BODY WEIGHT STATUS, EXERCISE ROUTINES AND NUTRITIONAL PATTERNS OF CLIENTS IN HEALTH CLUBS IN KAMPALA CITY, UGANDA

BY

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DECLARATION

I, Nahwera Loyce, declare that this is my original piece of work and it has never been submitted for award to any university or institution of learning.

Signature ..... Date .....

5th Dec. 2017

APPROVAL

This is to certify that this research study has been carried out by Nahwera Loyce under the title "Body Weight Status, Exercise Routines and Nutritional Patterns of Clients in Health Clubs in Kampala City, Uganda" has been under our supervision and is now ready for submission to Kyambogo University with due approval.

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DEDICATION

I dedicate this work to the Almighty God, my mother Mrs. Jovia Mbeera, my husband Mr. Geofrey Kiberu and my lovely daughter Yvette Blessing Nakiberu.

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ACRONYMS/ABBREVIATIONS

BMI:	Body Mass Index
CDV:	Cardiovascular diseases
HBP:	High blood pressure
OWO:	Overweight and obesity
PA:	Physical Activity
T2DM:	Type II diabetes mellitus
WC:	Waist circumference
WHO:	World Health Organization
WHR:	Waist to Hip Ratio

ABSTRACT

The prevalence of overweight and obesity (OWO) is increasing in developing countries including Uganda. This has been linked to lifestyle and work related pressure that has negatively influenced physical activity and nutritional patterns. The health and fitness industry has become increasingly crucial in providing some form of therapy to curb OWO. However little is known about clients who visited the fitness clubs. The study assessed the body weight status, exercise routines and nutritional patterns of clients in selected health clubs. Cross sectional survey design was used to assess body weight status, exercise routines and nutritional patterns of clients. Purposive sampling was used to select Kampala city, stratified sampling to select clients according to gender, and quota sampling to select two health clubs from each of the five divisions of Kampala city. Sample size was 206 clients and 100 clients responded. Questionnaires were used to collect data. Weight, height, waist and hip circumferences were measured. BMI, WC and WHR were computed. Data were analyzed using Statistical Package of Social Sciences version 16 and results presented using graphs, pie charts and tables. Using BMI, (45.3% male (M), 57.4% female (F), (18.9% M, 25.5% F) and (35.8% M, 17.0% F) were overweight, obese and normal respectively. Using WC, 51.06% F and 11.3% M were overweight or obese and using WHR, 24% M and 20% F were above the normal range. Results revealed that there was a significant relationship between BMI and WC scores of clients in Kampala health clubs, there was no significant relationship between BMI and WHR scores of clients in Kampala city health clubs and there was a significant difference between the weight status of female and male clients in Kampala city health clubs. Most clients took unhealthy diet and engaged in cardio training activities which alone may not provide optimal results. Study concluded that OWO are prevalent among clients in Kampala city and female clients were more overweight and obese than male clients. Study recommended appropriate exercise and nutritional programs for clients.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Body weight status refers to the way of determining a person's health (Alison & Leann 2008). It can be assessed using different anthropometric measures which include height, weight, Body Mass Index (BMI), mid upper arm circumference, skin fold thickness, bioelectrical impedance, waist and hip circumference, and Waist to hip ratio (WHR) (Delores, 2004).

According to Health Canada (2003), body weight status has got categories of underweight, normal weight, overweight and obese. A normal weight is a desirable health body weight status because it is associated with lowest risk of morbidity and mortality and it can be maintained by having a healthy life style that includes taking healthy, balanced diet and engaging in appropriate physical activities among others (Jeniffer & Loren, 2008). Underweight refers to extreme leanness and an underweight person is a person whose body weight is considered too low to be healthy (Schoenborn, Adams, and Barnes, 2002). According to Meghan (2008) and Fairburn (2008), being underweight is associated with a number of health risks which include under nutrition, osteoporosis, infertility, impaired immune competence, eating disorder and has numerous adverse effects on one's physical, psychological and social functioning. Overweight is a condition of having more body fat than is optimally healthy (World Health Organisation [WHO], 2014). Obesity is defined as abnormal or excessive fat accumulation that presents a risk to health (WHO, 2014). Underweight, Overweight and Obese are associated with high risks of morbidity and mortality, (WHO, 2000).

According to WHO, (2014), more than 1.9 billion adults, 18 years and older were overweight globally. 39% were overweight and overall 13% were obese. Accumulation of too much fat can impair movement and flexibility, and can alter one's appearances of the body (WHO, 2008). The global epidemic of obesity has become a worldwide problem not only in developed countries but also in developing ones. (Zhang, Dagevos, He, Van der Lans, & Zhai 2008). According The Overseas Development Institute (2014) noted that more than one-third of the world's adults were overweight and almost two-thirds of the world's overweight people were found in low and

middle-income nations and the rates are rising significantly faster than in rich nations. This implies that if the problem is not looked at, more people are even likely to become overweight and obese. For the case of Uganda, WHO (2011b), noted that in 2008, 20.1% males and 19.8% females were overweight while 3.8% males and 4.7% females were obese. Chebet, Goon, Nsibambi and Otala (2014), found out that among 958 pupils in primary schools in Uganda, the prevalence of overweight and obesity were 32.3% and 21.7%, respectively. Also Central Intelligence Agency World Fact Book (2014), noted that 4.3% of Uganda's total population were considered obese.

WHO (2014) observed that overweight and obesity and related non-communicable diseases can largely be prevented by making healthier choice of foods and regular physical activity. It recommends that people should limit energy intake from total fats and sugars, increase consumption of fruits and vegetables as well as legumes, whole grains and nuts and engage in regular physical activity. Regular physical activity reduces risk of a range of diseases, helps maintain a healthy weight, helps maintain ability to perform everyday tasks with ease, improves self-esteem and reduces symptoms of depression and anxiety (Chief Medical Officers, 2011).

According to Dietary Guidelines Advisory Committee [DGAC] (2015), nutritional patterns are defined as the quantities, proportions, variety or combinations of different foods and beverages in diets and the frequency with which they are habitually consumed. A healthy diet is a pillar of wellbeing throughout the lifespan and it promotes the achievement of healthy pregnancy outcomes, supports normal growth, development and aging, helps maintain healthful body weight, reduces chronic disease risk and promotes overall health and wellbeing (DGAC, 2015). Eating well improves the body weight and shape, blood pressure and cholesterol levels, reduces risks of developing conditions such as cardiovascular diseases, diabetes, certain cancers and osteoporosis. In addition eating well ensures a healthy weight and avoids health problems associated with overweight such as infertility, impotence, stress and sleep problems (WHO, 2014). WHO (2014) and DGAC (2015) coincide that a healthy diet is important in one's life if healthy lifestyle is to be achieved. Globally there has been an increased intake of energy dense foods that are high in fat and an increase in physical inactivity due to the increasingly sedentary

nature of many forms of work, changing modes of transportation and increasing urbanization (WHO, 2011c, 2014)

WHO (2008) noted that sedentary lifestyle has led to risks of death through different chronic diseases and thus pronounced as one of the leading causes of death worldwide. Because of the awareness of risks associated with undesirable body weight status worldwide, many health clubs have been set up around the world (Buck, 1999) and in the bid to mitigate this growing epidemic, health clubs are attracting an increasing number of clients.

A health club is a place which houses exercise equipment for the purposes of physical exercise. It can also be referred to as a fitness club (New York Magazine 1989). Different activities such as swimming, sauna, steam bath and weight lifting take place in health clubs. Health clubs also offer group exercise classes that are conducted by certified fitness instructors. These include classes based on aerobics, martial arts, high intensity training, and muscle training. (Buck, 1999). People go to different health clubs for different reasons which may include among others managing weight, overall health and wellbeing and socialization (International Health Racquet and Sports Club Association [IHRSA], 2009).

For Uganda in particular, there are a number of health clubs and most of them are located in Kampala, the capital City of Uganda (Registry of companies, Uganda 2014). In Kampala, some people are engaged in work that leads to a sedentary lifestyle and inactive life which increases cases of non-communicable diseases including overweight and obesity (WHO 2011b, WHO 2014). Because of this awareness, many health clubs have been set up to facilitate access to exercise and advice on a healthy, balanced diet. To ensure that there is proper control of overweight and obesity, there is need for people to monitor their weight, follow appropriate exercise routines and control their diet. However, there is paucity of information on the body weight status of clients who take part in exercise, their exercise routines and nutritional patterns around Kampala City and it was for this reason that this study was conducted to assess the body weight status, exercise routines and nutritional patterns of clients in health clubs in Kampala City in Uganda.

1.2 Statement of the Problem

Exercise and nutrition largely impact on body weight status (Harry 2015). Globally there is increased physical inactivity and increased intake of energy dense foods due to sedentary lifestyle which has contributed to increased cases of overweight and obesity (OWO). OWO are on the rise in low and middle income countries particularly in urban settings and are one of the major causes of Non Communicable diseases (NCDs) worldwide (WHO, 2014). According to the Global Report on healthy lifestyles and NCDs, 63% of all annual deaths worldwide are caused by NCDs and 36 million people die each year due to NCDs (WHO, 2011a). Because of this awareness, many healthy clubs have been set up to help people in managing their body weight by providing a variety of physical activities. However, it is not known whether people who take part in exercises regularly have been able to achieve a normal weight status. It was for this reason therefore that the researcher embarked on a study to assess body weight status, exercise routines, and nutritional patterns of clients in health clubs in Kampala city, Uganda.

1.3 General Objective of the Study

The general objective of the study was to assess body weight status, exercise routines and nutritional patterns of clients from selected health clubs in Kampala city

1.4 Specific Objectives of the Study

The specific objectives of the study were to:

1. Determine the body weight status of clients in Kampala City health clubs using selected anthropometric measures.
2. Find out the exercise routines of clients in selected health clubs in Kampala City.
3. Establish the nutritional patterns of clients in selected health clubs in Kampala City.

1.5 Research Questions and Hypotheses

The study was guided by both research questions and hypotheses

1.5.1 Research Questions

1. What is the body weight status of clients from health clubs in Kampala city?
2. What are the exercise routines of clients in selected health clubs in Kampala City?
3. What are the nutritional patterns of clients in selected health clubs in Kampala city?

1.5.2 Research Hypotheses

Ho_1: There would be no significant relationship between BMI and WC scores of clients in Kampala city health clubs.

Ho_2: There would be no significant relationship between BMI and WHR, scores of clients in Kampala city health clubs.

Ho_3: There would be no significant difference between the weight status of female and male clients in Kampala City health clubs.

1.6 Significance of the Study

The information obtained from the study will provide information that can be used by instructors to monitor and train clients according to body weight categories. It will also help clients to monitor themselves and seek knowledge about their weight status, right exercise routines and health foods they should eat so as to avoid risks of overweight and obesity. It will also help managers to ensure that the instructors they employ are qualified and have sufficient technical knowledge about what is required in health clubs. The Ministry of Health may use information from this study to develop ways of preventing and managing chronic diseases like hypertension, heart diseases and diabetes that are linked to overweight and obesity. The study provides data that may be used by other researchers in the field of sport science, health and exercise sciences in future.

1.7 Conceptual Framework

The conceptual framework was developed from Harry (2005). He explains that different physical activities together with nutritional patterns can determine an individual's weight category.

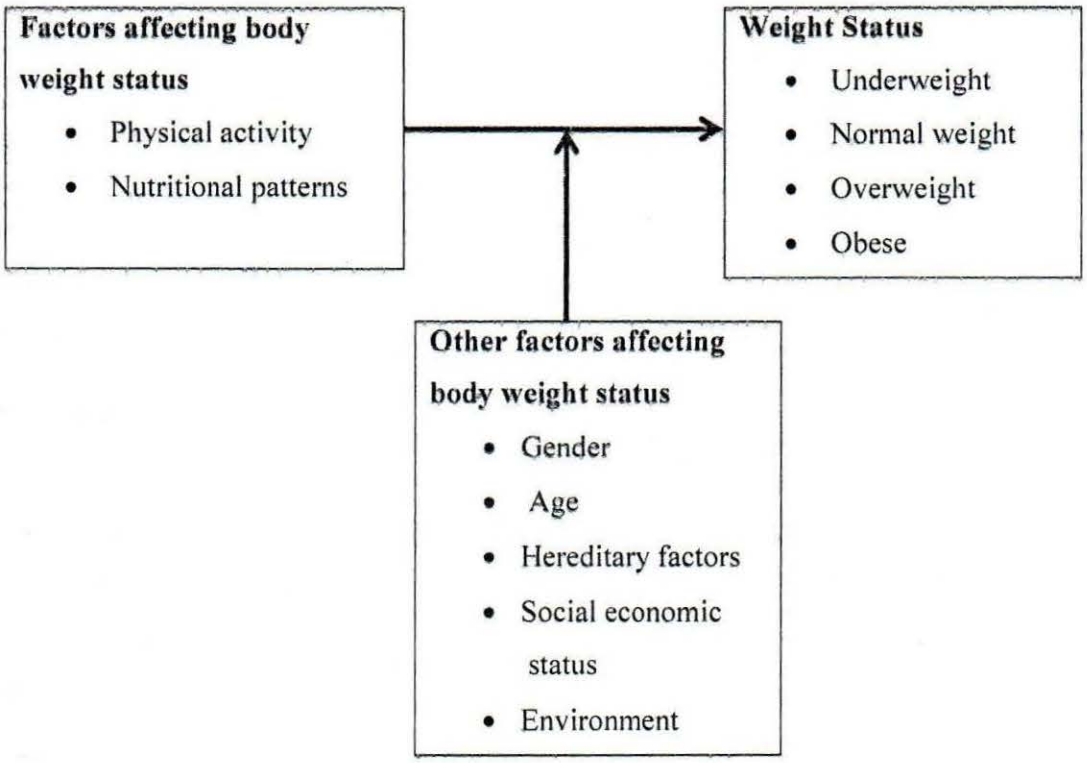


Figure 1.1: Conceptual Framework (Adapted from Harry (2005) and modified by the researcher)

It is believed that engaging in physical activities is an essential component of a healthy weight management program and becoming more active helps people to lose excess or maintain healthy weight (Harry, 2005). Physical activity is a lifestyle strategy to combat the increasing prevalence of overweight and obesity. It stems from the fact that it is one method that can be consistently used to increase energy expenditure (Jakicic, 2009).

Also, appropriate diet has an influence on a person's body weight status as it determines whether one is under weight, normal, overweight or obese. Therefore for clients in health clubs to have a normal weight status, there is a need to take part in appropriate physical activities and take right diet.

