculosis, HIV/AIDS, diarrhea, diabetes, hypertension and rheumatic fever. Surgical conditions include Caesarian Section (CS), large bowel surgery, hysterectomy, prostatectomy among others.

3.2 Research Methodology

3.2.1 Study Population

The study population comprised all adult patients seeking healthcare in PCEA Kikuyu Hospital residing in Kiambu County and attending the Out Patients Department (OPD) of PCEA Kikuyu Hospital.

3.2.2 Study design

The study design was Cross- Sectional, Descriptive and Analytical in nature.

3.2.3 Sample Size and Sampling Technique

3.2.3.1 Sample Size determination

The sample was drawn from an estimated population of 700 adult patients who visit the Outpatients Department (OPD) in a span of 2 weeks. (Information obtained from the Records department of the Hospital). To determine the desired sample size, (**nf**) when the population is less than 10,000, the required sample size (n) when the population is greater than 10,000 would be computed first and then **nf** derived from **n**.

Fischer's formula (Fischer et al., 1991) $n=z^2pq/d^2$ was used to determine **n**.

$$\mathbf{n=z^2pq/d^2}$$

Where:

P= Proportion of population in kikuyu district (calculated using 50%) (0.5) for unknown prevalence

q=1-p=1-0.5=0.5

Z= standard normal deviation set at 1.96 (95% confidence interval).

D=degree of accuracy desired or degree of precision = 5 %(or0.05)

Fischer's formula (Fischer and Laing, 1991) $n=z^2pq/d^2$ was used to determine **n**.

$$\mathbf{n=z^2pq/d^2}$$

$n= \underline{(1.96^2(0.5)\ (0.5)} = \underline{3.8416x0.25} = 384.16 = 384$

0.05^2 0.0025

To determine the desired sample size NF when population is less than 10,000,

Fischer's et al., (1991) recommends the following formula;

$$\mathbf{NF = n/1+ (n/N)}$$

384/1+ (384/700) =248

Plus 10% attrition,

=273 adult patients (a total of 275 respondents were reached)

Where NF= the desired sample size (when the population is less than 10,000)

n=the desired sample size, when the population is more than 10,000, which is 384

N= the estimate of the population size at OPD in a span of 2 weeks (700)

3.2.3.2 Sampling Procedures

Purposive sampling was done for PCEA Kikuyu Hospital in Kiambu County which is located in a rural urban setting. An exhaustive sampling was done for all the adult patients within the study period. All the patients visiting the Outpatient Department and who met the inclusion criteria was included in the study as they arrived for services and/or treatment until the required sample size was attained.

3.2.3.3 Inclusion Criteria

All adult (from age of 18 years and above) patients seeking health care in PCEA Kikuyu Hospital and were residents of Kiambu County attending the OPD, and who agreed to participate in the study.

3.2.3.4 Exclusion criteria

All patients who were seeking healthcare at PCEA Kikuyu Hospital that were below 18 years of age, non residents of Kiambu County, physically disabled due to age or otherwise and those who did not consent to participate in the study.

3.2.4 Research Tools and Instruments

The tools for data collection included a portable stadiometer (Seca Brooklyn, NY) that was used for height and weight measurement, a stretch resistant tape measure for waist and hip measurement, meal and food frequency questionnaire and a semi-structured questionnaire.

3.2.5 Data Acquisition Methods/Techniques

Quantitative data was collected using a pre-tested structured questionnaire. The design and setting was adapted from several questionnaires (FANTA, 2011), which guided in the content and structuring of the questionnaire and customized to suit the study objectives. The data included demographic and socio economics characteristics, nutrition status (Body Mass Index, Waist Circumference and Waist hip ratio) Food and meal frequency, level of physical activity, of the OPD patients.

3.2.5.1 Demographic and Socio-economic characteristics

The demographic and socioeconomic characteristics were assessed using the following indicators: age, gender, marital status, educational level, occupation, monthly income of individuals, total expenditure on food per month, housing characteristics, and household amenities. This information was captured by administering a pretested structured questionnaire. (Appendix1)

The wealth index was used as a proxy indicator to reflect the socio-economic status as well as the living standard of the participant and was derived from the weighting of ownership of household consumer items. The assigned weights were generated through the principal component analysis and then standardized to produce normally distributed scores (Gwatkin and Rutstein, 2000). This study used the summation of scores of ownership of 6 types of assets namely; radio, television, mobile phone, vehicle, bicycle and motorcycle. The average score was 3 while the minimum and maximum scores were 0 and 6 respectively. Based on this classification, individuals with 2 or less items were considered “less wealthy”, 3 items was “average wealth” and 4-6 items was considered “wealthy” (Gwatkin and Rutstein, 2000).

3.2.5.2 Overweight and obesity assessment

The body mass index, Waist Circumference and Waist Hip Ratio were used to assess overweight and obesity (Appendix 1). A Portable Stadiometer (Seca Brooklyn, NY) was used to measure the height and weight. The following cut off points was used in classifying the respondents as being normal, obese or overweight:

Table 3: Cut off points for overweight and obesity (WHO, 2000)

Classification	**BMI**
Normal range	18.50-24.99
Overweight	25.00-29.99
Obese	≥30

For height and weight measurements, a stadiometer that had both a weighing scale and a height rod was used. It was placed on a hard, flat surface and checked for accuracy, at the beginning of each session using a 2kg weight and calibrated at zero for the height. For the height, the subjects were required to remove their footwear, stand straight on the stadiometer scale with their feet together, knees straight, heels and, buttocks and the shoulder blades in contact with the vertical surface of the stadiometer and the arms hanging loosely on the sides and the shoulders relaxed.

The movable headboard was gently lowered until it touched the crown of the head, gently but firmly compressing the hair and measurements taken to the nearest centimeter (WHO, 2000). Two readings were taken and an average recorded to the nearest 0.1 cm. If measurements differed by more than 0.1 cm, a third reading was taken. Only the two measurements with a difference within 0.1 cm were used to calculate the average.

In taking the weight, the subjects remained standing on the centre of the scale looking straight ahead. Two different measurements were taken and the average weight recorded to the nearest 0.1 kg. The BMI was calculated as a ratio of weight to height squared (kg/m^2), a formula developed by statistician Belgium Adolphe Quetelet (WHO, 1995) (Appendix 2).

Waist circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch resistant tape. The hip circumference was measured around the widest portion of the buttocks (WHO, 2011).

For waist and hip measurements, the respondents stood with feet close together, arms at the side and body weight evenly distributed. Heavy sweaters and jackets were removed to allow measurements to be taken with minimal clothing. The respondents were asked to relax and the measurements were taken at the end of a normal expiration. Each measurement was taken twice. When the measurements were within 1cm of one another, the average was calculated. When the difference between the two measurements exceeded 1cm, the two measurements were repeated (WHO, 2011).

3.2.5.3 Food and meal consumption frequency

This information was collected by using a weighted food frequency questionnaire indicated in Appendix 2 (WHO 2002). In which an estimate of the weight of food the respondent consumed was recorded. Food models were used to estimate the quantities of food consumed. The indicators for meal and food frequency were the number of meals consumed per day, number of times a specific food from each food group was eaten per week and the amount in grams.

The nutrient amount of the common nutrients was estimated using a food scale, and pictures taken and put in a catalogue which were shown to the respondents to estimate the amount

(grams) of nutrients they consumed. Based on the pictures, the respondents would select a picture responding to the amount of food they took. The actual amounts of nutrients were converted into the percentages of the Recommended dietary allowance (RDA) for the main nutrients (energy, proteins, fat, carbohydrates), and based on recommendations found in the nutri-survey software and which are based on the German society for Nutrition (DGE), the recommendations of the WHO/FAO and Recommended dietary allowance (RDA) from the USA. The results were compared to the recommended energy intake levels for men and women (USDA/HHS, 2000).