Harry (2005) further explains that there are other factors other than physical activity and nutrition that also determine a person's body weight status and these include gender, age, hereditary factors, socioeconomic status and environment.

In respect to age, people are more likely to lose lean body mass and increase fat once they begin aging and this determines their body weight. For gender, women have a higher essential fat storage need than men. Hereditary factors also affect body weight as people cannot change the genes they are born with. Similarly, body fat may also be an influence of genes. Lower socioeconomic status is linked to increased body weight as people in this category tend to consume high calorie food and avoid physical exercise compared to high social economic status where people are less likely to be obese because they respond with healthy eating and regular exercise. Environment where people function and interact also determines body weight status as people make decisions based on the environment or community. People in an environment that makes it easier to engage in physical activity and to have healthy diet are less likely to be obese.

1.8 Scope of the Study

The study was delimited to clients in health clubs in Kampala city, Uganda. It focused on measuring body mass index, waist circumference, and waist to hip ratio as parameters that determine weight status. It was also delimited to nutritional patterns and exercise routines of clients in health clubs. The parameters of nutrition that were considered included intake of whole meal foods in a week, daily servings of fruits and vegetables, eggs taken weekly, frequency meat consumption, weekly intake of fried foods, sources of fat used for cooking, legume, nuts and dairy products intake per week, snacks, water, alcohol intake and number of times meals taken daily. The parameters of exercise routines included number of days, duration, intensity of exercise and activities clients engaged in.

1.9 Limitations of the Study

Body weight was determined using BMI, WC, and WHR and these may not give the exact amount of body fat a client might have but they are not prohibitively expensive to measure. The researcher was also limited by the willingness of one health club manager to allow data to be

collected from their clients and this caused the researcher to collect data from nine instead of ten intended health clubs.

1.10 Operational Definition of Terms

Body Mass Index: Body weight in kgs divided by height in meters squared.

Clients: People who use the services of the health clubs in Kampala city in Uganda.

Exercise Program: A programme detailing a range of physical exercises and the amount of time each exercise should be performed.

Health Clubs: Places which house exercise equipment for the purposes of physical exercise in Kampala City.

Nutritional Patterns: Quantities, proportions, variety or combinations of different foods and beverages in diet and the frequency with which they are habitually consumed.

Waist Circumference: Measure of the distance around the abdomen.

Waist to Hip Ratio: Measure of central obesity and calculated from the waist circumference divided by the hip circumference.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

In this chapter, literature was reviewed under the following sub-themes:- concept of Body weight status; Determining body weight status; Factors affecting body weight status; The concept of nutritional patterns and guidelines; Factors affecting nutritional patterns; Determination of nutritional patterns; The concept of physical activity and exercise guidelines, Related studies and summary.

2.2 Concept of Body Weight Status

Body weight status can be categorized as underweight (UW), normal weight (N), overweight (OW) and obesity (O). Underweight refers to extreme leanness according to Schoenborn, Adams, and Barnes, (2002). Underweight people have a body mass index of less than 18.5 kg/m^2. The National Health and Nutrition Examination Survey (NHANES) (2011, 2012) revealed that 1.7% of adults aged 20 and over in the United States are underweight. In 2009, over 2% of adults in England were also underweight (Brown *et al* 2010). In most developing countries, there is persistence of under nutrition and people who are underweight (Food and Agriculture Organization (FAO), 2006). However, there is limited data on the number of people considered underweight in Uganda. According to Meghan (2008) and Fairburn (2008), being underweight is associated with a number of health risks which include under nutrition, osteoporosis, infertility and impaired immune competence. It is also an indication of eating disorder or other underlying illness and has numerous adverse effects on one's physical, psychological and social functioning.

A normal weight is the desirable weight as it lowers the risk of chronic diseases in adults (WHO, 1998). It has a BMI range of 18.5-24.9kg/m^2. A healthy weight contributes to a better mental health and life satisfaction. Participation in regular physical activity and eating appropriate amounts of healthy foods can help to achieve or maintain a healthy weight (National Health and Medical Research Council, 2013)

Overweight and obesity are defined as abnormal or excessive fat accumulation in an individual's body that brings about various risks to health. Being overweight or obese is caused by an increased intake of energy dense foods that are high in fat and an increase in physical inactivity. Physical inactivity has been associated with sedentary nature of many forms of works, changing modes of transportation and increasing urbanization (WHO, 2014). A BMI range of 25.0-29.9 indicates overweight and a BMI of 30 and above indicates obese. The relative risk of mortality begins to increase at a BMI of 25.0. In general, the higher the BMI, the greater the risk to ill health (WHO, 2000; Wabuyabo & Wamukoya, 2009).

Globally, in 2008 about 1.5 billion adults were overweight in the world and out of these, 500 million were considered obese (WHO, 2008). In 2014, more than 1.9 billion adults aged 18 years and older were overweight. Of these over 600 million were obese and overall about 13% of the world's adult's population (11% of men and 15% of women) were obese (WHO, 2014). The global epidemic of obesity has become a worldwide problem not only in developed countries but also in developing ones (Zhang *et al.* 2008). As a result, developing countries are now shouldering a double burden of malnutrition that is the persistence of under nutrition and people who are underweight along with an upsurge in the number of people who are overweight or obese (FAO, 2006).

Accumulation of too much storage fat can impair movement and flexibility, and can alter one's appearances of the body (WHO, 2008). According to the National Institute of Diabetes and Digestive and Kidney Disease (NIDDK) (2012), OWO are associated with type 2 diabetes, High Blood Pressure (HBP), heart disease, stroke, cancer, sleep apnea, osteoarthritis, fatty liver disease, kidney disease and pregnancy problems. According to Center for Disease Control and Prevention (CDC) (2013), obesity and overweight have increased markedly in the United States and 37.9% of adults aged 20 years and over are obese while 70.7% are overweight and obese. The problem of overweight and obesity exists in nearly every country and this has been linked to several morbidities and mortality (WHO, 1995).

Overseas Development Institute (ODI) (2014), showed that more than one-third of the world's adults are overweight and that almost two-thirds of the world's overweight people are found in

low and middle-income nations. ODI (2014) further noted that the number of obese or overweight people in developing countries rose from 250 million to almost 1 billion in under three decades, and these rates are rising significantly faster than in developed nations. South Africa demonstrates this alarming new trend, with nearly double the average global obesity rates. Incredibly, 69.3% of South African females display unhealthy levels of body fat and more than four in 10 are clinically obese (defined as having a BMI higher than 30) (Birrell, 2014).

In Uganda, there are cases of overweight and obesity. In 2008, it was estimated that the total population was 33,424,683 people and among these 20.1% males and 19.8% females were overweight while 3.8% males and 4.7% females were obese (WHO, 2011b). Nsibambi, Wamukoya, Wanderi and Onywera (2011) revealed that out of 1,929 of school children in central Uganda, 4% are underweight, 7% overweight and 4% are obese. The CIA World Fact Book (2014) indicated that 4.3 % Ugandans are obese. Chebet, Goon, Nsibambi and Otala (2014) also revealed that pupils in Kampala schools suffer from overweight (32.3%) and obesity (21.7%)

2.3 Determining Body Weight Status

Body weight status is determined by different parameters which include underwater /hydrostatic weighing; Body mass index (BMI), skin fold thickness, bioelectrical impedance, waist circumference, hip circumference, mid upper arm circumference, and WHR. This study used Body mass index (BMI), Waist circumference (WC) and Waist to hip ratio (WHR). These techniques provide a reasonable estimate of body weight status, take short time to be administered, easy to administer and require no specialised training and equipment (Goss *et al* 2003)

2.3.1 Body Mass Index (BMI)

BMI is one of the most commonly used indices of relative weight. It is defined as body weight in kg divided by height in square metres. It is commonly used to classify underweight, overweight and obesity in adults (George, Thomas and Kenneth, 2005, WHO, 2014).

$$\text{BMI} = \frac{\text{mass(kg)}}{(\text{height(m)})^2}$$

BMI is not a direct measure of body fat but it is more

accurate at approximating body fat than measuring weight alone (Zwiauer, Widham & Kerby, 1990). It is the most useful indicator of weight related health risks. Presently it is most widely investigated and most useful indicator of health problems that are associated with underweight and overweight (WHO, 2008). It is a useful measure of body composition and is based on the concept that weight should be proportional to height. The higher the BMI the higher the risk for certain diseases such as heart disease, high blood pressure, diabetes, breathing problems, and certain cancers (William, Frank &Victor, 2006, WHO, 2008, and Wabuyabo & Wamukoya, 2009).

To calculate BMI, weight and height must be measured. Weight should be measured with individuals wearing light clothing and no shoes. Height should be measured with no shoes, standing erect, looking straight ahead, feet together and heels against a wall or measuring board. William, Steven & Micheal (2012) stated that BMI between 25.0- 29.9 is in the overweight category and greater or equal to 30 in the obese category. George, Thomas and Kenneth (2005), William, Frank, and Victor (2006), and WHO (2004) classify BMI as indicated in Table 2.1.

Table 2.1 Classification of body weight

BMI	Classification
≤18.5	Underweight
18.5-24.9	Normal
25.0-29.9	Overweight
30.0 - 34.9	Obesity class 1
35.0 - 39.9	Obesity class 11
≥40.0	Extreme obese

According to CDC, (2009) there are several limitations of using BMI. BMI is a surrogate measure of body fatness because it is a measure of excess weight rather than excess body fat and it does not distinguish between excess fat, muscle, or bone mass, nor does it provide any indication of the distribution of fat among individuals. CDC (2009) further pointed out that BMI should not be used as a diagnostic tool but instead be used as a measure to track weight status in populations and as a screening tool to identify potential weight problems in individuals.

Ross and Janiszewski (2008) further explained that BMI does not always budge in response to lifestyle change. It does not always change even though you may be getting healthier. This is particularly so if you adopt a physically active lifestyle, along with a balanced diet, but are not necessarily cutting a whole lot of calories. This lack of change in BMI or body weight is all too often interpreted as a failure, resulting in the disappointed individual resuming their inactive lifestyle and unhealthy eating patterns.

Although BMI is a useful measurement across populations, it is increasingly apparent that it has significant limitations in the assessment of the individual as it does not take into account the distribution of body fat. BMI measurement does not provide any information regarding where body fat is stored. Thus two people with exactly the same BMI can have very different patterns of body fat distribution and thus very different risk of cardiovascular disease and risk of developing type 2 diabetes (Eknoyan, 2007).
However, BMI was used for this study since it is easy to administer and widely used. It is still used to screen weight categories that can lead to health problems (Shaw *et al.* 2007 and The Sports Fitness Advisor, 2010)

2.3.2 Waist Circumference (WC)

Waist circumference is a measure of the distance around the abdomen. It is one of the most practical tools to assess abdominal fat for chronic disease risk and during weight loss treatment. A high waist circumference is associated with an increased risk for type 2 diabetes, high cholesterol, high blood pressure and heart disease (National Heart, Lung, and Blood Institute, 2009).

Welborn & Dhaliwal (2007) and The National Heart and Blood institute (2007) indicated that waist circumference is superior to BMI in predicting cardiovascular disease risk. Waist circumference may be a better indicator of health risk than BMI alone. It is therefore advisable to use it in combination with BMI (National Heart, Lung, and Blood Institute, 2009).

WHO (1997) recognized the importance of abdominal fat mass, which can vary considerably within a narrow range of total body fat and body mass index (BMI). It also highlighted the need

for other indicators to complement the measurement of BMI, to identify individuals at increased risk of obesity-related morbidity due to accumulation of abdominal fat. Waist circumference was suggested as an additional measure of body fat. (WHO, 2000) and Huxley *et al.* (2010) stated that there was probable evidence that measures of abdominal obesity is better than BMI as predictors of Cardio Vascular Disease (CVD) risk, although combining BMI with WC may improve their discriminatory capability. Therefore, assessing waist circumference (WC) is very useful, and sometimes more reliable.

WHO (2008) indicated that waist circumference should be 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. Larsson *et al.* (1984) noted that abdominal obesity in men is associated with an increased risk of myocardial infarction, stroke and premature death, and these diseases are not associated with measures of generalized obesity such as BMI, Lapidus *et al.* (1984). The WC has been used as an indicator or measure of the health of a person. Table 2.2 indicates the WC cut-off points recommended by WHO, (2000).

Table 2.2 Waist circumference cut off points

WC Cut-Off Points	Category
Men >102 cm Women >88 cm	Normal
Men ≥102 cm (40 in.) Women ≥ 88 cm (35 in.)	Overweight or Obese

Excessive abdominal fat is associated with health problems such as type 2 diabetes, coronary heart disease and hypertension. For a given WC, men and women have similar levels of abnormal fat but women are at higher risk than men at the same WC. The cut off point for women is therefore set lower than that for men. WC ≥102 cm (40 inches) in men and ≥ 88 cm (35 in.) in women have been shown to be associated with substantially increased risk of diseases associated with abdominal obesity (WHO, 2000). Total abdominal fat includes both subcutaneous fat (under the skin) and visceral fat (around internal organs). High levels of visceral fat have been shown to be associated with several risk factors that influence the development of diabetes and coronary heart disease.

Waist circumference is less accurate in some situations, including pregnancy, medical conditions where there is distension of the abdomen, for certain ethnic groups and for children and young people (National Health and Medical Research Council, 2014). The Measurement procedure of WC has not been standardized and it may be difficult to measure and less accurate in individuals with a BMI of 35 or higher (Hu, 2008).

2.3.3 Waist to Hip Ratio as a Measure of Body Fat Distribution

The waist to hip ratio (WHR) is another measure of central obesity. It is calculated from the waist circumference divided by the hip circumference. The score from the WHR predicts the risk of developing several conditions associated with excess abdominal fat. Alone, BMI is not enough to determine the risk of developing obesity-related conditions. Excess abdominal fat, regardless of overall body fat, will predispose you to obesity-related disease. This highlights the importance of measuring WHR (2008).

Waist–hip ratio was suggested as an additional measure of body fat distribution and it provides an index of both subcutaneous and intra-abdominal adipose tissue (Bjorntorp, 1987). It is calculated from the waist circumference divided by the hip circumference. Abdominal obesity is further defined as waist–hip ratio above 0.90 for males and above 0.85 for females (WHO, 2008)

Table 2.3: Waist to Hip Ratio cut-off points and risk of metabolic complications

Indicator	Cut-off points	Risk of metabolic complications
Waist–hip ratio	≥0.90 cm (M);	Substantially increased
	≥0.85 cm (W)	Substantially increased

M= men; W=women

The WHO defines the ratios of >0.90cm in men and >0.85cm in women as one of the decisive benchmarks for metabolic syndrome. Welborn and Dahlia (2007) and Srikanthan, Seeman, and Karlamangla (2009) confirm that WHR is a superior clinical measurement for predicting all cause and cardiovascular disease mortality. Welborn and Dhalia (2007) further pointed out that the hip circumference indicates a lower risk for body fat accumulation and thus including it into the waist-to-hip equation enhances the accuracy of this measurement technique.

2.4 Factors affecting Body Weight Status

According to Harry (2005), body weight is determined by multiple factors including heredity, metabolic rate, eating habits, general physical activity level, gender, age, social economic status and environment.

With respect to heredity, genes influence body weight by setting basic parameters on the body's metabolic efficiency. Fatter people tend to have very efficient metabolisms; they require less fuel to run than thin people, and store excess fuel in the form of fat (Harry 2005). Genes governing metabolism run in families. If an individual's parents are obese they are several times more likely to be obese themselves than someone whose parents are of a healthy weight. If both parents are obese an individual is at a very high risk of becoming obese. Genes only determine a tendency towards higher or lower metabolic efficiency; they do not by themselves determine what actual body metabolism will be. It should be noted however that lifestyle choices such as exercising also influence a person's metabolism and thus their weight.

Harry (2005) further noted that people's metabolic rates are largely determined by how active they are. Every ten years beyond from early to mid-twenties the metabolism slows about 10 percent. While a reduction in metabolism is observable as we age, such a reduction may be more due to a sedentary lifestyle than to mere aging. Muscle tissue is metabolically active compared to fat, and thus metabolic level at any moment is in large part due to the state of the muscle mass. Inactivity accelerates loss of muscle tissue over time which decreases metabolism, making it certain that weight will be gained. Moderate to vigorous physical activity, on the other hand, reduces muscle loss, or even increases muscle mass, with the effect of increasing metabolism and making it easier to lose weight.

People's food-related habits and cultural expectations are also important determinants of body weight as they influence the types and amounts of foods consumed. For instance, families favoring high-fat, high calorie food served 'family style' are at greater risk for eating too much food and gaining weight than are families serving smaller portions of lean meats, steamed vegetables and brown rice (Harry, 2005). Similarly, families who push members to eat, or who keep high fat snacks and deserts handy are at greater risk for weight problems than are families

that promote sensible portion sizes and save treats for special occasions. The speed at which people learn to eat and the consciousness with which they do so are important too. People who eat quickly tend to eat more than people who eat slowly as it takes a few minutes for the stomach to inform the brain it is full. Fast eaters sometimes finish their plates before getting the stomach's fullness message thus eating too much that may result into overweight or obese.

Physical activity is an essential component of a healthy weight management program. Where a person's genetics are more or less set at conception, the amount of energy a person expends in physical activity is under voluntary control. Active living helps in management of weight. Exercise builds lean muscle mass and burns up fat reserves (Harry 2005). Adding muscle mass through strength training raises metabolism (the rate at which the body burns calories) which makes it easier to lose weight. Adding muscle mass helps people to look firmer and slimmer because muscle takes up less space than fat. On the other hand, a significant loss of muscle mass, which is what happens when people are sedentary, reduces resting metabolic rate and makes it harder to lose weight. Careful strength training reduces the risk of accidental injury, improves bone density, helps with digestion and assists in lowering blood pressure, cholesterol and triglyceride levels (all predictors of disease when elevated. Harry (2005) further explains that there are other factors other than physical activity and nutrition that also determine a person's body weight status and these include gender, age, and hereditary factors, socioeconomic status and environment.

In respect to age, people are more likely to lose lean body mass and increase fat once they begin aging and this determines their body weight. For gender, women have a higher essential fat storage need than men. Hereditary factors also affect body weight as people cannot change the genes they are born with and genes also affect where body fat accumulates in the body. Lower socioeconomic status is linked to increased body weight as people in this category tend to consume high calorie food and avoid physical exercise compared to high social economic status where people are less likely to be obese because they respond with healthy eating and regular exercise. The environment where people function and interact also determines body weight status as people make decisions based on the environment or community. People in an environment that makes it easier to engage in physical activity and to eat healthy diet are less

There are different types of exercises such as aerobic exercises that increase cardiorespiratory endurance and losing weight and examples include walking, jogging, dancing, biking, swimming among others, anaerobic/ strength exercises that increase strength, speed, power and examples include lifting free weights, using resistant machines and using resistance bands. There is also flexibility exercise that enhances range of motion on your muscles and joint movements such as stretching and stability or balance exercise that improves ability to maintain body alignment, resisting un wanted bone and joint movements and examples include heel to toe walking, standing on one leg among others.(Miguel, 2015, National heart, lung and blood institute, 2016)

Shannon (2015) revealed that in order to lose weight or maintain a healthy body weight status, it is important to combine cardio training with weight lifting. She noted that most studies show that after a weight training work out the metabolism can be boosted for up to 36 hours post workout which helps to burn more calories. Regular participation in weight training session will increase calorie burning and thus fat burning capacity. To generate a high amount of post-calorie burn from cardio, it must be done for a very long duration of time. Weight training enables to build up a larger degree of lean muscle mass, which then basically serves as calorie burning power house in the body. The more the muscle, the higher the rate of basal metabolic rate and the better the calorie burning results. Therefore weight training sessions may not burn as many calories minute per minute during the actual work out, the overall calorie burning benefits you receive from it typically out weights that of cardio. Combining cardio and weight training help in weight loss and in order to lose weight cardio is a great stepping stone for increasing fitness levels and burning calories quickly. However in order to have a toned sculpted body weight training workouts must be added.

Penn State researchers carried out research where they put dieters into three groups of no exercise, aerobic exercise only and aerobic exercise and weight training. They all lost around 21 pounds but those who included weight training lost 6 more pounds of fat than those who didn't lift. This was because lifters loss was pure fat and others lost fat and muscle. Therefore if you weight train as you diet, you protect muscles and burn more fat (Campbell, 2014 Aleisha 2013). They further noted that weight that is lost during cardio training is a combination of fat and muscle while weight lost during weight training is typically fat.

Therefore, people who do more cardio may lose weight but remain with bodies that are not toned compared to those who do both

WHO (2014) recommends that children and adolescents aged 5-17 years should do at least 60 minutes of moderate to vigorous-intensity physical activity daily, amounts greater than 60 minutes daily will provide additional health benefits and should include activities that strengthen muscle and bone, at least 3 times per week. Adults aged 18–64 years should do at least 150 minutes of moderate-intensity physical activity throughout the week, or do at least 75 minutes of vigorous-intensity physical activity throughout the week, or an equivalent combination of moderate and vigorous-intensity activity. For additional health benefits, adults should increase their moderate-intensity physical activity to 300 minutes per week, or equivalent. Muscle-strengthening actiyities should be done involving major muscle groups on 2 or more days a week. Adults aged 65 years and above should do at least 150 minutes of moderate-intensity physical activity throughout the week, or at least 75 minutes of vigorous-intensity physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity. For additional health benefits, they should increase moderate-intensity physical activity to 300 minutes per week, or equivalent.

The Center for Disease Prevention and Control Physical Activity (2007) also recommends that adults should engage in 30 minutes of moderate activity on five or more days per week or 20 minutes of vigorous activity on three or more days per week to maintain a normal weight. Wabuyabo & Wamukoya, (2009) as well as Center for Disease Prevention and Control Physical Activity (2007) recommends that fitness training should be conducted 3 to 5 times a week for optimal results and 20-30 continuous minutes of intense exercise must be used in order to improve cardio respiratory endurance. They further stated that training at the right intensity is very necessary and it should vary with the type of exercise being done. WHO (2011c) defines intensity as the rate at which the activity is being performed. The intensity of different forms of physical activity varies between people and depends on an individual's relative level of fitness. Exercises for cardio respiratory development must be strenuous enough to elevate the heart rate between 60 and 90% of the heart rate reserve (220-age).

Those with low fitness levels should start exercising at a lower training heart rate of about 60% of heart rate reserve (Wabuyabo & Wamukoya, 2009).

Globally, around 23% of adults aged 18 and over were not active enough in 2010 (men 20% and women 27%). In high-income countries, 26% of men and 35% of women were insufficiently physically active, as compared to 12% of men and 24% of women in low-income countries. Also 81% of adolescents aged 11-17 years were insufficiently physically active in 2010. Adolescent girls were less active than adolescent boys, with 84% vs. 78% not meeting WHO recommendations. The drop in physical activity is partly due to inaction during leisure time and sedentary behavior on the job and at home and increase in the use of "passive" modes of transportation. Countries and communities must take action to provide individuals with more opportunities to be active, in order to increase physical activity. (WHO, 2010)

2.6 The Perception of Nutritional Patterns

According to Dietary Guidelines Advisory Committee (DGAC) (2015), Nutritional patterns are defined as the quantities, proportions, variety or combinations of different foods and beverages in diets and the frequency with which they are habitually consumed. DGAC (2015) pointed out that a healthy diet is a pillar of wellbeing throughout the lifespan and it promotes the achievement of healthy pregnancy outcomes, supports normal growth, development and aging, helps maintain healthful body weight, reduces chronic disease risk and promotes overall health and wellbeing.

Eating right can help you maintain a healthy weight and avoid certain health problems. Studies have linked eating a typical Western diet filled with red and processed meats, packaged meals, takeout food, and sugary snacks with higher rates of depression, stress, bipolar disorder, and anxiety (Maya, Paul & Jeanne 2015). They further stated that eating more fruits and vegetables, cooking meals at home, and reducing your fat and sugar intake, on the other hand, may help to improve mood and lower your risk for mental health problems.

WHO (2004) noted that fruits and vegetables are important components of a healthy diet and their sufficient daily consumption could help prevent major diseases such as cardiovascular diseases and certain cancers. WHO (2004), further explained that insufficient intake of fruits and vegetables is estimated to cause around 14% of gastrointestinal cancer deaths, about 11% of ischemic heart disease deaths and about 9% of stroke deaths globally. WHO (2004), therefore recommends a minimum of 400g of fruit and vegetables per day for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity.

Wabuyabo & Wamukoya (2009) confirmed that including five servings of fruits and vegetables daily and that a life based on healthy eating and regular physical activity can be a real lifesaver. Also the Australian Dietary Guidelines to Health Eating [AGHE] (2013) pointed out that the consumption of vegetables is associated with a reduced risk of weight gain and consumption of fruits is associated with a reduced risk of obesity and overweight. The dietary guidelines recommend the following servings per day for men and women.

Table 2.4: Dietary Guidelines showing number of servings per Day for Men and Women

	Men		Women	
Age	**Vegetables**	**Fruits**	**Vegetables**	**Fruits**
19-50	6	2	5	2
51-70	5.5	2	5	2
70+	5	2	5	2

Australian Dietary Guidelines to Health Eating [AGHE] (2013)

Lawrence, Maya, Paul and Jeanne, (2015) were in agreement with the AGHE (2013), WHO, (2004), Wabuyabo & Wamukoya (2009), as they also pointed out that fruits and vegetables are low in calories and nutrient dense, which means they are packed with vitamins, minerals, antioxidants, and fiber. Focus on eating the recommended daily minimum of five servings of fruit and vegetables will naturally fill you up and help you cut back on unhealthy foods. A serving is half a cup of raw fruit or veg or a small apple or banana.

Public Health England, (2016) noted that fruits and vegetables should make up just over a third of the food we eat each day. It also recommends eating at least five portions of a variety of fruits and vegetables each day. Public Health England (2016) recommends that people should choose from fresh, frozen, canned, dried or juiced. A portion or serving is 80g or any of these: one apple, banana, pear, orange, or other similar size fruit, 3 heaped tablespoons of vegetables, a desert bowl of salad, 30g of dried fruit or a 150 ml glass of juice or smoothie (counts as a maximum of one portion a day) (Public Health England, 2016).

The AGHE (2013) noted that it is necessary to enjoy a wide variety of nutritious foods. These include drinking plenty of water, grain foods mostly whole grain and or high cereal fibre varieties, vegetables and legumes/beans, lean meats, poultry, fish eggs, nuts and seeds, milk yoghurt, cheese and /or alternatives mostly reduced fat. These reduce risk of cardiovascular diseases, Type 2 diabetes and excess weight gain. This health diet also provides a wide variety of other nutrients that may be more important and these include iodine, zinc, iron and other minerals and vitamins especially B and Omega 3. Consumption of at least two serves a week of fish is associated with reduced risk of mortality from cardiovascular disease, stroke, and muscular degeneration and with reduced incidence of cardiovascular disease (AGHE, 2013).

Similarly, nuts and seeds are rich in energy and nutrients, dietary fibre, contain significant levels of unsaturated fatty acids, rich in micro nutrients, vitamin E, magnesium and other nutrients. Consumption of nuts and seeds reduce the risk of heart disease and is not associated with weight gain if total energy intake is controlled. Consumption of nuts is also associated with a reduction in serum cholesterol, a surrogate marker for cardiovascular disease. Legumes/ beans provide a valuable source of protein, iron, some essential fatty acids, soluble and insoluble dietary fibre and micronutrients.

Elisa (2014) stated that nutritionally, eggs have a lot to offer with about 70 calories in one large egg, they are a great source of protein that helps stabilize blood sugar levels and provides structure to the body. Egg protein is also high quality, providing all the essential amino acids. Egg yolks also contain antioxidants that may protect against heart disease, stroke and some cancers. He noted that among 115,000 adults followed for 14 years, eating one egg daily was not

associated with an increased risk of coronary heart disease and stroke. Eggs can also fill you up, and may even help you eat less thus help in controlling appetite. Elisa (2014) agreed with Djousse and Gaziano (2008) and confirm that eggs contain nutrients that may help lower the risk for heart disease, including protein, vitamin B12 and D, riboflavin and folate. Djousse and Gaziano (2008) supports the idea that eating an egg a day is generally safe for the heart but going much beyond could increase the risk for heart failure later in life. However Elisa (2014) stated that there are cautions since eggs are a source of saturated fat which has been linked to raise total cholesterol and LDL (bad) cholesterol levels, risk factors for cardiovascular disease.