Daily quantities of foods consumed were calculated using a standardized formula;

Average Daily Amount= (Weekly frequency ×Amount)/7

An assumption was made that quantities consumed were equally distributed over a one week period, hence the denominator of 7 days. The mean daily intakes of most frequently consumed foods and of interest subject to overweight/obesity occurrence were subsequently determined. The computed means for the selected foods of interest were transferred to Nutri-Survey® 2007 software and further analyzed in terms of energy, fats and carbohydrates.

3.2.5.4 Physical activity levels

A validated screening tool was used to assess adults (>18years) physical activity level and provided a simple, 4-level Physical Activity Index (PAI) of: Active, Moderately Active, Moderately Inactive and Inactive (WHO, 2009). A standard questionnaire (General Practice Physical Activity Questionnaire) was used to collect data on the physical activity level (WHO 2009). The questionnaire was used to determine the frequency, nature and intensity of physical activity.

The categories of physical activities include; activity at work, travel to and from places and recreation. The indicator for this assessment was the number of days (5 days are recommended) the subjects were involved in physical activity, the length of time (30 minutes daily are recommended) and the intensity of the activity as indicated by either vigorous or moderate.

The GPPAQ also assessed sedentary behavior as indicated by the number of hours the subjects spend sitting by considering total time spent at work or at home sitting (Appendix 2).

3.2.6 Ethical and Human Rights Considerations

Before the data collection exercise commenced, the researcher sought and was granted approval by the University of Nairobi to conduct research and thereafter obtained Ethical clearance from the Ethical Research Committee (KNH/UON-ERC). Permission was sought and authority granted from PCEA Kikuyu Hospital to conduct the research at the hospital. The researcher wrote an undertaking promissory note to give PCEA Kikuyu Hospital a copy of the dissertation upon completion of the project. A letter of consent explaining to the subjects the objectives and purpose of the study assuring them of confidentiality was written and read to the subjects and it was only after their consent that the interview commenced. The subjects were then given feedback regarding their nutrition status and advised accordingly after the interview and the anthropometric measurements were taken.

3.2.7 Recruiting and Training of Research Assistants

The researcher interviewed and recruited three graduate research assistants, one female and two males, who were proficient in English and Swahili languages, had data collection experience with a background of nutrition education. They were trained for three days at the hospital and the training covered the following topics: ethics and research, obtaining informed consent from the

subjects, purpose and objective of the study, questionnaire interpretation and administration interview techniques and taking anthropometric measurements. The teaching methods included: lecture, demonstration, practical and role play. Materials and equipment that were used included: flip charts, markers, pens and pencils, note books, masking tape, portable stadiometer with weighing scale and tape measure. (Appendix 3)

3.2.8 Pretesting of Tools

Ten adult (>18 years) patients from Nazareth Mission Hospital OPD were involved in a pretest of the questionnaire. After completing the questionnaire, they were asked about the clarity and relevance of each item. On the basis of comments and responses collected during the pretest, adjustments were made to the questionnaire to ensure validity.

3.2.9 Quality Control

Various data quality control measures were employed throughout the collection process:

Minimizing Bias

To ensure accuracy of data, study tools were pre-tested and modified. Calibration of the weighing scale was done at the beginning of data collection to minimize instrument bias. The respondents were informed on the importance, objectives and purpose of the research and were encouraged to give accurate information, while being assured of confidentiality on any information they provided.

Research Assistants Training

Experienced and educated research assistants were recruited and then properly trained on all aspects of the data collection process to ensure efficiency, accuracy and quality of data. They

were supervised by the researcher throughout the data collection period and were encouraged to take adequate time in filling the questionnaires to avoid errors.

Accuracy of Anthropometric Measurements

The research assistants were trained on the calibration of equipment and measuring techniques to ensure accurate measurements were taken. The height and weight measurements were taken twice and then averaged using calculators to improve the precision of the research assistants (WHO. 1995). The widest acceptable difference in height and weight was 0.1cm and 0.1kg respectively.

Supervision

All the activities during the entire study period were closely monitored and supervised by the researcher. The researcher ensured that all the questionnaires were filled correctly by the research assistants and the figures indicated were verified at the end of each day,

3.2.10 Data management and Analysis

3.2.10.1 Data Management

Questionnaires were edited for data quality control, and then data was coded and entered into the Statistical Programme for social sciences (SPSS 16.0). The data was cleaned by running frequencies and checking for normality and kurtosis. Data was crosschecked for erroneous entry and explored to check for outliers, which were corrected in the final analysis for figures which were improbable by referring back to the questionnaire for the right data.

3.2.10.2 Data Analysis and Statistical Methods

SPSS 16.0 Statistical package, Ms-Excel and Nutrisurvey software were used to analyze data. Descriptive statistics and graphs were generated using the software. These provided general

information on the socio demographic characteristics of the population by running frequencies, measures of central tendency, cross tabulations and variations.

The independent sample t-test was used to compare means and chi square test to find out the association between the variables. In comparing the mean BMI and waist circumference per age group a one-way ANOVA was applied.

To evaluate the association between obesity and predisposing factors, logistic regression analysis was used for the factors that had manifested positive association under the chi square test. To assess association between continuous variables, Pearson correlation statistics was used. Significance level was set at 5%.

To assess whether the energy intake of the respondents is within acceptable levels, calculations were done based on the Goldenberg equation (Black, 2000).

PAL (Physical activity level) X Exp [-2 X $\sqrt{(23^2+8.5^2+15^2)/100)/\sqrt{n}}$]

Where: n= 275, is the sample size

23= coefficient of variation: is the within-subject variation in energy intake

8.5= coefficient of variation: is the within-subject variation in repeated BMR measurement

15= coefficient of variation: is the between-subject variation in PAL

The lower and upper energy levels are going to be used to determine under reports and over reports in the energy levels of the respondents.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents the results of the study based on the specific objectives of the study and where possible stratification by age, sex and some selected socio-demographic variables was made to allow for valid statistical comparisons among these groups.

4. 1 Socio-economic characteristics of the study population

A total of 275 adult patients were involved in the study of whom 53.1% (146) were females and the rest (46.9%, n=129) males with the male to female ratio being 0.883. The mean age of the study participants was 40.06 (±12.18) years and the median age was 38 years. The youngest participant was 18 years old while the eldest was 78 years of age. With a 5% error rate, the mean age of men (42.4±13.3) was significantly higher than that of women (38±10.8) (t_{273} =2.982; p=0.003). By marital status, majority (71.3%) of the participants were married followed by those who were single (22.5%) then those who were widowed and separated/divorced at 4.7% and 1.45% respectively.

Slightly more than half of the participants (52.7%) had attained secondary education or higher. More than half of the participants (54.5%) were self employed followed by formal employment at 31.6%. Table 4 presents information on the socio-economic characteristics of the study participants.

Table 4: Socio-economic characteristics of the study participants

Characteristic		Frequency	Percent
Marital Status (n=275)	Married	196	71.3
	Divorced/separated	4	1.5
	Widowed	13	4.7
	Single	62	22.5
Highest Educational level (n=275)	No formal education	2	0.7
	Primary	59	21.5
	Secondary	84	30.5
	Tertiary	130	47.3
Occupation of participant (n=275)	Casual worker	5	1.8
	Unpaid family member	23	8.4
	Self employed	150	54.5
	Unemployed	10	3.6
	Formal employment	87	31.6
Occupation of participant of spouse (n=196)	Casual worker	6	3.1
	Unpaid family member	11	5.6
	Self employed	96	49.0
	Unemployed	9	4.6
	Formal employed	74	37.8
Income category (n=254)	<= 10000.00	58	22.8
	10001.00 - 25000.00	85	33.5
	25001.00 - 40000.00	68	26.8
	40001.00 - 55000.00	22	8.7
	55001.00 - 70000.00	20	7.9
	70001.00+	1	0.4
House tenure (n=275)	Rented	157	57.1
	Owned	118	42.9
Ownership of household items (n=275)	Television	250	90.9
	Radio	260	94.9
	Vehicle	88	32.0
	Bicycle	67	24.4
	Motorcycle	28	10.2
	Mobile phone	275	100.0

Majority (84.2%) of the female participants indicated that they make decisions on household expenditure on food by themselves compared to their male counterparts (41.9%), figure 1. The mean monthly expenditure of the study participants on food was Kshs.9278.30 and the median was kshs.8000 with the lowest and the highest expenditures being Kshs.800 and Kshs.25000 respectively.

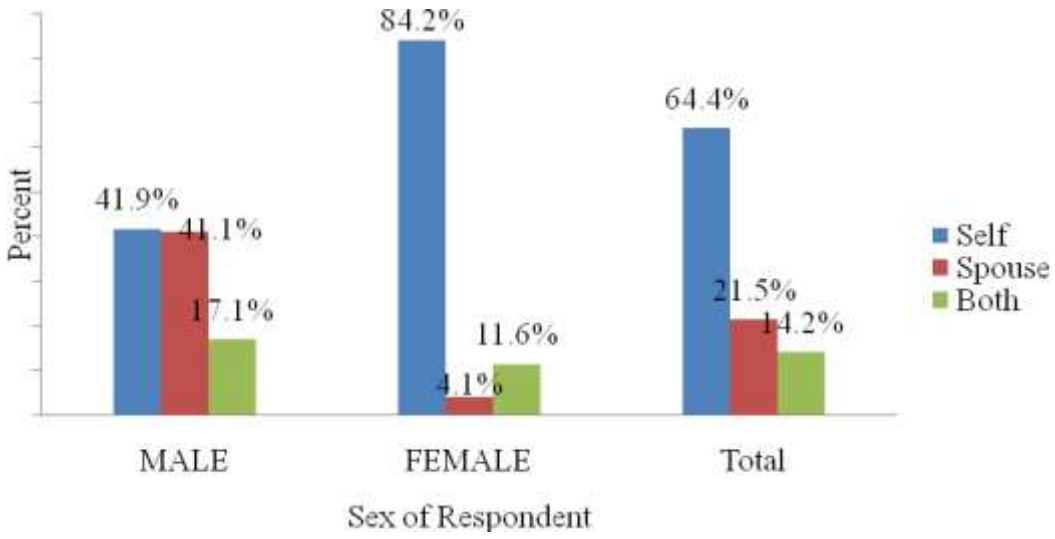


Figure 1: Distribution of respondents by decision on food expenditure and sex

Regarding wealth, using the index that is presented in section 3.2.5.1, the results show that 10% of the respondents were categorized as less wealthy with slightly less than half of them being of average wealth. Nearly half of them were wealthy (44.4%).

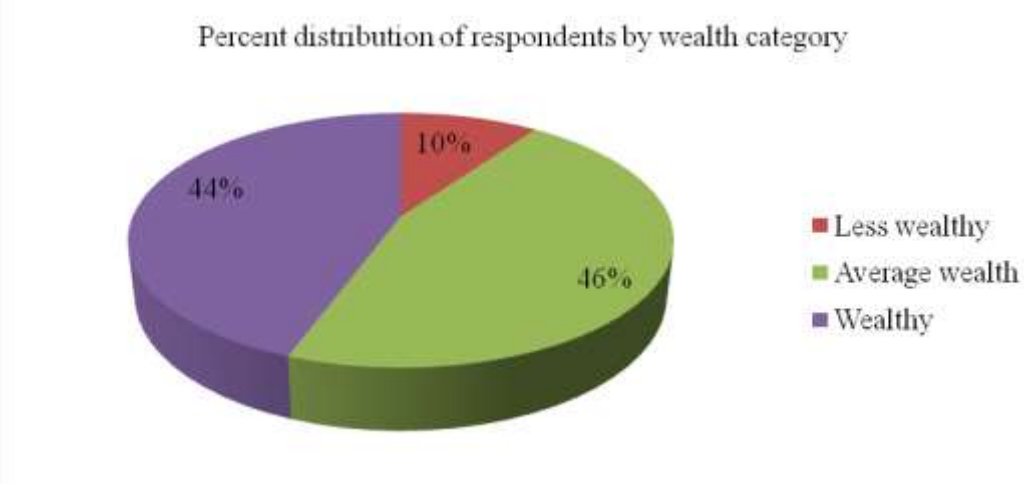


Figure 2: Distribution of respondents by wealth category

Among those who were overweight and obese, majority (76.2%n=141) had above primary level education as shown in table 5.

Table 5: Distribution of respondents by education level and body mass index

	BMI category		Total
	Normal N=90	overweight/obese N=185	(N=275)
Primary level	18.9% (n=17)	23.8% (n=44)	22.2% (n=61)
Above primary level	81.1%(n=73)	76.2%(n=141)	77.8% (n=214)

4.2 Prevalence of overweight and obesity

A total of 275 respondents were assessed with the overall prevalence of overweight and obesity being 67.2%. According to BMI 36.7% (n=101) were overweight and 30.5% (n=84) were obese. According to waist circumference, 30.2% men and 68.5% women were obese while 25.6% men and 16.4% women were overweight. Almost half (49.8% n=137) of the respondents were overweight and obese based on the waist hip ratio (table 6). The mean weight for the respondents was 75.7 Kg ± (1.28) while the mode and median were 80 kg and 75 Kg respectively. Their weight ranged between 48-115 kg.

The respondents had a mean BMI of 27.7 Kg/m^2 (±4.99). The lowest BMI was 16.9 Kg/m^2 while the highest was 43.6 Kg/m^2.

Table 6: Prevalence of overweight and obesity

Variable	Normal			Overweight			Obese		
	male	Female	Total (%)	male	Female	Total (%)	male	female	Total (%)
BMI	38% (n=49)	28.1% (n=41)	32.7	39.5% (n=51)	34.2% (n=29)	36.7	22.5% (n=50)	37.7% (n=55)	30.5
WC	44.2% (n=57)	15.1% (n=22)	28.7	25.6% (n=33)	16.4% (n=24)	20.7	30.2% (n=39)	68.5% (n=100)	50.6
WHR	73.9% (n=102)	26.1% (n=36)	50.2	19.7% (n=27)	80.3% (n=110)	49.8			

Among the total male respondents assessed, 129 (46.9%), most 52 (40.3%) were overweight and 34% were obese. This trend was similar but greater compared to the total female assessed 146 (53.1%), where 50 (34.2%) within the overweight category. However, more females (37%) than males were found to be obese. When respondents were categorized according to BMI and sex, more men (39.5 n=51) were overweight than women (34.2 n=29) while more women (37.7 n=55) were obese than men (22.5 n=50). There was a significant difference in the mean BMI between males and females (p=0.001)

There was a significant difference of mean BMI among the age groups (p=0.000). As shown in table 7, the mean BMI gradually increased from the lowest mean BMI age of 18 years and decreased from the age of 54 years.