With respect to dairy foods the AGHE (2013) further noted that consumption of two or more serves of dairy foods per day is associated with reduced risk of stroke, three serves of any milk, cheese or yoghurt products a day is associated with reduced risk of hypertension, 2-4 serves is associated with reduced risk of metabolic syndrome, 1.5 serves a day is associated with reduced risk of type 2 diabetes. Dairy products have reduced fat and have various health benefits and a good source of many nutrients including calcium, protein, iodine, vitamin A, D, B, riboflavin and zinc.

Table 2.5: Recommended servings per day of milk, yoghurt and cheese (AGHE, 2013)

Age	Men	Women
19-50	2.5	2.5
51-70	2.5	4.0
70+	3.5	4.0

Serve sizes: 1 cup of 250 ml milk fresh, ½ cup of 120 ml evaporated unsweetened milk, ¾ cup of 200g yoghurt and 40 g of hard cheese.

Public Health England (2016) noted that it is important to have dairy products such as milk and yoghurt as part of a healthy diet. They are good sources of protein and vitamins and an important source of calcium, which helps to keep our bones strong. It is important to choose from lower fat and lower sugar products. When buying dairy alternatives it is important to go for unsweetened, calcium fortified versions.

The AGHE (2013) further stated that it is necessary to take plenty of water and that it is required in amounts that exceed the body's ability to produce it. Adequate fluid consumption is an integral component of a healthy diet and water is a good source of fluid and has the advantage of not adding energy to the diet. It is preferred to meet most fluid needs by drinking plain water. Consumption of plenty of water is associated with reduced risk of type 2 diabetes, stroke, and reduced bone strength. Jenny, *et al.* (2006) discovered that consumption of water is one strategy for decreasing the energy density of the diet as water contributes weight to food with limited energy.

With respect to alcohol, Lelbowitz (2007) revealed that alcohol use would seem to be a contributing factor to individual weight gain due to the high caloric content of most alcoholic beverages. Lelbowitz added that it stimulates metabolism which can lead to overeating and inhibits the body's ability to burn fat as the liver converts alcohol into acetate which is released into the bloodstream and used by the body as an energy source. As acetate levels rise, the body begins to burn more acetate and less fat leading to overweight. AGHE (2013) also advised that it is necessary to limit the intake of alcohol. Alcohol is both a food providing energy and a drug affecting the brain function. Consumption of alcohol regularly at an intake of one standard drink per day for women and 1.5 to 2 per day for men is associated with a reduced risk of cardiovascular disease morbidity and mortality.

However the effect of alcohol on the cardiovascular system is complex and alcohol can raise blood pressure and increase the risk of shortness of breath, some types of cardiac failure, haemorrhagic stroke and other circulatory problems. It affects management of type 2 diabetes through its effects on diet and control of blood glucose levels. It interferes with the action of insulin, insulin secretagogues and glucagon there by including the risk of hypo glycaemia in people with type 2 diabetes. Alcohol also depletes your body's calcium stores thus necessary to limit it.

The Mediterranean diet is one of the world's healthiest diet, the flavors in it are rich and the health benefits for people choosing it are hard to ignore (Estruch, *et al.* 2013). Ingredients of Mediterranean cuisine include olive oil, fresh fruits and vegetables, protein-rich legumes, fish

and whole grains with moderate amounts of wine and red meat. People who take it are less likely to develop high blood pressure, high cholesterol or become obese (Estruch, *et al*, 2013). Many studies have linked a Mediterranean diet to a lower risk of cancer, better cardiovascular health and a longer life. The building blocks of the Mediterranean diet are foods that are low in saturated fat, rich in healthy oils, and packed with fresh fruits and vegetables plus exercise (Greg & Robert, 2015).

According to Lawrence *et al* (2015), eating healthy carbohydrates, whole grains, beans, fruits and vegetables help to feel full longer and keep blood sugar and insulin levels stable. Healthy carbohydrates are low to moderate in calorie density, high in an enormous variety nutrients, devoid of refined sugars, high in naturally occurring fiber which helps lower not only blood sugars and insulin levels but also bad cholesterol and low in saturated fat. Healthy carbohydrates include whole grains, brown rice, millet, fresh fruits and vegetables, legumes like peas and beans among others. A diet rich in good carbohydrate can lead to a lean body and good health. On the other hand unhealthy carbohydrates for example white rice have been stripped of all fiber and nutrients, are high in calorie, refined sugars, refined grains, saturated fat, cholesterol and trans fats, low in many nutrients and in fiber. They digest quickly and cause spikes in blood sugar levels and energy.

According to Samantha (2013), a diet that regularly includes fried or fast foods can lead to obesity. Fried fish and fried chicken can cause a problem by putting your health at risk. Roberto (2015) agreed with Samantha and stated that fried fish and chicken are linked to weight gain. Joe (2016), however noted that oils that are mostly saturated and monounsaturated are best and it is necessary to avoid oils that contain large amounts of polyunsaturated fats. Joe therefore recommends coconut oil for eating fried food as it contains over 90% of saturated fatty acids which makes it resistant to heat. Joe further recommends that olive oil should be used as it is one of the healthiest fats on earth and very high in monounsaturated fatty acids which have only one double bond and highly resistant to heat. Martin (2015) in agreement with Joe (2016) recommends that olive oil is the best oil for frying and cooking as it contains 76% monounsaturated, 14% monounsaturated that are much more resistant to oxidation than 10% polyunsaturated oils.

Aiman (2015), noted that fat content in red meat is greater than white meat and therefore eating red meat in large quantities will lead to much fat accumulation in the body. White meat on the other hand contains lesser calories thus highly recommended. He however noted that it is necessary to consume both so as to reap the benefits of all. One should obtain the essential nutrients and proteins from red meat and maintain weight by white meat but both must be taken in balanced quantities as excess of everything is bad.

Sampateek (2013) in agreement with Aiman,(2015) stated that red meat has higher fat content than white meat and white meat has lower caloric content than red meat. Red meat has higher concentration of protein called Myoglobin which increase the risks associated with cancer. White meat from chicken are usually fed with antibiotics that may cause harmful effects on your health when consumed. Therefore both red and white meat have advantages and disadvantages so they should both be taken and it does not depend on what kind of meat you consume it is how you prepare the meat and always choose lean cuts.

The AGHE (2013) coincides with Sampateek (2013) and Aiman (2015) as they all found out that although red meat is high in saturated fat and cholesterol, which can raise your blood cholesterol, moderating consumption is recommended because it is an important source of protein, iron and other vitamins and minerals. However it is necessary to cut back on the amounts of saturated fat and cholesterol eaten and choose lean cuts of meat with fat trimmed. Eat not more than 6 ounces of meat a day.

According to Harshbarger (2009), there are several health benefits of eating plantain (Matooke) and it is a reliable source of starch and energy. It contains low amounts of dietary fibre which helps ensure health bowels and reduces constipation. They are rich in vitamin C and consumption of foods rich in vitamin C helps the body develop resistance against infectious agents. The Uganda multimedia news and information team (2012) noted that bananas are low in calories but high in water and contains potassium, magnesium, carbohydrates and vitamins that the body needs to function properly. However it is not healthy to eat only Matooke because it may miss out some vital nutrients.

With respect to frequency of meals, Wabuyabo & Wamukoya (2009) revealed that to get enough fuel from the food people eat and to obtain the variety of foods needed for nutrient balance, they should eat three meals a day. They stated that snacking between meals can contribute to good nutrition if the right foods are eaten. Alexandra (2013) also noted that people should not skip breakfast as a good meal in the morning can help the body prepare for the day to come and lower the risk of obesity. He warned that skipping breakfast may make you hungrier and more likely to eat larger meals which leads to surge in blood sugars. He however noted that it is good to eat light lunch as fueling up makes sense earlier in the day when the body needs most calories for energy. He further explained that if you eat a heavy dinner you are not as likely to get rid of those calories and what is not burnt off is more likely to be stored as fat as there is less activeness at night.

Fitschen (2015) however disagreed with Wabuyabo & Wamukoya (2009) and noted that meal frequency does not appear to have an effect on weight maintenance or weight loss when calorie intake is matched. Focus on consuming fewer calories than you are expending for weight loss rather than the number of meals being consumed. Also, Amy (2014) noted that it is necessary to cut on daily calories regardless of how often one eats. Amy further stated that the longer you wait between meals the hungrier you get and you are more likely to over eat and therefore it is important to eat after long hours of sleep as one needs energy to get moving.

2.6.1 Determination of Nutritional Patterns

National Institute of Health (2009) noted that there are three methods of determining nutritional patterns. These include cluster analysis, factor analysis and index analysis. They use distinct statistical approaches to approximate dietary patterns.

Cluster analysis and factor analysis are broadly categorized as "data driven" approaches that derive a posteriori patterns. Patterns identified via cluster analysis and factor analyses are influenced by the given population and an investigator driven food grouping strategy. National Institute of Health (1995, 2000), further noted that although cluster analysis and factor analysis are both empirical methods, they are distinct in their approaches. Cluster analysis finds people who share similar frequency patterns for consumption of foods, whereas factor analysis finds

foods that are correlated and then scores people based on the degree to which their diets show same pattern of variation.

The DGAC (2015) also noted that dietary pattern assessment is through data driven approaches such as cluster analysis (which addresses the question "using the self-reported food and beverage intake data are there groups of people with distinct (non-overlapping dietary patterns?") and the factor analysis (which addresses the question "which components of the diet track together to explain variations in food or beverage intake across diet patterns?"). These data driven approaches are outcome independent that is the relationship between the dietary patterns and intermediate or long term health outcomes are examined once the patterns themselves are defined. Other data driven approaches are out come dependent such as reduced rank regression (which addresses the question, "what combination of foods explains the most variation in one or more intermediate health markers?")

Index analysis is an "investigator driven" approach that creates patterns based on a priori decisions. Patterns identified via index analysis patterns are influenced by an investigator driven schema and food grouping strategy. Index based analysis imposes an external structure and assesses the degree to which individuals fit with in it. Index based analysis uses a numerical scoring system defined on the basis of a priori knowledge. (National institute of health, 1995, 2000). The DGAC (2015) agrees with the National Institute of Health and confirm that dietary patterns can be characterized in three main ways and the first is by use of a priori index that is based on a set of dietary recommendations for a healthy dietary pattern as a result of scientific consensus or proposed by investigators using an evidence based approach. An individual's index is derived by comparing and quantifying their adherence to the criterion food and /or nutrient component of an index and then summed up over all components. A population's average mean and individual component scores can be similarly determined.

Kurt, Matthias, Anja, Ute, & Heiner (2003) noted that there are two approaches used to determine nutritional patterns. An a priori or hypothesis-oriented approach where scientific evidence available prior to the current study is used to define dietary patterns. The second approach is the exploratory, thus dietary patterns are derived from data at hand. This ignores

prior knowledge completely, statistical exploratory methods that accomplish pattern derivation are principal component analysis (PCA) and factor analysis. PCA aims to explain the total variation in intake of many foods or food groups in terms of a few linear functions called principal components.

The DGAC (2015) explains the third method which examines individual's food and beverage in take preferences as they are commonly defined by foods included or eliminated in cohort studies. This pattern is usually based upon qualitative self-reported behaviors rather than detailed questionnaires. The researcher in this study used cluster analysis which addresses the question using the self-reported food and beverage intake data.

2.6.2 Factors affecting Nutritional Patterns

Artem (2003) noted that factors such as gender, culture and age make individuals unique. These differences influence appropriate dietary choices. With respect to gender and diet, men and women think and act differently and have varying needs even in the same situations. Their dietary habits are also different for example women are smaller than men thus need for fewer calories than men. This means women need to eat less food than men.

Artem further point out that culture differences also affects nutritional patterns as some cultures or even religions may emphasize different diet for their people. Age also plays an important role in influencing dietary choices. As a person ages, certain dietary modifications may need to be taken. Since the elderly tend to move around less, they need to consume fewer calories to maintain a healthy weight. Because their digestive system does not work as well as before (Artem, 2003)

According to Ruth (1998), the dietary patterns and practices of individuals are affected by many variables such as physiological factors. Physiological factors that affect food consumption include age, sex, body size, metabolic rate, health status, level of physical activity, pregnancy, lactation, hormonal secretions, use of drugs and physiological comparisons.

Food selection and consumption may also be affected by general health status. Those who are ill tend to eat less. The use of drugs may alter food consumption as many drugs stimulate or depress appetite. Cigarette smoking for example is accompanied by decreased consumption of sweet testing, high calorie foods. Environment influences include exposure to food related customs and traditions, parental and peer influence and media advertisement (Ruth, 1998).

According to the European Food Information Council (EUFIC), (2006) there are different factors that influence food choices and these include biological determinants such as hunger, appetite, and taste, economic determinants such as cost, income, availability, physical determinants such as access, education, skills and time, social determinants such as culture, family, peers and meal patterns, psychological determinants such as mood, stress and guilt attitudes, beliefs and knowledge about food.

2.7 Related Studies on body weight status, exercise and nutrition

Shalom and Opeyemi (2014), carried out a study about the prevalence of underweight, overweight and obesity using BMI amongst 341 (194 male, 147 female) healthy young adult population of Ota, Nigeria. Weight was measured using digital balance, height using meter rule and BMI was calculated. Paired sample t-tests and Pearson chi-square tests were used to determine the significance of differences between the sexes. Differences were said to be significant at the level of $p<0.05$. Results were expressed as mean ± standard error of mean. Results revealed that 2.6, 18.6 and 2.6% males were underweight, overweight and obese respectively while 12.9, 19.7 and 3.4% females were underweight, overweight and obese respectively. The prevalence of normal weight was higher in male subjects (76.3%) compared to females (64.0%) and overweight and obesity occurred more in females than in male subjects. The study of Shalom and Opeyemi (2014) relates to this research study as it also used BMI and found out that overweight was the most prevalent body weight status among clients in health clubs in Kampala city and female were more overweight than male clients.

Charlotte, et al. (2002) carried out a study about body weight status of 68,556 adults in the United States aged years and above. Self-reported height and weight data were collected and body weight status was estimated using data from 1997-98 National Health Interview Survey

(NHIS) for 68,556 adults and response rate was 77.2%. Results revealed that one half of the adults (54.7%) were overweight and 1 in 5 (19.5%) were obese. Women were more likely than men to be of healthy weight although men and women were equally likely to be obese. Obesity was most prevalence among middle aged adults and it was concluded that overweight and obesity were widespread in the United States in 1997-98 and prevalence varied significantly by population subgroups. In contrast with Shalom and Opeyemi (2014), men (62.7%) were considerably more likely than women (46.9%) to be overweight and no differences between men and women were found in the prevalence of obesity. Women (49.5% were significantly more likely than men (36.3%) to be of health weight. In this study women were more likely to be overweight and obese than men which contradicts with Charllotte et al (2002).