Table 7: Mean body mass index by age groups

Age Groups	Mean (27.74)	SD (4.72)	C.I	One-way ANOVA
18-27 yrs	24	4.3	22.1-25.8	F_5=9.73
28-37 Yrs	27.3	4.9	25.0-27.2	p<.000
38-47 Yrs	28.1	4.6	27.3-29.1	
48-57 Yrs	30.2	5	28.3-31.5	
≥58 Yrs	29.1	4.8	27.5-31.3	

Among the study respondents, the mean waist circumference for males and females was 96.4(±14.4) cm and 93.7± (12.3) cm, respectively. The median and mode of the waist circumference were found to be 94.8cm and 82 cm respectively. The lowest waist circumference was 67.0 cm while the highest was 108.5 cm. The hip circumference ranged from 80-138.8 cm. Cut offs of 0.8 and 1.0 were used to categorize both female and male respondents respectively into normal (≤0.8 and ≤1.0) and high waist hip ratio (≥0.8 and ≥1.0). Of the 129 male respondents in the study, majority 102 (79.0%) had waist hip ratio less than 1 (Normal) while only 27 (20.9%) had waist hip ratio of greater than 1 (High). On the other hand, of the 146 female respondents interviewed, majority 115 (78.7%) had waist hip ratio greater than 0.8 (High) while 31 (21.2%) had waist hip ratio less than 0.8 (Normal).

Table 8 shows there was no significant difference of mean waist circumference between male and female respondents.

Table 8: Mean waist circumference by sex and age groups

Sex	Mean Waist Circumference	SD	Student t-test
Male (n=129)	96.4	14.4	t0.025, 273=1.659
Female (n=146)	93.7	12.3	p=0.098
Age Groups	**Mean Waist Circumference**	**SD**	**ANOVA**
18-27 yrs	83.30	10.9	F_5=15.37
28-37 Yrs	93.6	15.4	p=.000
38-47 Yrs	96.5	9.4	
48-57 Yrs	102.0	11.8	
≥58 Yrs	101.2	10.3	

A comparison of mean waist circumference by age groups showed highly significant difference among these groups as shown in table 8.

Waist circumference for both male and female were categorized into three groups (WHO, 2002). Male were categorized into normal <94.0 cm, medium 94-102 cm and high waist circumference >102 cm. Out of the 129 male respondents, 44.2% had normal waist circumference, while more than a half had waist circumference of above 94 cm as shown in figure 3. On the other hand, female respondents were categorized into normal waist circumference <80 cm, medium 80-88cm and high >88 cm. Of the 146 female respondents interviewed, majority (68.5%) had waist circumference above 88cm as shown in figure 3.

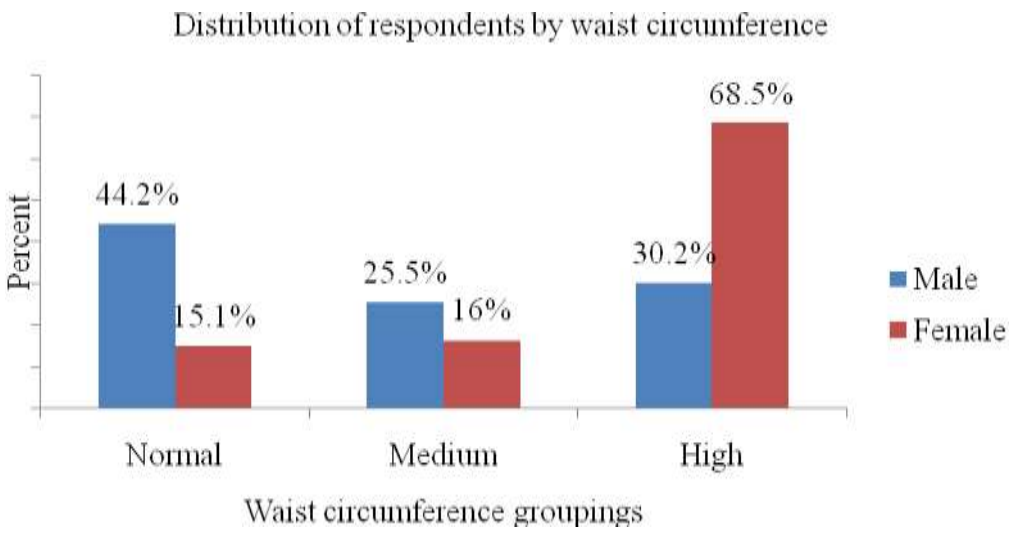


Figure 3: Distribution of respondents by waist circumference

Figure 4 below shows the trend in mean BMI and waist circumference and the different age categories.

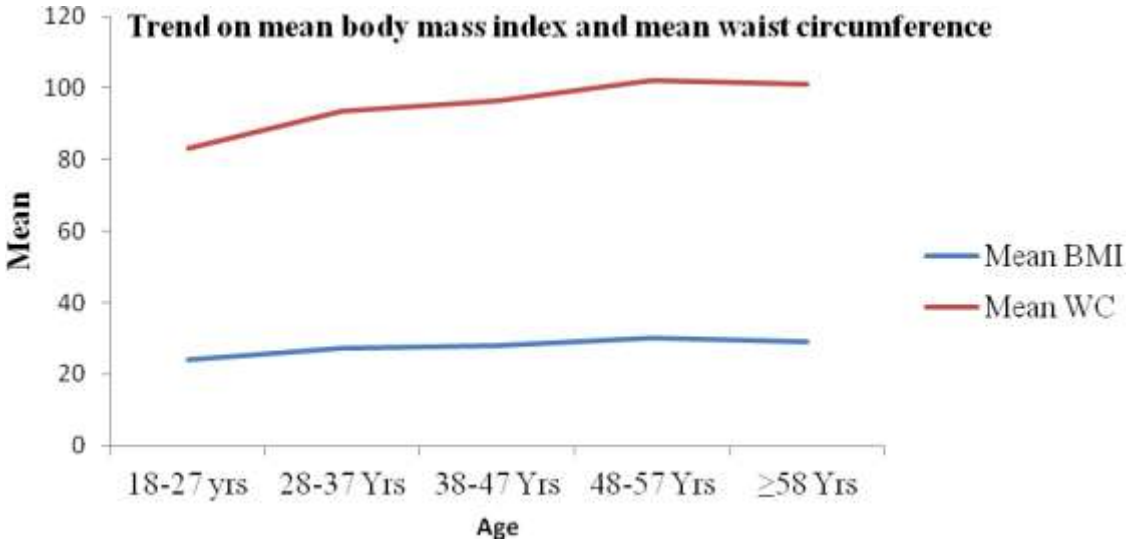


Figure 4: Trend on body mass index and waist circumference

Waist-Hip Ratio

Waist and hip circumference was combined to waist hip ratio (WHR). The mean Waist-Hip ratio for the male respondents was 0.93 (± 0.11) while that of females was 0.85 (± 0.08). Different waist hip ratio cut off points was used for male and female respondents. Cut off points of <1.0 (Normal WHR) and >1.0 (High WHR) were used for males while <0.8 (Normal WHR) and >0.8 (High WHR) were used for females.

4.3 Food and meal consumption frequency

As shown in table 10, majority of the respondents reported that they consumed breakfast and lunch on a regular basis while almost all took dinner.

Table 9: Meal consumption frequency of the respondents

Meal type	% of Respondents (N=275)		
	Regular	sometimes	Rarely
Breakfast	74.2	18.5	7.3
Mid-morning snack	24.0	30.2	45.8
Lunch	56.7	33.8	9.5
Afternoon snack	16.7	22.9	60.4
Dinner	92	6.2	1.8
Evening snack	5.5	8.4	86.2

The results show that about a third of the respondents do not take lunch on a regular basis and that they are more likely to take a mid-morning snack than any other snack in between meals. Less than half (39.3% n=108) of the respondents took the main meals followed closely by those who took only breakfast and dinner (31.3% n=86). The overweight and obese respondents also took the same meals at a higher percent, 38.4% n=71 for the main meals and 30.8% n=57 for breakfast and dinner only as shown in table 11.

Table 10: Distribution of respondents by meal consumption and body mass index

Meal consumption	BMI category		Total (n=275)
	Non overweight/obese (n=90)	Overweight/obese (n=185)	
All meals (B+L+D+S)	2.2% (n=2)	7.0% (n=13)	5.5% (n=15)
Main meals (B+L+D)	41.1% (n=37)	38.4% (n=71)	39.3% (n=108)
B+L	2.2% (n=2)	3.2% (n=6)	2.9% (n=8)
B+D	32.2% (n=29)	30.8% (n=57)	31.3% (n=86)
L+D	14.4% (n=13)	8.6% (n=16)	10.5% (n=29)
B/L/D	7.8% (n=7)	11.9%(n=22)	10.5% (n=29)

*B (Breakfast), L (Lunch), D (Dinner) and S (Snack)

Majority of the respondents consumed vegetables and dairy products more frequently compared to the other food groups as shown in table 12. Among the carbohydrates, the most preferred was bread where more than a third of the respondents (39.8%) reported to be consuming it on a daily basis. This was closely followed by ugali (23.6%) among others. Among the complex carbohydrates, Irish potatoes were most preferred and about 22% of the respondents consumed them daily. Beans were the most preferred legumes where about 22% of the respondents reported to consuming them two times in a typical week.

Table 11: Food consumption frequency

Food group	Frequency (N=275)		
	1-3 times a week (%)	4-7 times a week (%)	Rarely/never (%)
Cereals	31.12	27.5	41.36
Legumes	37.53	13.73	48.73
Roots and tubers	23.6	14.62	61.84
Meat and meat products	28.08	10.92	61
Dairy and dairy products	16.55	48.15	35.25
Vegetables	18.98	66.35	14.68
Fruits	22.2	24.35	53.43
Beverages	7	21.62	71.48
Fast foods	20.48	8.4	71.66
Sugar/alternatives	5.45	41.65	52.9
Nuts	29.1	15.6	55.3
Spreads	11.45	19.75	68.9

The average daily energy intake was 3505 kilocalories, while fats and carbohydrates provided 37% and 49% of the average daily energy intake respectively. Protein provided 14% of the average daily energy intake.

The results show that frying was the most commonly used cooking method (88.4%) followed by boiling (8%) and the least was steaming (1.1%). The most commonly used cooking oil is vegetable oil (82.2%) with the rest using cooking fat. Comparison of the mean BMI of the respondents based on the cooking method showed no significant difference ($F_{3,\ 271}$=0.535, p=0.658).

4.4 Physical activity levels of the respondents

In reference to section 3.2.5.4, majority of the study respondents spent less than 60 minutes engaged in physical activities (84.36% n=232) with only 15.64% (n=43) being engaged in physical activities for more 60 minutes in a week. In terms of intensity, majority (60% n=165) engaged in moderately intense physical activity with only 2.5% n=7 engaging in vigorous activity and the rest (37.5% n=103) being in active.

About two thirds of the respondents (66.9%) engaged in some form of physical exercise with almost half of them (49%) having walking as their usual physical activity. Jogging was the second most preferred form of physical activity (figure 4). The study results show that most respondents do not actively engage in physical exercise and that the few who participate in physical exercise do so as part of their normal routine such as commuting, shopping among others.

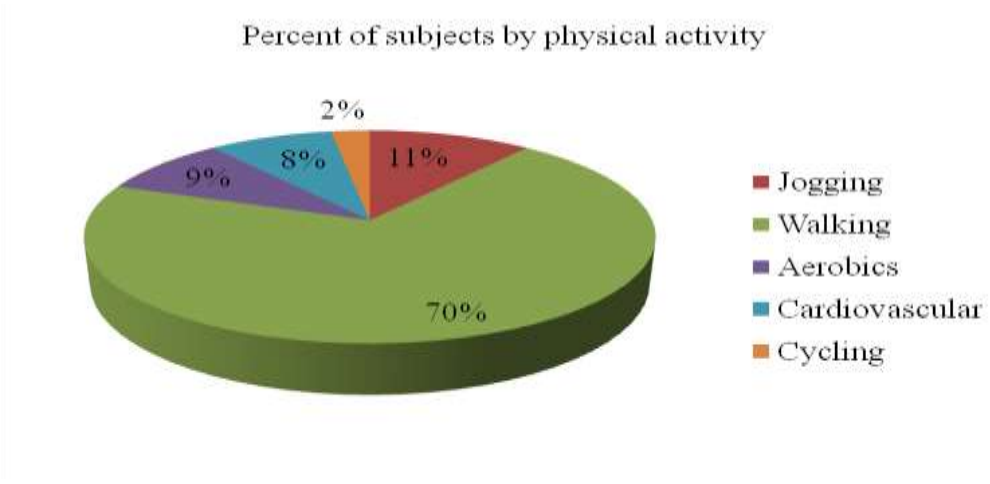


Figure 5: Percent distribution of respondents by physical activity type

The average working hours for the respondents were 8.6±2.34 hours per day with the shortest and longest working hours being 2 and 16, hours respectively.

When intensity of physical activity and time were assessed together in relation to BMI, majority (60% n=165) of the respondents were engaged in physical activity but for less than an hour. Majority (58.9% n=109) of the overweight and obese were engaged in physical activity but for less than an hour (table 13).

Table 12: Distribution of respondents by physical activity level

Physical activity level	BMI categorization		Total (n=275)
	Non-overweight /obese (n=90)	Overweight/obese (n=185)	
Inactive	10.0%(n=9)	6.5% (n=12)	7.6% (n=21)
Active for less time	62.2% (n=56)	58.9% (n=109)	60.0% (n=165)
Moderate intense	24.4% (n=22)	33.5% (n=62)	30.5% (n=84)
Vigorous intense	3.3% (n=3)	1.1% (n=2)	1.8% (n=5)

* Inactive-not engaging in any physical activity, Active for less time- engaging in physical activity but for less than an hour, moderate intense- engaging in moderately intense physical activity for more than an hour, vigorous intense- engaging in vigorously intense activity for more than an hour.

According to the Goldenberg equation 1.55 was used as the physical activity coefficient as majority of respondents engaged in light activity physical activity.

$1.55 \text{ X Exp } [-2 \text{ X } \sqrt{(23^2+8.5^2+15^2)/100)}/\sqrt{n}]$

$1.55 \text{ X Exp } [-2 \text{ X } \sqrt{(23^2+8.5^2+15^2)/100)}/\sqrt{275}] = 1.22$ (lower PAL)

$1.55 \text{ X Exp } [2 \text{ X } \sqrt{(23^2+8.5^2+15^2)/100)}/\sqrt{275}] = 1.95$ (upper PAL)

1.22 was used as the lower limit and1.95 as the upper limit in calculating energy intake.

Therefore: at 95% CL, for light activity 1.55 and with the mean energy intake for respondents being 3505. And the recommended energy intake for the females being 1800 and for males being 2400.

Lower limit for women:

Energy Intake = 1.22X1800

= 2196

Upper limit for women:

Energy Intake = 1.95X1800

=3510

Lower limit for men:

Energy Intake = 1.22X2400

= 2928

Upper limit for men:

Energy Intake = 1.95X2400

=4680

4.5 Associations of overweight and obesity

Socio demographic characteristics were associated with overweight and obesity. There was a significant association between age, sex, marital status and education with overweight and obesity; x^2=37.53, df=8, p=0.000, x^2=7.75, df=2, p=0.021, x^2=11.025, df=2, p=0.004 and Fischer exact value 20.01, p=0.001 respectively. A significant association was also noted between the wealth status, occupation and overweight and obesity (x^2=11.43, df=2, p=0.003 and Fisher's exact value 12.928, p =0.008 respectively). A highly significant association was noted between sex of the respondents and the Waist Hip Ratio (χ2= 81.11, df=1, p=0.000).