Baalwa, et al. (2010), carried out a cross sectional survey of 683 young adults aged 18-30 years about the prevalence of overweight and obesity in young adults in Uganda using BMI. The objective of the study was to determine the prevalence of overweight and obesity in young adults in urban (Kamala city) and rural (Kamuli District) areas. The findings from the study revealed that the overall prevalence of obesity and overweight was 2.2% and 10.4% respectively and females were more likely to be obese (2.9 vs 1.8%) or overweight (17.4% vs 3.3%). The study concluded that gender differences in the prevalence of obesity among young adults in Uganda were observed. The study was in agreement with Shalom and Opeyemi (2014) who revealed that female students were five times more likely to be overweight and obese compared to their male counterparts. The findings also revealed that female students were increasingly susceptible to excess weight gain because they were less likely to engage in regular exercises or sporting activities partly due to lack of facilities that are gender sensitive. Also to some degree they are culturally constrained to taking care of domestic chores after school hours which leaves them with less time for roles that include vigorous physical exercise.

Karl and Supa (2012) carried out the study about overweight and obesity and associated factors among school aged adolescent in Ghana and Uganda and the aim was to assess overweight and obesity and associated factors in school going adolescents in African low income countries. Secondary analysis of existing data from the Global school based Health Survey from Ghana (2007) and Uganda (2003) was done. A two stage cluster sample design was used to collect data

to represent all students in grades 6,7,8,9 and 10 in the county. Height and weight were based on self-reports and BMI was calculated. The study found the prevalence of overweight or obesity of 10.4% among school going girls and 3.2 % among boys and 0.9% and 0.5% obesity only among girls and boys respectively in Ghana and Uganda. It was concluded that low prevalence of overweight or obesity were found among adolescents in Ghana and Uganda. Doku, Koivusilta, Raisamo, and Rimpelä, (2011) investigated the level of physical activity among adolescents in Ghana using a four point likert type scale where responses were combined into two categories of physically active and not physically active. The findings indicated that 69% of adolescents in Ghana were physically active and that boys were more likely to report that they were physically active than girls.

Chebet, Goon, Nnsibambi and Otala (2014) carried out a study to assess the prevalence of overweight and obesity among 958 (435 boys and 523 girls) primary school children in Kampala central, Uganda aged 8-12 years. Weight and height were measured and BMI calculated. Results revealed that the prevalence of overweight and obesity were 32.3% and 21.7%, respectively. Girls had higher percentage of overweight (64.4%) and obesity (52.9%) than boys (35.6%; and 47.1%, respectively). Normal weight was 50.3% and 49.7% for males and females, respectively. Overweight and obesity occurred more in girls than in boys.

Nsibambi, (2013) carried out a pre experimental research to analyze the body composition of 1929 pupils aged 6 to 9 years in central Uganda. The results showed that out of the 901 boys 92% had normal weight, 5% were underweight, 2 % were overweight and 1% was obese. Of the 1028 girls, 78.5% had normal weight, 3.1% were underweight, 11.6% were overweight and 6.8% were obese.

Mugwang'a (2014) carried out a study about dietary and physical activity behavior among a group of 402 adolescents aged 13-19 years in Nairobi, Kenya. The aim of the study was to investigate in the school environment the consumption of energy dense foods and energy dense beverages as are typical of "western" dietary pattern and physical inactivity among a sub group of adolescents. Across sectional survey design was used and results indicated that the majority reported consumption of energy dense beverages (82.3%) and energy dense foods (88.3%) at

least once during the school day. The findings also indicate that boys were more likely to participate in team sports and gym based workouts than girls

Hu (2002) found out that a healthy body weight is associated with dietary patterns low in fat such as those characterized by the high consumption of high fiber foods such as whole grains, legumes, fruits and vegetables and high consumption of dairy products (Louie, Flood, Hector, Rangan & Gill, 2011). Hu (2002) further revealed that western dietary pattern which is high in sugar and fat is associated with increased risk of weight gain. Weight gain has been linked to the high consumption of fast foods and sugar sweetened beverages since they have high energy and low satiety property. (Pearson & Biddle, 2011; Hu & Malik, 2010; Olsen & Hetmann, 2009; Prentice & Jebb, 2003) Jenny et al (2015) researched about dietary energy density and association with energy intake and weight status in US adults and the findings revealed that persons with a high fruit and vegetable intake had lowest energy density values and the lowest obesity prevalence. Findings also discovered that consuming water and fiber rich foods such as fruits and vegetables is one strategy for decreasing the energy density of the diet as water and fiber contribute weight to food with limited energy.

Although these studies have been carried out, there is no study that has been carried out in Uganda to find out whether clients, who visit health clubs and take part in exercise have been able to achieve a desirable weight status and thus the reason why this study was carried out.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the research design, variables, location of the study, target population, sampling procedure and sample size, instrumentation, validity and reliability of the instruments, data collection procedure, data analysis and presentation and ethical consideration.

3.2 Research Design

The researcher used descriptive cross sectional survey research design to assess the body weight status, nutritional patterns and exercise routines of clients in health clubs in Kampala city. This was because the study aimed at establishing weight status, nutritional patterns and exercise routines without manipulation of variables. The study aimed at providing the data (baseline information) that can be used to describe the characteristics of clients in relatively short period of time.

3.3 Variables

Independent variables in the study include Physical Activity and Nutritional patterns and dependent variable included Body Weight status. Extraneous variables included gender, age, hereditary factors, social economic status and environment.

3.4 Location of the Study

The study was conducted in Kampala, Uganda. Uganda is located in East Africa. It is a country made up of four regions namely, the central, eastern, western and northern region. The study area comprised of the central region in which Kampala city is located. Kampala city is the capital city of Uganda. Kampala city is divided into 5 divisions namely, Central, Nakawa, Makindye, Kawempe and Rubaga. The study was carried out in these divisions of the city.

3.5 Target Population

The study targeted 206 clients from selected health clubs in Kampala city to take part in exercise. The response rate was 100 clients. According to the Registry of companies, Uganda (2014), Kampala city has a total number of 28 registered health clubs.

3.6 Sampling Procedure and Sample Size

Purposive sampling was done to select Kampala city which has the highest number of health clubs in Uganda. Quota sampling was used to select two health clubs from each of the five divisions of Kampala city. Stratified random sampling technique was used to select clients according to gender. Ten (10) clients were selected from each health club making a total of 100 clients.

3.7.1 Research Instruments

Questionnaire

The researcher used a questionnaire (appendix II) to collect data from clients in selected health clubs. The questionnaire had sections. The first section included the demographic details and exercise routines of clients, the second section included measurements of weight, height, waist and hip circumferences and the third section included nutritional habits of clients.

3.7.2 Research Equipment

Weighing Scale

Calibration was done before every measurement. To determine the body weight status of the clients, a standard Tafel Digital weighing scale was used to measure body weight in kilograms. Weight was measured to the nearest 0.1kg with clients having light clothes.

Stadiometer

A stadiometer that was locally manufactured was used in metres to measure human height. Height was measured barefooted to the nearest centimeter.

Anthropometric tape

A tape measure with linear measurement markings was used to measure in centimeters the waist and hip circumferences of clients. The measurements taken were used to determine the BMI, WC and WHR of clients. Waist circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest (WHO, 2008). Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor. For both measurements the clients stood with feet together, arms at the side and body weight evenly distributed and wore light clothes. Clients were relaxed and the measurements were taken at the end of a normal expiration. Measurements were repeated twice and if found within 1cm of one another the average was calculated. If the difference exceeded 1cm, the two were repeated.

3.8.1 Validity of the Instruments

The researcher used the digital weighing scale from a recognized Tafal company in Germany to measure the weight of clients in kilograms. A new battery was bought and inserted before use and it was always adjusted to zero before use. The researcher used a calibrated stadiometer that was in good working condition to measure the height in meters. The anthropometric tape was used to measure waist and hip circumferences. To ensure the validity of the questionnaire, a pilot study was done on ten participants who were not participating in the study. This was to find out the applicability of the questionnaire in terms of language, content and time and to ensure that it was relevant and able to collect the intended data. All questions that were reported to be vague or unclear were revised by the researcher together with the supervisors and the final tool as appended (appendix II) was generated and used to collect data.

3.8.2 Reliability of the Instruments

To test for the reliability of the questionnaire used, the Cronbach's alpha test of reliability was carried out and the findings were as follows

Reliability Statistics

Cronbach's Alpha	N of Items
0.704	45

This value of 0.704 was acceptable as far as the reliability of the questionnaire is concerned based on the assertion by Årestedt (2013) that for Cronbach's Alpha reliability test, a figure that is less than 0.5 is rated as unacceptable; that in the range 0.5-0.7 as weak but acceptable; that in the range 0.7-0.8 as good; while that above 0.9 as excellent. As such, this implied that the data collected was credible enough for further analysis.

3.9 Data Collection Procedure

A letter of introduction (appendix I) to collect data was obtained from the department of Sportscience, Kyambogo University. This helped to introduce the researcher to the health club managers who also introduced the researcher to the instructors in health clubs and the instructors introduced the researcher to the clients. The clients then, signed the consent form (appendix III) and the researcher then made appointments with the instructors and clients on when to collect data. The clients first filled part of the questionnaire to enable the researcher obtain their demographic and nutrition patterns information. The researcher then measured and recorded their weight in kilograms, height in meters, waist and hip circumferences in centimeters in the data entry form (appendix IV). These helped the researcher to calculate the anthropometric measures of BMI and WHR which in turn helped to determine body weight status of clients.

3.10 Data Analysis and Presentation

Descriptive statistical methods that included frequencies, percentages, means and standard deviation were used to analyze data collected from clients. Analysis was performed using the Statistical Package for Social Sciences (SPSS) version 16.0. Pearson correlation analysis was used to compare different parameters that were used in determining body weight status and one sample t-test to compare weight status of male and female clients. Hypothesis testing was conducted using the SPSS version 16.0 for all the three hypotheses to establish the level of significance between BMI and WC, BMI and WHR and between the weight status of female and male clients in Kampala City health clubs. The correlation was significant at 0.01 and p-value was 0.05. Data was presented in graphs, pie-charts and tables for easy interpretation and understanding.

3.11 Ethical Considerations

The purpose of the study was explained to the clients prior to data collection and they were fully sensitized about what was required. They were assured of confidentiality and right to withdraw from the study in case they were not comfortable. The clients who volunteered to participate in the study signed a consent form. To ensure confidentiality the names of the clients were not indicated anywhere on the questionnaire and their weight, height, waist and hip circumferences were not mentioned to the rest of the clients. Data was collected from only those who were willing to take part in the study.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents the presentation and discussion of the collected data. The first section is about the background information of the clients followed by the findings of the study objectives namely, (1) to determine the weight status of clients in Kampala City health clubs using selected anthropometric measures (2) to establish the nutritional patterns of clients in selected health clubs in Kampala City, (3) to find out the exercise routines of clients in Kampala city health clubs and (4) to recommend appropriate exercise and nutritional guidelines for the clients.

4.2 Demographic Data of the Clients

The data presented here is about the gender, age, and the marital status of the clients.

4.2.1 Gender distribution of Clients

The sex of each client was recorded among the personal characteristics.

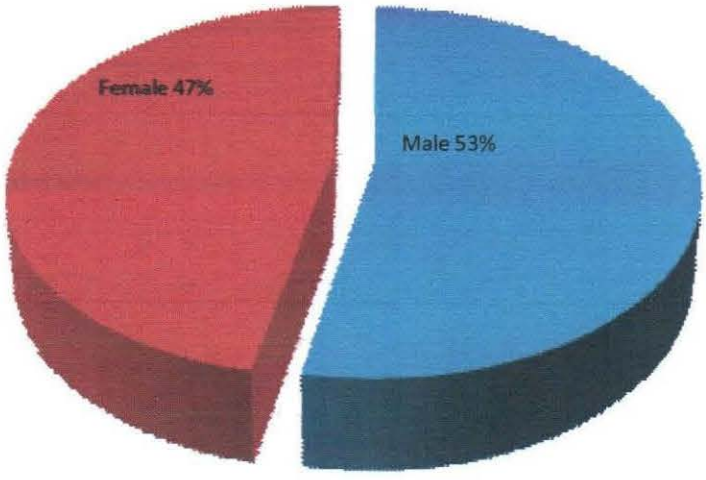


Figure 4.1: Gender of Clients

As indicated in Figure 4.1, it was established that there were more male (53, 53.0%) compared to the female (47, 47.0%) clients.

4.2.2 Marital Status of the Clients

Clients were also required to indicate their marital status and the results got are indicated in figure 4.2 below.

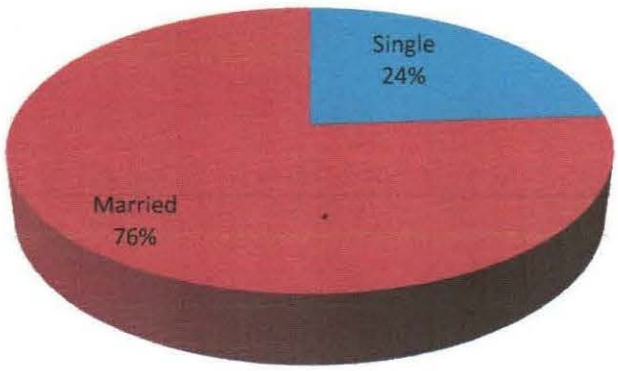


Figure 4.2 Marital status of clients

As far as the marital status was concerned, it was established that 76 (76%) of the clients were married while 24 (24%) of the clients were single. The findings of this research are in disagreement with (Nomaguchi & Bianchi, 2004) whose study rather revealed that married people do not often visit health clubs since majority of them work harder at their jobs while at the same time spend time as parents.