Regression analysis showed a weak positive relationship between the BMI of the respondents and their age (r=0.3) with 10% of the BMI being explained by variation of age among the respondents (Coefficient of determination r^2=0.099). There was a weak correlation between age and waist circumference of the respondents (r=0.4) and only 17% of the change in waist circumference is explained by variation of age among the respondents (r^2=0.168). There was a weak correlation between age and waist hip ratio of the respondents (r=0.4) and only 16% of the change in waist hip ratio is explained by variation of age among the respondents (r^2=0.16). There was weak correlation between waist hip ratio and BMI of the respondents interviewed (r=0.295) with 9% of change in BMI is explained by variations in waist hip ratio (r^2=0.087). However, there was a strong correlation between waist circumference and BMI of the respondents interviewed (r=0.707) with 50% of change in BMI is explained by variations in waist circumference (r^2=0.499).

No significant association was found between meal consumption pattern (χ2= 4.17, df=4, p=>0.05) and food consumption frequency (χ2= 7.60, df=4, p=>0.05) with overweight and obesity. There was no significant association between overweight and obesity and duration and intensity of physical activity done (fisher exact value 4.52 and p>0.05). No significant association was found between overweight and obesity and length of time taken to engage in physical activity was also found ((χ2= 0.62, df=2, p=>0.05).

A logistic regression analysis was done to find out the factors associated with overweight/obesity among the study participants and the results are as illustrated in table 14 below.

Table 13: Predictive factors associated with overweight/obesity

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Sex	-.853	.301	8.038	1	.005	.426
Age (18-27yrs)			14.125	4	.007	
Age (28-37yrs)	-1.892	.662	8.169	1	.004	.151
Constant	1.098	.665	2.724	1	.099	2.997

Dependant Variable: Overweight/Obesity (*significant predictor)

As shown in Table 14, a statistically significant model, χ^2 (6) = 50.17, p=0.000 emerged. Sex and age between 18-38 years were significant contributors to overweight/obese among the respondents interviewed. The null hypothesis for this study is rejected that there is no significant association between socio demographic characteristics and overweight and obesity as results show that there is a significant association with age, sex, education level, marital status and wealth status. However, no significant association was found between overweight and obesity and meal and food consumption frequency, and physical activity level even when controlling for age and sex.

CHAPTER FIVE: DISCUSSION

5.0 Introduction

This chapter is a self-critique of the findings and analyses of how the results obtained compare to other researches done in the area of study. Therefore a discussion on the dependent and independent variables is presented. The main dependent variable was overweight/obesity determined by BMI of above 24.9 (WHO, 2002).

5.1 Socio-demographic of the study population

The ratio of male to female was 0.883 which is consistent with the National figures of male to female ratio (KNBS, 2010). There was a significant association between sex and overweight and obesity, and males had a lower likelihood of becoming overweight and obese which is similar to the findings of other studies in Ghana (Biritwum, et al., 2005 Amoah, 2003), South Africa ((Van Der Merwe and Pepper, 2006), (Puoane, et al., 2002), Latin America (Uauy, Albala, and Kain, 2001), Cameroon (Kamadjeu et al., 2006), U.S (Andajani-Sutjahjo, et al., 2004) and rural China (Zhang, et al., 2008), which have also estimated the prevalence of overweight and obesity to be higher among females than in males.

Females have a tendency to channel extra energy into fat storage while males use more of this energy for protein synthesis (WHO, 2000). This energy usage in females contributes to further positive energy balance and fat depositions because storage of fat is far more energy- efficient than that of protein and also will lead to a lowering of lean –to - fat tissue ratio with the result that Resting Metabolic Rate does not increase at the same rate as body mass (WHO, 2000). Pregnancy has been associated with excess weight gain and development of overweight, with such changes persisting beyond 1 year postpartum (Gunderson and Abrams, 1999). Higher pregnancy-related weight gains for women already overweight before pregnancy have also been

reported (Rooney and Schauberger 2002; Linne and Rossner, 2003). It would therefore be expected that females have an increased likelihood of being overweight and obese as observed in this study.

This study showed a significant relationship between the BMI of the respondents and their age. A comparison of mean BMI by age groups shows that respondents within 48-57 years age group had the highest mean BMI. Mean BMI gradually increases from youthful age and starts to decrease as one approaches old age. Similar findings indicate the prevalence of overweight and obesity vary greatly with age, generally increasing until 48-57 years and then decline (Kamadjeu, et al. 2006). A study in U.S showed the prevalence of obesity among middle-aged adults aged 40–59 was higher than among younger adults aged 20–39 or older adults aged 60 and over (Ogden, et al., 2013).

Most people tend to experience a reduction in their metabolic rate as they age as a result of changes in the body's relationship with calories (St-Onge and Gallagher, 2009). With age, the energy expenditure drops due to a decline in resting metabolic rate (Luhrmann, 2010), there may also be a reduction in the conversion of stored body fat to energy (Perichon and Bourre, 1995) and there is an age-related reduction in fat-free mass in the body which means a proportionate loss of this more metabolically active and energy-burning muscle tissue (St-Onge and Gallagher, 2009).

Marital status of the respondents had a highly significant association with overweight and obesity. These findings agree with other study findings that show entry into marriage among both men and women is associated with weight gain (Wilson, 2012). The reasons for this are not

clear. It has been suggested, however, that there could be a reduction in energy spent courting, and increase in contentment and social eating. However gender differences may exist in the rate of body weight change after marriage with more immediate changes in women more than in men (Rauschenbach, et al., 1995). A significant association was noted between the wealth status and overweight and obesity. This is consistent with a study done in Australia that indicates obesity mostly affects middle-aged adults (especially women) from wealthy, urban environments (Boyd et al., 2011).

5.2 Prevalence of overweight and obesity

The prevalence of overweight and obesity within this population was relatively high at 67.2% and agrees with the increase in overweight and obesity among the rural urban populations as highlighted by some studies done in seven African countries; Malawi, Senegal, Kenya, Ghana, Tanzania, Niger and Burkina Faso (Ziraba, et al., 2009; Martorell, et al., 2000). Other studies that were done in Cameroon (Kamadjeu, et al., 2006; Sodjinou, et al., 2008)), indicate that as much as 20-50% of the urban population of African countries is either overweight or obese. One survey showed that on average 31.4% of women are overweight or obese, with prevalence as high as 38% among urban women in Kenya (Ziraba, et al., 2009). A hospital based study done in Ghana showed a high prevalence of overweight and obesity at 21% and 17% respectively (Amegah, 2011).

A comparison of mean waist circumference by age groups showed a significant difference among these groups, the mean waist circumference increases with age as does BMI. These findings collaborate with other findings that show a close correlation between WC, WHR and BMI (Lean, et al., 1995). Waist Circumference can approximate intra-abdominal fat mass (Han,

et al., 1997) and total body fat (Lean, et al., 1996). In this study females compared to males had higher Waist Circumference, which may imply that central obesity is more common in females than in males as shown by a study done in Northern Iran on adults (Veghari, et al., 2012). There was a significant relationship between waist hip ratio and the BMI of the respondents. As discussed earlier, WHR correlates closely with BMI.

The tendency for abdominal obesity is greater in men than in women, because the female sex hormone protects women against fat accumulation in the abdominal cavity. However, abdominal obesity is seen in many women. After the menopause, the tendency for abdominal obesity is as great as in men exercise (Després, 2006). The following factors will increase fat accumulation: smokers have more fat in their abdominal cavities than non-smokers; those who consume large quantities of alcohol have more internal fat than moderate drinkers; there is less visceral fat in people who are overweight and exercise than in those who do not exercise (Després, 2006).

5.3 Food and meal consumption frequency

No significant association was found between the meal consumption pattern and overweight and/or obesity in this study. Results from an experimental study done on women aged 20-40 years in U.S and another study in the same country among adults indicate that a greater number of eating episodes each day was associated with a lower risk of obesity; skipping breakfast was associated with increased prevalence of obesity (Keim, et al., 1997 and Yunsheng, et al., 2003).

Results from previous studies suggest that eating frequency may be causally associated with body weight and weight changes (Bellisle et al., 1997). Eating multiple, small meals may suppress hunger and overall serum insulin concentrations (Jenkins, 1989). Insulin inhibits lipase enzyme activity and increases fat deposition. Since insulin is related to fatty acid storage, meal frequency may be one of the factors affecting body weight. There also are reports suggesting that

individuals who do not eat breakfast have a greater overall daily energy intake (Stanton, 1989). In a human study in which 35 individuals were instructed to keep a continuous record of their eating behavior during a 10-week behavioral weight loss program, an association between meal skipping and overeating at subsequent meals was documented. (Schlundt et al.,1989).

A study using data from the National Weight Control Registry (Wayatt et al., 2002) suggests that eating breakfast is a characteristic common to successful weight loss maintainers and may be a factor in their success. Data suggest that the consumption of carbohydrate-rich foods in the late evening leads to increased glycogen levels in the muscles (Keim et al., 1997). Unless this stored glycogen is burned as fuel, it will ultimately be stored as fat. Therefore, consumption of late-evening meals with carbohydrate-rich foods may also be related to obesity through its effect on hormonal regulation of energy and lipid metabolism (Keim et al., 1997). The current results differ from these studies which may be attributed to the differences in sample size and study methodology.

In this study, the average daily energy intake was 3505 kilocalories, while fats and carbohydrates were 37% and 49% of the average daily energy intake respectively. The energy intake was more than the average recommended daily intake for a healthy adult in Kenya of 1860 kilocalories (FAO, 2001). However, the energy intake of respondents both males and females was within acceptable limits based on the Goldenberg equation, (Black, 2000) and the energy intake cut off values (USDA/HHS,) Further, most of this energy was from fat intake which was also more than the recommended percentage daily intake (30%). A positive energy balance occurs when energy intake is greater than energy expenditure; hence, extra energy intake promotes an increase

in energy stores and body weight. This implies a higher prevalence of obesity being observed in the study population with time.

5.4 Physical activity levels

Majority of respondents were found to engage in physical activity below the WHO recommendations. WHO recommendations stipulates that throughout a week, including activity for work, during transport and leisure time, adults should do at least 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous-intensity physical activity (WHO, 2006)

In this study, no associations were found between physical activity and overweight and obesity. However other studies indicate that physical activity is a key determinant of energy expenditure and thus fundamental to energy balance and weight control (Zhang, et al., 2008, Sodjinou, et al., 2008 and Rguibi and Belahsen, 2006). In the Rguibi and Belahsen study done in a Moroccan women population, women who spent more time in sedentary behaviour were more obese than those who did not. Exercise was found to a strong determinant of obesity in a hospital based study done in Ghana with respondents who did not exercise being found to be about four times more likely to be obese than their counterparts who did exercise (Amegah, 2011).

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

Conclusions

In relation to the study objectives,

There is a high prevalence of overweight and obesity among adult (18 and above) patients seeking health care at PCEA Kikuyu hospital, in Kiambu County, whether measured by BMI, WC or WHR.

Socio-demographic factors have a relationship with overweight and obesity among patients seeking healthcare at PCEA Kikuyu Hospital. Age and sex are predictive factors for being overweight and obese among patients seeking healthcare at PCEA Kikuyu Hospital.

There is no relationship between meal and food consumption frequency as well as physical activity and overweight and obesity among patients seeking healthcare at PCEA Kikuyu Hospital.

Among the overweight and obese patients seeking healthcare at PCEA Kikuyu Hospital, there is skipping of meals with many taking either two meals in a day or only one meal regularly. Physical activity levels are below the WHO recommendations among patients seeking healthcare at PCEA Kikuyu Hospital.

Recommendations

The high rates of overweight and obesity among patients seeking healthcare at PCEA Kikuyu Hospital point to a need for behaviour change related to improved lifestyle through increased physical activity and improved dietary practices. There is need for nutrition education by health professionals on adequate meal consumption patterns as findings from this study show that

patients seeking healthcare at PCEA Kikuyu Hospital were not consuming their meals frequently.

Patients seeking healthcare at PCEA Kikuyu Hospital need awareness on increasing their physical activity, both planned and unplanned, for instance by walking or enrolling in facilities that offer planned physical activity. For patients seeking healthcare at PCEA Kikuyu Hospital who cannot afford these facilities, walking or jogging would be viable for them.

Health professionals need to encourage patients seeking healthcare at PCEA Kikuyu Hospital to monitor their nutrition status by using simple anthropometric measurements, such as the Waist Circumference as an independent measure of central obesity which is strongly associated with cardiovascular disease risk factors such as hypertension.

Subsequent studies should be undertaken by the Ministry of Health and other research bodies on overweight and obesity and other related factors in Kenya.

Monitoring and evaluation should be done to assess the impact of strategies that have been laid down in the national nutrition action plan to combat overweight and obesity.

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Appendices

Appendix 1: Informed Consent Form

Main objective and purpose of the research
To investigate prevalence and determinants of overweight and obesity in adult patients seeking healthcare services PCEA Kikuyu Hospital, Kenya. The purpose of the proposed study is to generate information on the prevalence and determinants of overweight and obesity in Kiambu County, Kenya.

Benefits
The study aims at contributing towards decreasing morbidity and mortality due to non-communicable diseases in Kenya. This information will help you to know your nutritional status as a participant which is useful especially in making relevant and informed choices; dietary and lifestyle including physical activity. The information is also expected to be useful to the Government of Kenya and other stakeholders with an interest in public health in planning and designing relevant interventions.

Procedure
Upon your consent, you will be asked questions related to your social demographic characteristics, dietary intake, and daily activity. You will also be weighed and your height, waist and hip circumference will be measured by a team of trained research assistants (RA's).

Your role in the study
You are requested to cooperate in the study by answering the questions in the questionnaire and providing any other information that pertains to the study. You are requested to be as honest as possible and the information collected will be treated with utmost confidentiality.

Risks
There are no risks associated with your participation in the study.

Compensation
Your participation is voluntary and therefore, you will not receive any form of compensation if any that may not have been specified earlier.

Your rights as a participant
This study is protected and approved by human ethics committee (KNH, UoN). In the event that you feel that you do not want to participate in this study, you are free to do so without losing any benefits or entitlements (if any) that may/not has been specified earlier.
If you have any questions about your rights as a research participant, please contact:
The secretary KNH/UoN Ethics review committee, P. O. Box 1976/20723-00202, Nairobi, Kenya, or, Tel 254-020-2726300 Ext44355, or, Email uonknh_erc@uonbi.ac.ke or by accessing their website at http://www.uonbi.ac.ke/activities/KNHUoN.

Volunteer agreement
I have read the consent form describing benefits, risks and procedures for "***Prevalence and Determinants of Overweight and Obesity among Adult Patients seeking Health Services in PCEA Kikuyu Hospital, Kenya.***"
I voluntarily agree to participate:

Signature_____ Date_____

Thumbprint *(if participants cannot write)* _____

For official use only
I certify that the nature and purpose, the potential benefits and possible risks associated with participating in this study, have been explained to the above individual.