4.2.3 Age Groups of Clients

Clients were also required to indicate their age groups and the results are displayed in figure 4.3 below

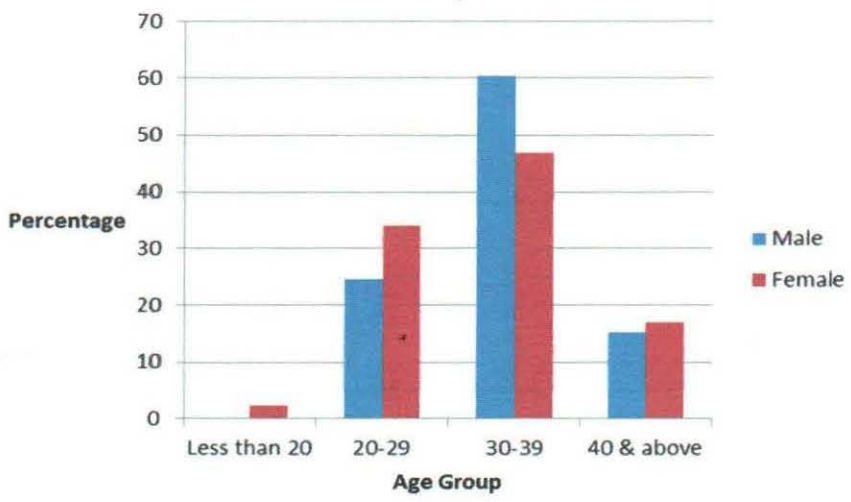


Figure 4.3 Age Groups of Clients

In terms of age, majority 32 (60.4%) of the male clients belonged to the age group of 30 -39 years old, followed by that of 20-29 years at 13 (24.5%). Similarly, majority of the female clients were aged 30-39 years followed by 20-29 years old at 22 (46.8%) and 16 (34.0%) respectively. Whereas there was no male client below the age of 20 years, there was only one female client. Of the total 53 male clients, 8 (15.1%) were 40 years and above while 17% of the female were in this age category.

In general the middle aged participants were the majority compared to the teenagers and those above 40 years of age. This implies that the health clubs seemed to attract mainly the middle aged clients which could be explained by the fact that this is age period during which people become more conscious of their physical status in relation to health and physical appeal. At the same time, these are likely to be employed people who are able to pay for exercise.

4.3 Body Weight Status of Clients

To determine the weight status of clients in Kampala City health clubs, selected anthropometric measures were used. These included weight, height, and waist and hip circumferences. The findings for male clients separate from their female counterparts are indicated in Table 4.1. The mean and standard deviation were for male 78.6 ± 12.4 respectively and 72.4 ±12.2 for females respectively, the mean height and standard deviation for male were 1.72m ± 0.06 and 1.60 ± 0.07 for females respectively; the mean waist circumference and standard deviation for men were 91.66cm ± 12.30 and 89.3 ± 11.07 respectively. The mean hip circumference and standard deviation for men were (99.6cm ± 15.9 and 107.9 ± 11.1for women respectively.

Table 4.1: Weight, Height, Waist and Hip Measurements of Clients

Sex of the clients		Weight of clients in kg	Height of clients in meters	Waist circumference in cm	Hip circumference in cm
Male					
	Mean	78.6521	1.7207	91.6642	99.6396
	Std. Deviation	12.49867	.06635	12.30596	15.94715
	Minimum	54.90	1.58	64.30	32.50
	Maximum	118.40	1.91	129.00	122.00
Female					
	Mean	72.4553	1.6050	89.3149	107.9915
	Std. Deviation	12.28962	.07255	11.07743	11.18875
	Minimum	60.40	1.49	71.00	88.90
	Maximum	119.50	1.89	133.00	149.50

Source: Primary Data

According to the findings, the mean values for weight, height, waist circumference, and hip circumference for male clients were 78.6kg, 1.7m, 91.66cm, and 99.63cm in that order and for female clients 72.4kg, 1.6m, 89.31cm, 107.99cm respectively. The correspondent standard deviations for male were 12.4kg, 0.06m, 12.30cm and 15.94cm and for female clients 12.2kg, 0.07m, 11.07cm and 11.18cm respectively. Considering that mean is a measure of central tendency, the findings imply that on overage male respondents to this study weighed 78.6kg, and measured 1.7m in height, 91.66 cm in waist circumference and 99.63 cm in hip circumference

while on average women weighed 72.4kg, 1.6m height, 89.31 cm waist circumference and 107.99cm hip circumference.

The findings of this study suggest that the weights of individual respondents varied so much from the mean making the mean less reliable. The standard deviations of 12.49 for male and 12.28 for female imply that each data point in the study sample was 12.49 and 12.28 points respectively from the mean. The same can be said about the waist and hip circumference which recorded standard deviations of 12.3cm for male and 11.07cm for female clients and 15.9 cm for male and 11.18 for female respectively. This implies that the standard deviations for male clients were more compared to their female counterparts.

Considering that the BMI is calculated by dividing weight by the square of height and that the average weight for male clients was established to be 78.6kg while the height was 1.7m, the average BMI for the male study population can be said to be 27.19kg/m^2. Also considering that 72.45kg was average weight for female clients and 1.6m average height, the average BMI for female clients is 28.3 kg/m^2. According to George, Thomas and Kenneth (2005) and WHO (2014), it can be concluded that the study sample for both male and female was generally overweight at 27.19 kg/m^2 and 28.3 kg/m^2 respectively as these fall in the overweight BMI range of 25.0-29.9 but women were more over weight than men which puts them at greater risk to ill health as revealed by WHO (2000).

The study findings revealed that the average waist circumference of male clients was 91.66cm which falls in the normal category. However the female clients were found to have an average WC of 89.3cm which is greater than the normal range of 88cm. This implies that majority of the female clients were OWO as compared to their male counterparts. As a result the females are at more risk of diseases associated with obesity as revealed by WHO (2000).

4.3.1 Measurement of BMI

The body mass index was used to establish the body weight status. The findings are shown in Figure 4.4.

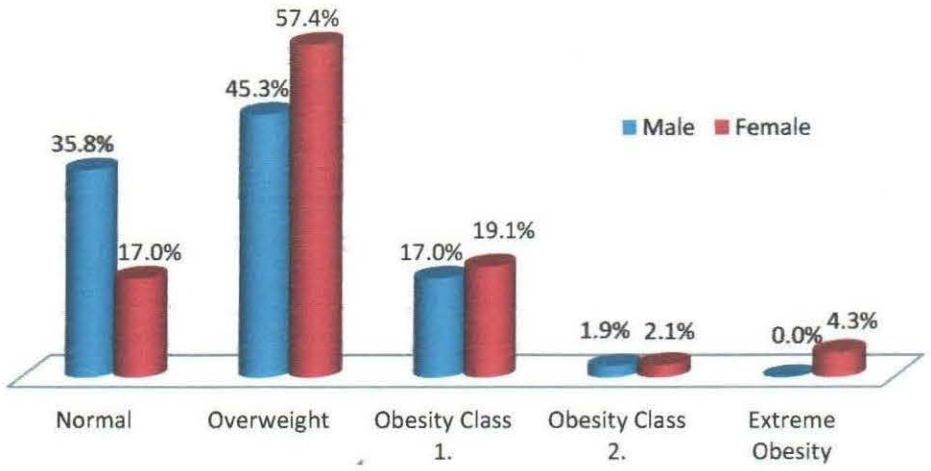


Figure 4.4: BMI Ratings of Clients

Figure 4.4 shows that out of the 53 male clients, only 35.8% and out of 47 female clients, only 17.0% were rated as having a normal Body mass index (BMI). There were twice as many male as female who were rated as having a normal BMI. This means that more women were either overweight or obese. In both the male and the female, majority (45.3%, 57.4%) of the clients were rated as being overweight respectively, 17% and 19.1% were rated as obese type I clients. No male client was rated as being extremely obese unlike the female where 4.3% were noted to be so.

The findings from this research concurs with other researchers such as Shalom and Opeyemi (2014), who found that the prevalence of normal weight was higher in male subjects (76.3%) compared to females (64.0%) and body weight abnormalities occurred more in females than in male subjects. Baalwa et al (2010) in agreement with this study and Shalom and Opeyemi also found out that females were 5 times more likely to be overweight and obese compared to their male counterparts.

In contrast Charlotte et al (2002), found out that men (62.7%) were considerably more likely than women (46.9%) to be overweight and no differences between men and women were found in the prevalence of obesity. Women (49.5% were significantly more likely than men (36.3%) to be of health weight.

4.3.2 Waist Circumference of Clients

The normal waist circumference cut off points for men is >102 cm and women it is >88 cm; and for overweight or obesity they are ≥102 cm (40 in.) for men and ≥ 88 cm (35 in.) for women. (WHO, 2000)

Using waist circumference to determine the level of obesity, it was established that out of 47 female, 24 (51.06%) and out of 53 male 6 (11.3%) were obese.

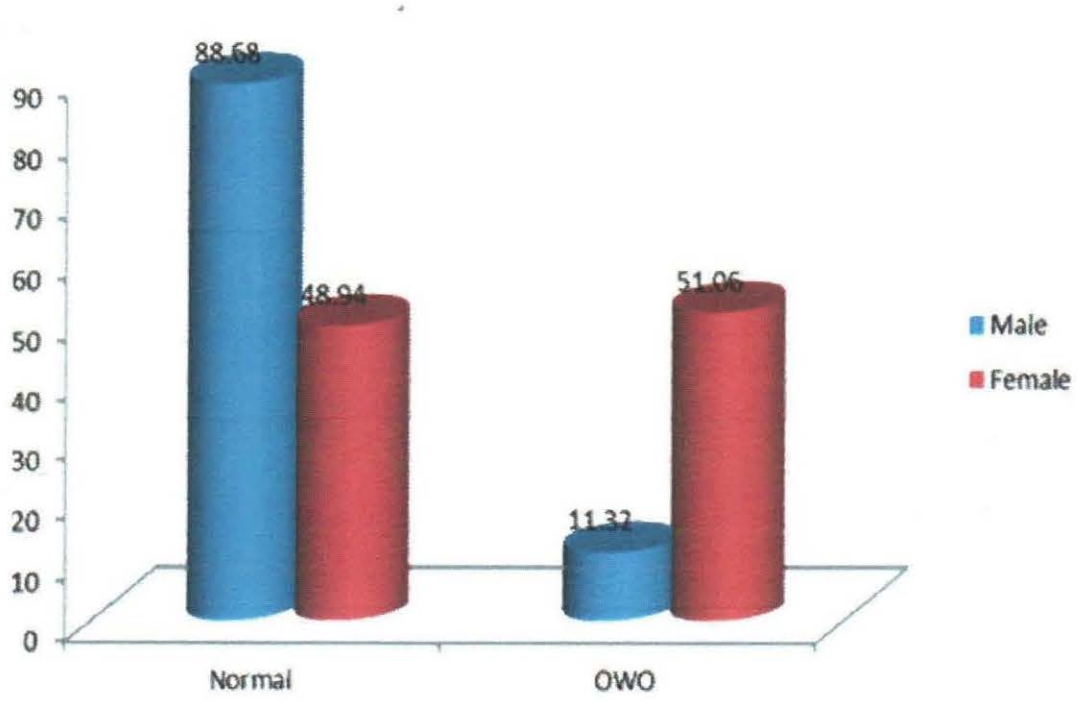


Figure 4.5: Waist Circumference scores of clients

4.3.3 Waist to Hip Ratio (WHR) as a Measure of Body Fat Distribution

To establish the WHR ratings of the clients, waist circumferences were divided by hip circumferences. This was an indirect measure of the obesity or lack of it as it estimates the body fat distribution. The waist-hip ratio cut-off points used in this assessment were according to WHO (2008) which put them at $\geq$ 0.90 cm for male and $\geq$ 0.85 cm for female. The findings revealed that 29 (54.7%) of the male clients and 27 (57.4%) of the female had normal ratios.

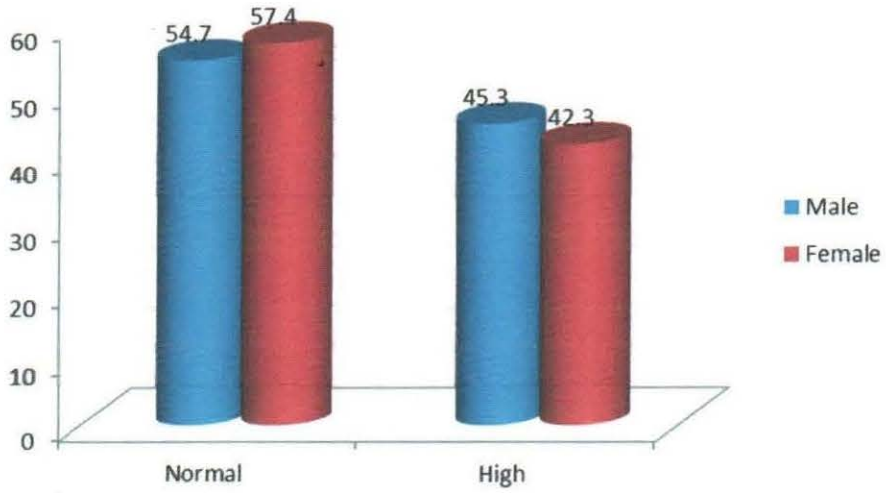


Figure 4.6: Waist-hip Ratios of clients

According to Figure 4.6, more male clients (24, 45.3%) had a high WHR which puts them at risk of metabolic-related diseases compared to 20, 42.3% of the female clients.

4.3.4 Hypothesis Testing

The three hypotheses that guided this study were tested and their findings were as shown below.

4.3.4.1 Hypothesis Testing on the Relationship between BMI and WC

The first hypothesis read as follows:

> H_{O1}: There would be no significant relationship between BMI and WC scores of clients in Kampala city health clubs.

Pearson correlation analysis was carried out to establish if at all the two variables, BMI and WC, are correlated. The findings were as shown in Table 4.2

Table 4.2: BMI - Waist circumference in cm

Correlations

Sex of the respondent			BMI scale	Waist circumference in cm
Male	BMI scale	Pearson Correlation	1	.762**
		Sig. (2-tailed)		.000
		N	53	53
	Waist circumference in cm	Pearson Correlation	.762**	1
		Sig. (2-tailed)	.000	
		N	53	53
Female	BMI scale	Pearson Correlation	1	.710**
		Sig. (2-tailed)		.000
		N	47	47
	Waist circumference in cm	Pearson Correlation	.710**	1
		Sig. (2-tailed)	.000	
		N	47	47

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

Source: Primary Data

According to the results, the two-tailed P-values in both cases were .000. This implied that there was a positive statistically significant correlation between the waist circumference and the BMI for both the male and the female clients at 99% confidence level. Considering that the Pearson Correlation coefficient in the case of the male statistics was .762 and that of the female was .710 implies that both correlations were not only statistically significant as established by the p-values, but they were strong correlations considering that the values were close to 1.0. Based on these findings, the hypothesis that, "there would be no significant relationship between BMI and WC scores of clients in Kampala city health clubs", is rejected

4.3.4.2 Hypothesis Testing on the Relationship between BMI and WHR

The second hypothesis (Ho_2) that "There would be no significant relationship between BMI and WHR, scores of clients in Kampala city health clubs", was similarly tested and he results were as shown in Table 4.3

Table 4.3: BMI - WHR Hypothesis Testing

Correlations

Sex of the respondent			BMI scale	WHR
Male	BMI scale	Pearson Correlation	1	.135
		Sig. (2-tailed)		.336
		N	53	53
	WHR	Pearson Correlation	.135	1
		Sig. (2-tailed)	.336	
		N	53	53
Female	BMI scale	Pearson Correlation	1	.037
		Sig. (2-tailed)		.806
		N	47	47
	WHR	Pearson Correlation	.037	1
		Sig. (2-tailed)	.806	
		N	47	47

Source: Primary Data

According to the results, the two-tailed P-value for the male clients' data was .336 while that of the female clients was .806. In both instances the P-values were neither significant at 99% nor at 95%. Further, the correlations could be termed as being very weak or insignificant since the Pearson correlation values were .135 and .037 for male and female respectively and that they were very close to zero. It can be concluded that there was no statistically significant correlation between WHR and BMI for both the male and the female clients. Based on these findings, the hypothesis that, "There would be no significant relationship between BMI and WHR, scores of clients in Kampala city health clubs", is accepted

4.3.4.3 Hypothesis Testing on the Relationship between Male and Female Weights

The final hypothesis (H_{O3}) was that "There would be no significant difference between the weight status of female and male clients in Kampala City health clubs". The one-sample Test was used to test it and the findings were as shown in Table 4.4

Table 4.4: Weight Status Hypothesis Testing

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Weight of respondent in kg	59.526	99	.000	75.73960	73.2149	78.2643

Source: Primary Data

The results above show that the two-tailed P-value was .000. This implied that there was a statistically significant correlation between the weights of the male and those of the female clients at 99% confidence level. Based on these findings, the hypothesis that, "There would be no significant difference between the weight status of female and male participants in Kampala City health clubs", is rejected

4.3.4.4 Summary of Hypotheses Tests

The findings of the three hypothesis test results are displayed in table 4.5

Table 4.5: Summary of Hypothesis Testing Results

Null Hypothesis	Hypothesis Statement	Sex	p-value	Interpretation	Remarks
Ho_1	There was no significant relationship between BMI and WC scores of clients in Kampala city health clubs	Male	.000	Significant	Hypothesis rejected
		Female	.000	Significant	Hypothesis rejected
Ho_2	There was no significant relationship between BMI and WHR, scores of clients in Kampala city health clubs	Male	.336	Not Significant	Hypothesis accepted
		Female	.806	Not Significant	Hypothesis accepted
Ho_3	There was no significant difference between the weight status of female and male clients in Kampala City health clubs	All	.000	Significant	Hypothesis rejected

4.4 Exercise Routines of Clients

Exercise routines of clients in selected health clubs in Kampala city were found out. Exercise routines included the frequency in days the clients exercised, the duration of the exercise, the intensity of the exercise and the activities the clients engaged in while at the health club in relation to physical fitness.

4.4.1 Number of Days Exercise was carried out in a Week

Clients were required to indicate the health club weekly attendance frequency and the findings were as shown in Figure 4.7.

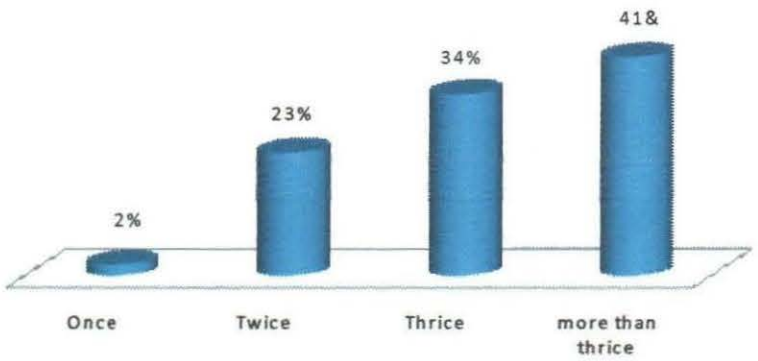


Figure 4.7: Frequency of attending health club per week

It can be observed that many clients (41.0%) attended the health club more than three times in a week, followed by 34.0% who attended the gym thrice in a week. In total, 75.0% of the clients attended the gym at least three times in a week. When the data was split along gender lines, Table 4.6 was developed.

Table 4.6 Number of days of exercising by Male and Female in a week

Sex			Frequency	Valid Percent
Male	Valid	Once	1	1.9
		Twice	9	17.0
		Thrice	17	32.1
		more than thrice	26	49.1
		Total	**53**	**100.0**
Female	Valid	Once	1	2.1
		Twice	14	29.8
		Thrice	17	36.2
		more than thrice	15	31.9
		Total	**47**	**100.0**

From Table 4.6 above it can be seen that more male (49.1%) than female (31.9%) clients exercised for more than thrice in a week. Only male clients and 2.1% female clients reported exercising only once a week.

From the above results the total of 81.2% and 68.1% female clients attended the gym at least three times in a week and this finding is in agreement with what Wabuyabo & Wamokoya (2009) recommended that fitness training should be conducted 3 to 5 times for optimal results. The research finding is also in agreement with Center for Disease Prevention and Control Physical Activity (2007) that recommends that for adults, three or more days of moderate exercise per week or 3 or more days of vigorous exercise per week reduce the risk for overweight and obesity. This means that 75 % of the clients who exercised at least thrice a week stand reduced risk for overweight and obese compared to the rest who exercised less than thrice a week. It was also seen that more male (49.1%) than female (31.9%) clients exercised for more than thrice in a week thus males stand more chances of reduced risk of overweight and obesity than females. This research finding is in agreement with Doku et al. (2003) who investigated the level of physical activity among adolescents in Ghana using a four point likert type scale where responses were combined into two categories of physically active and not physically active and the findings indicated that 69% of adolescents in Ghana were physically active and that boys were more likely to report that they were physically active than girls. The findings also concurs with Mugwang'a (2014), who carried out a study about dietary and physical activity behavior among a group of adolescents in Nairobi, Kenya and the findings also indicate that boys were more likely to participate in team sports and gym based workouts than girls

4.4.2 Duration of Exercise the Clients Spent in a Health Club

The time clients spent in the health club doing exercise was considered important because it gives an indication of the possible duration spent doing exercises. Clients were asked to state how long they did exercises in the health clubs and according to the results as displayed in Table 4.7, 86.0% of the clients spent more than 30 minutes with a further 10% spending 30 minutes. This implies that 96.0% of the clients spent not less than 30 minutes doing exercises whenever they attended the health clubs.

Table 4.7: Duration of Exercise you do in a Health Club

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 30 minutes	4	4.0	4.0	4.0
	30 minutes	10	10.0	10.0	14.0
	More than 30 minutes	86	86.0	86.0	100.0
	Total	100	100.0	100.0	

According to the above results 96% of the clients spent not less than 30 minutes doing exercises whenever they attended the health clubs. This is in agreement with Wabuyabo & Wamokoya (2009) who recommend that 20 -30 minutes of intense exercise must be used in order to improve cardiorespiratory endurance and get optimal results. The finding is also in agreement with the Center for Disease Prevention and Control Physical Activity (2007) that recommends that 30 minutes of moderate exercise activity and 20 minutes of vigorous activity should be done to get optimal results.

4.4.3 Intensity of Exercise carried out by Clients

Considering that the level of intensity of exercise relates to the extent of "burning" of body fat, it was important to establish the vigour at which the clients exercised. This was indirectly established by asking them to indicate whether they were able to talk while doing the exercises or not. The findings as see in Figure 4.8 show that 97.0% indicated that they were able to talk during the training sessions.

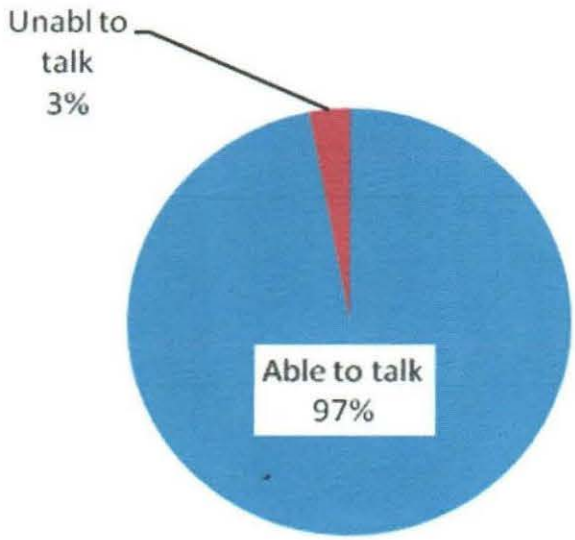


Figure 4.8: Exercise Intensity

These finding may indirectly point out that the exercises undertaken by the clients during the gym sessions were not very intense. This finding correspond with Wabuyabo & Wamokoya (2009) who noted that training at the right intensity is very necessary in order to obtain optimal results and according to the findings above 97% of the respondent were able to talk while doing exercise meaning that they were training at moderate level while 3% were not able to talk meaning that they were doing more than they could manage.

4.4.4 Activities Clients Engaged in

The clients were required to indicate which activities they participated in pertaining to physical exercise and the findings were as illustrated in Figure 4.9.

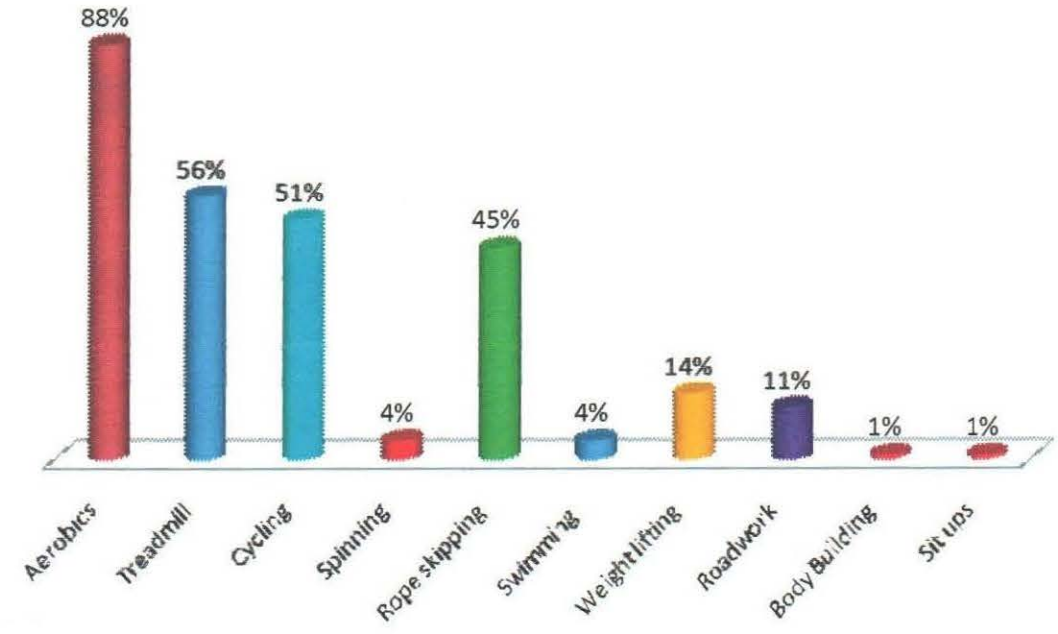


Figure 4.9: Activities clients engaged in

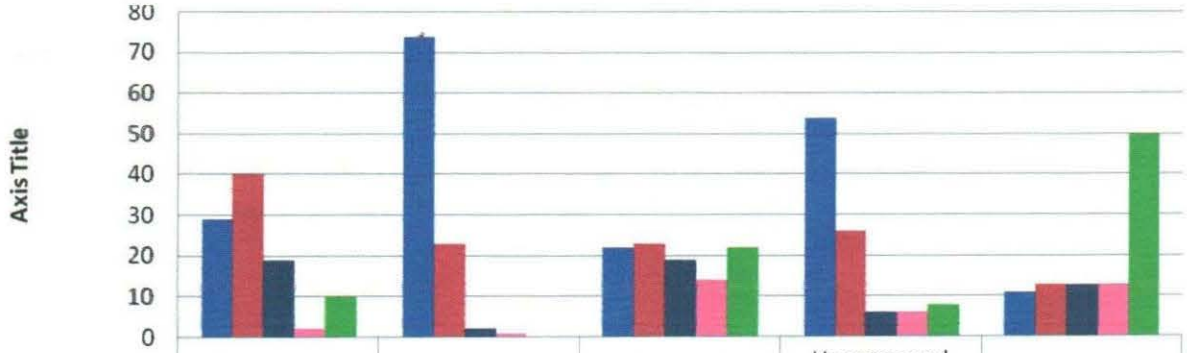
According to the findings, the most popular activity was aerobics at 88% (n=100) followed by treadmill, cycling and rope skipping at 56%, 51%, and 45% respectively. The moderately scored activities were weight lifting (14%) and roadwork (11%).

Considering the range of activities carried out and what they entail, it can be concluded that most of the activities that clients participated in were cardio exercises which help most in reducing weight and keeping healthy. However this finding is in disagreement with Shannon (2015), Campbell (2014) and Aleisha (2013) who in agreement recommend that cardio training should be combined with weight training in order to acquire optimal results. In order to lose weight cardio is a great stepping stone for increasing fitness levels and burning calories quickly. However in order to have a toned sculpted body weight training workouts must be added. Weight that is lost during cardio training is a combination of fat and muscle while weight lost during weight training is typically fat. Therefore, people who do more cardio may lose weight but remain with bodies that are not toned compared to those who do both. The findings from this study indicated that majority of the clients participated in only cardio training and ignored weight training which could be a reason why most of them were found overweight and obesity.

4.5 Nutritional Patterns of Clients

Nutritional patterns of clients attending health clubs in Kampala were established. The respondents were required to indicate weekly frequency of meals, snacking, alcohol consumption and the times breakfast, lunch, dinner or supper were taken. Clients were required to state the meals they took in any given week as this was considered relevant in determining how nutrition may influence the weight and general wellbeing of the clients. It covers the taking of whole meals, fruits, vegetables and eggs.