Signature_____Date_____

Appendix 2: Study Questionnaire

Date _____ Name of interviewer _____

Questionnaire No: _____ Sex_____ Age_____

Instructions: *circle where necessary*

<table>
<tr><td colspan="3">Demographic and Socioeconomic Information</td></tr>
<tr><td>Q1. Residential County
1. Kikuyu
2. Kiambu
3. Nairobi
4. Others (specify_____</td><td>Q2.Highest level of education
1. No formal education
2. Primary
3. Secondary
4. Tertiary
5. Adult literacy</td><td>Q3. Occupation
1. Casual worker
2. Unpaid family member
3. Self employed
4. Unemployed
5. Formal employment
Specify_____
Q4. If unemployed, source of income_____</td></tr>
<tr><td>Q5. Marital status
1. Married
2. Divorced/separated
3. Widowed
4. Single</td><td>Q6. if married , spouse occupation
1. Casual worker
2. Unpaid family Member
3. Self employed
4. Unemployed
5. Formal employment
Specify_____</td><td>Q7. Which of the following items do you have
1. TV
2. Radio
3. Vehicle
4. Bicycle
5. Motorcycle
6. Mobile</td></tr>
<tr><td>Q8. Do you live in
1. Rented house
2. Owned house
Q9. Number of rooms in the house_____</td><td>Q10. Total monthly income_____

Q11. Total monthly expenditure on food_____</td><td>Q12. Who makes discussions on food related budgets
1. Self
2. Spouse
3. Both
4. Children
5. Other_____</td></tr>
<tr><td colspan="3">HEALTH STATUS</td></tr>
<tr><td>Q13. Are you currently
1. Diabetic
2. Hypertensive
3. High cholesterol</td><td>Q14. Do you experience
1. Knee pain
2. Back pain
3. Heel pain</td><td>Q15. Do you experience
1. Breathlessness
2. Sleep apnea</td></tr>
<tr><td colspan="3">FOOD CONSUMPTION PATTERNS</td></tr>
<tr><td colspan="3">Q16. In the last three months how would you rate your meal consumption pattern</td></tr>
<tr><td>Breakfast
1. Regular
2. Sometimes
3. Rarely</td><td>Midmorning
1. Regular
2. Sometimes
3. Rarely</td><td>Lunch
1. Regular
2. Sometimes
3. Rarely</td></tr>
<tr><td>Afternoon snack
1. Regular
2. Sometimes
3. Rarely</td><td>Dinner
1. Regular
2. Sometimes
3. Rarely</td><td>Evening snack
1. Regular
2. Sometimes
3. Rarely</td></tr>
</table>

Q17. Most frequently consumed foods (more than 4 times per week**)**

	Frequency of consumption (tick where appropriate)									**Amount**
	1	2	3	4	5	6	7	8 (Rarely)	9 (Never)	ref. to food atlas
Cereals										
Bread										
Ugali										
Rice										
Spaghetti										
Wheatabix										
Others										
Legumes										
Beans										
Pea										
Lentils										
Green grams										
Soy beans										
Others										
Roots and tubers										
Arrow roots[										
Yams										
Cassava										
Sweet potatoes										
Irish potatoes										
Others										
Meat and meat products										
Chicken										
Fish										
Mutton										
Beef										
Pork										
Bacon										
Goat meat										
Others										
Dairy and dairy products										
Fresh milk										
Low fat milk										
Yogurt (full fat)										
Low fat yogurt[]										

Cheese										
Ghee										
butter										
Others										
	Frequency of consumption (tick where appropriate)									**Amount**
	1	2	3	4	5	6	7	8 (Rarely)	9 (Never)	ref. to food atlas
Vegetables										
Kales										
Cruciferous										
African leafy										
Onions										
Carrots										
Tomatoes										
Others										
Fruits										
Citrus										
Apples										
Mango										
Avocado										
Others										
Beverages										
Tea										
Coffee										
Soy										
Cocoa										
Chocolate										
Others										
Fast foods										
Chips										
Soda										
Crisps										
Cakes										
Sausages										
Sugar and alternatives										
Sugar										
Honey										
Artificial sweeteners										
Nuts										
Peanuts										
Cashew nuts										
Others										

Spreads										
Peanut butter										
Margarine										
Others										

Cycle where appropriate

Q16. Most frequently used cooking method 1. Frying 2. Boiling 3. Baking 4. Steaming 5. Stewing 6. grilling/roasting Other _____	**Q17. How often do you read/get information on food and diet?** 1. Weekly 2. Monthly 3. Once in 3 months 4. Rarely never	**Q18.Source of information** 1. Radio 2. TV 3. Newspaper 4. magazines 5. Dietician Other _____
Q19. Do you use Spices 1. Yes 2. No	**Q20. Type of oil used for cooking** 1. Vegetable Fat **2.** Vegetable oil Animal fat/ghee	**Q21. How would rate the amount of Salt you like in food** 1. High 2. Low 3. Medium
Q22. Do you add salt to food on the table 1. Yes 2. No	**Q23. If yes, how often** 1. Regular 2. Sometimes 3. Rarely	
LIFESYTLE		
Q24. About how many hours do you spent at work on a normal day_____	**Q25. If working away from home, do you carry packed lunch** 1. Yes 2. No	**Q26. How many times/week do you eat away from home** 1. Once 2. Twice 3. thrice 4. 4 times 5. More than 4 times
Q27. Do you engage in any physical activity? 1. Yes 2. No	**Q27. Do you engage in any physical activity?** 3. Yes 4. No	**Q28. Which is your usual physical activity** 1. Jogging 2. Walking 3. Aerobics 4. Cardiovascular 5. Cycling Other_____

General Practice Physical Activity Questionnaire

1. What is type and amount of physical activity involved in your work?

		Please mark one box only
a	I am not in employment (e.g. retired, retired for health reasons, unemployed, fulltime career etc.)	
b	I spend most of my time at work sitting (such as in an office)	
c	I spend most of my time at work standing or walking. However, my work does not require much intense physical effort (e.g. shop assistant, hairdresser, security guard, child-minder, etc.)	
d	My work involves definite physical effort including handling of heavy objects and use of tools (e.g. plumber, electrician, carpenter, cleaner, hospital nurse, gardener, postal delivery workers etc.)	
e	My work involves vigorous physical activity including handling of very heavy objects (e.g. construction worker, refuse collector, etc.)	

2. During the ***last one week,*** how many hours did you spend on each of the following activities? Please answer whether you are in employment or not; mark one box only on each row.

		None	**Some but less than 1 hour**	**1 hour but less than 3 hours**	**3 hours or more**
a	Physical exercise such as swimming, jogging, aerobics, football, tennis, gym workout etc.				
b	Cycling, including cycling to work and during leisure time				
c	Walking, including walking to work, shopping, for pleasure etc.				
d	Housework/Childcare				
e	Gardening/DIY				

3. How would you describe your usual walking pace? Please mark one box only.

Slow pace (i.e. less than 3 mph)	
Steady average pace	
Fast pace(i.e. over 4mph)	

Anthropometric Measurements	**1st Reading**	**2ndReading**	**Average**
Weight (kg)			
Height (cm)			
Waist Circumference			

Appendix 3: Training curriculum for training assistants

Day	Training Narrative	Teaching method
1	• clear understanding of the objectives • introduction to the measuring equipment calibration and use • how to measure weight and height • filling in the anthropometric data	Lecture Demonstration
2	• Consent letter communication • interview skills • filling in the questionnaire • administering of diet assessment tools	Lecture Demonstration
3	• assessment of each research assistants • pretesting, • adjusting questionnaire	Lecture Demonstration Role play Questions