4.5.1 Whole Meal Foods taken in a Week



	Brown rice	Millet	White posho	Unprocessed posho	"matooke"
Never	29	74	22	54	11
1-2 times	40	23	23	26	13
2-4 times	19	2	19	6	13
5-6 times	2	1	14	6	13
7 times	10	0	22	8	50

Figure 4.10: Types of Whole Meals and the Frequency taken

From Figure 4.10, plantain locally known as "matooke" a Buganda traditional food, one of the most common foods in Uganda was the most popular whole meal. Of the total clients, 50.0% indicated that they take it seven times a week, meaning that they take it daily. Posho was the only other that was rated at above 20% as 22.0% of the clients consumed it daily. This was followed by brown rice at 10.0%. A total of 74.0% of the clients indicated that they never take millet followed by 54.0% unprocessed "posho" or porridge.

According to Lawrence, et al (2015) healthy carbohydrates include brown rice, millet, and unprocessed posho while unhealthy carbohydrates include white rice, white posho that have been stripped of all fiber and nutrients. This study also shows that many clients feed on unhealthy foods because 74.0%, 29.0% and 22.0% never took millet, brown rice, unprocessed posho respectively but fed on other foods. According to George Mateijan Foundation (2007), brown rice is one of the world's healthiest foods and its rich in fiber and selenium. Oils in brown rice lower cholesterol. In this study, 22% take white posho daily that is refined thus positively associated with weight gain. 29%, 74% and 54% never took brown rice, millet and unprocessed posho respectively which are having necessary nutrients that prevent weight gain. This could be the reason why majority (64.2% m & 83.0%) of the clients are overweight and obese.

The Uganda multimedia news and information team (2012) stated that plantain (matooke) are low in calories but high in water and it contains potassium, magnesium and vitamins that the body needs to function properly therefore it should be part of a healthy diet.

Clients were asked to indicate other whole meals taken in a week and the results are shown in Figure 4.11, Irish potatoes had the highest percentage of clients who took it (5.0%) and these are low carbohydrates diets followed by sweet potatoes (3%) that are naturally sweet and contain fiber. Of these Irish and sweat potatoes do not increase weight like refined carbohydrate. The rest of those mentioned were at 1.0%. In general, majority of the clients did not take other whole meals other than those discussed earlier.

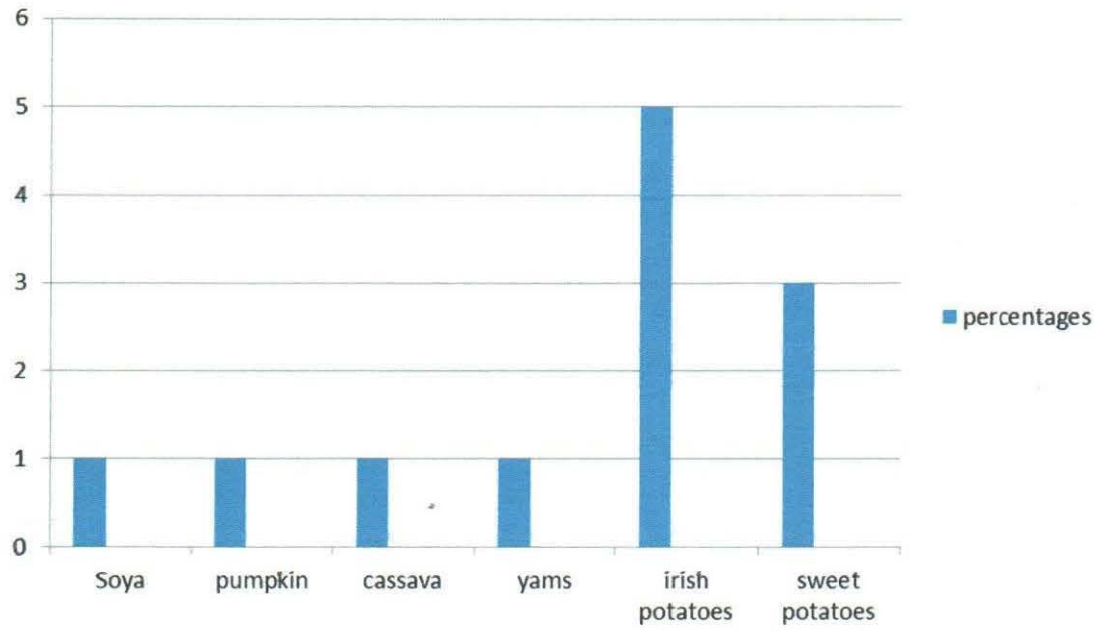


Figure 4.11: Other types of whole meals taken

4.5.2 Frequency and Type of Fruits taken

Clients were also required to give details about their daily taking of fruits. Apart from that, they were required to give examples of the fruits that they take. The findings are presented below.

With respect to servings of fruits taken daily as per Table 4.8, many male clients (47.2%) and majority female (51.1%) take 1-2 servings of fruits daily. Those taking 5 servings daily were 30.2% for male clients and 36.2% of the female. While the percentages show some reasonable differences, the actual differences in terms of frequencies between male and female clients were very minimal for the 1-2 servings (25 for male & 24 for female) and 5 servings (16 for male & 17 for female) respectively.

Table 4.8: Daily Servings of Fruits

Sex of the respondent			Frequency	Percent
Male	Valid	Never	1	1.9
		1-2 servings	25	47.2
		3-4servings	11	20.8
		5 servings	16	30.2
		Total	**53**	**100.0**
Female	Valid	1-2 servings	24	51.1
		3-4servings	6	12.8
		5 servings	17	36.2
		Total	**47**	**100.0**

According to Table 4.8, 30.2% male and 36.2% female take 5 servings daily and this finding is in agreement with WHO (2004) that recommends daily minimum of 5 servings of fruit and vegetables that naturally fill you up and help cut back on unhealthy foods. The result also is in agreement with Wabuyabo & Wamokoya (2009) and Lawrence *et al* (2015) that also recommend that taking a minimum of 5 servings daily is necessary for health eating and is associated with reduced risk of overweight and obesity. 30.2% male and 36.2% female clients who took the recommended servings of fruits and vegetables stand the reduced chances of being overweight and obese. However, the results from table 4.8 show that many clients (47.2% male, 51.1% female) took 1-2 servings against the recommended 5 servings which is associated with weight gain. This could be the reason why majority were found to be overweight and obese.

Clients were also required to give two common examples of fruits they take per week; the findings are as shown in Figure 4.12.

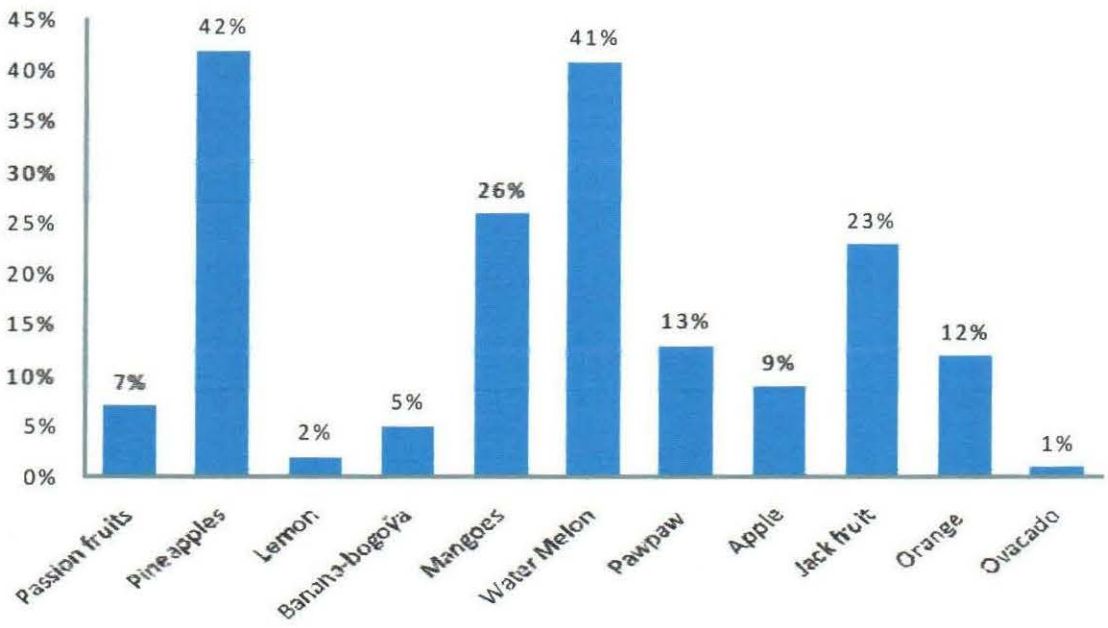


Figure 4.12: Types of Fruits Taken

It was established that 42.0% and 41.0% of the clients took pineapples and water melon respectively. These were followed by mangoes and jack fruit at 26.0% and 23.0% respectively. The other fruits which included passion fruits, paw paws, oranges, banana among others were consumed by 13.0% clients or less. Fruits and vegetables contain essential vitamins and minerals, fiber and other substances that are important for good health. In addition water and fiber in fruits and vegetables add volume to dishes thus eating same amount of food with fewer calories. They are also naturally low in fat and calories and are associated with reduced risk of obesity and overweight (WHO 2004, Wabuyabo & Wamokoya 2009, and Lawrence *et al* 2015)

4.5.3 Daily Vegetable Consumption

As part of their nutritional intake, clients were required to indicate the vegetables that they take and the frequency of serving them. They were also required to give examples of the vegetables. The findings are as discussed below.

As shown in Table 4.9, (41.0%) of clients take 1-2 servings of vegetables daily. This was followed by those (34%) taking 3-4 servings. Only 6.0% of the clients indicated that they never take vegetables.

Table 4.9: Daily servings of vegetables

		Frequency	Percent
Valid	Never	6	6.0
	1-2 servings	41	41.0
	3-4servings	34	34.0
	5 servings	19	19.0
	Total	**100**	**100.0**

According to the results only 19.0% take the recommended number of daily 5 servings of vegetables according to Lawrence et al (2015) and Wabuyabo & Wamokoya (2009) thus healthy eating as vegetables contain essential vitamins and minerals, fiber and other substances that are important for good health. However 34% took 3-4 servings daily and 41% took 1-2 servings daily which is against the recommended servings and thus associated with overweight and obesity. 6% who never took vegetables are at high risks of becoming overweight and obese.

Clients were also required to indicate the examples of vegetables they take and results are displayed in figure 4.13

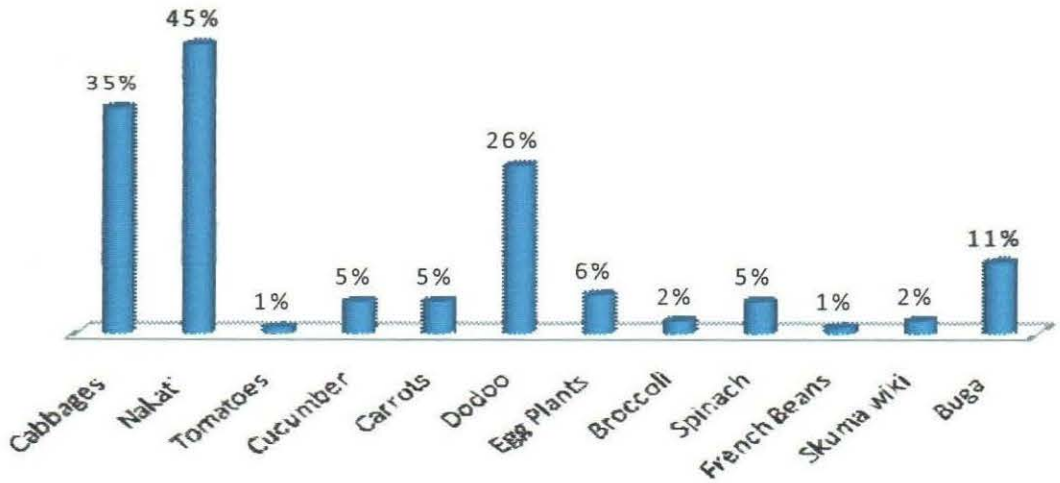


Figure 4.13: Examples of Vegetables taken by clients

Solanumaethiopicum commonly known as "Nakati", a local vegetable was rated as the most commonly taken vegetable by 45.0% of the clients followed by cabbages at 35.0% and amaranth commonly known as "dodo", another local vegetable, at 26.0% as shown in figure 4.13. The other significantly taken vegetable is amaranth commonly known as "bugga" at 11.0%. The rest of the vegetables taken included eggplant, spinach, cucumber, tomatoes, and French beans among others and all these were rated at 6% and below. Vegetables are naturally low in fat and calories, contain potassium, dietary fiber, folate, vitamin C. Dietary fiber helps reduce blood cholesterol levels and may lower risk of heart disease. Fiber help provide a feeling of fullness with fewer calories. Eating a diet rich in vegetables reduce risk of heart disease, protect against certain cancers, lower blood pressure, reduce risk of overweight and obesity and type two diabetes and lower calorie intake (WHO 2004, Wabuyabo & Wamukoya 2009, AGHE 2013).

4.5.4 Weekly Egg Consumption

Table 4.10 indicates that 24.5% of male clients and 21.3% of the female clients never take eggs. About 30.2% of male indicated eating more than four eggs in a week compared to 19.1% of the female.

Table 4.10 : Weekly Egg Consumption

Sex of the respondent			Frequency	Percent
Male	Valid	None	13	24.5
		1-2 eggs	17	32.1
		3-4 eggs	7	13.2
		More than 4	16	30.2
		Total	**53**	**100.0**
Female	Valid	None	10	21.3
		1-2 eggs	19	40.4
		3-4 eggs	9	19.1
		More than 4	9	19.1
		Total	**47**	**100.0**

Elisa (2014) recommends that eating one egg daily is not associated with an increased risk of coronary heart disease and stroke. This is in line with the recommendation of the American Heart Association that it is prudent to stick up to one egg per day or seven per week. Djousse and

Gaziano (2008) supports the idea that eating an egg a day is generally safe for the heart but going much beyond could increase the risk for heart failure later in life.

About 30.2% of male clients indicated eating more than four eggs in a week compared to 19.1% of the female. Eggs are a source of saturated fat and too much saturated fat has been shown to raise total cholesterol and LDL (bad) cholesterol levels, risk factors for cardiovascular disease (Elisa 2014). This implies that 30.2% of male and 19.1% female clients who take more than four eggs are likely to face the risks of overweight and obesity.

4.5.5 Meat Consumption

Clients were required to indicate their frequency of eating red meat such as beef and pork and white meat such as chicken and fish. The findings were as shown in Figure 4.14.

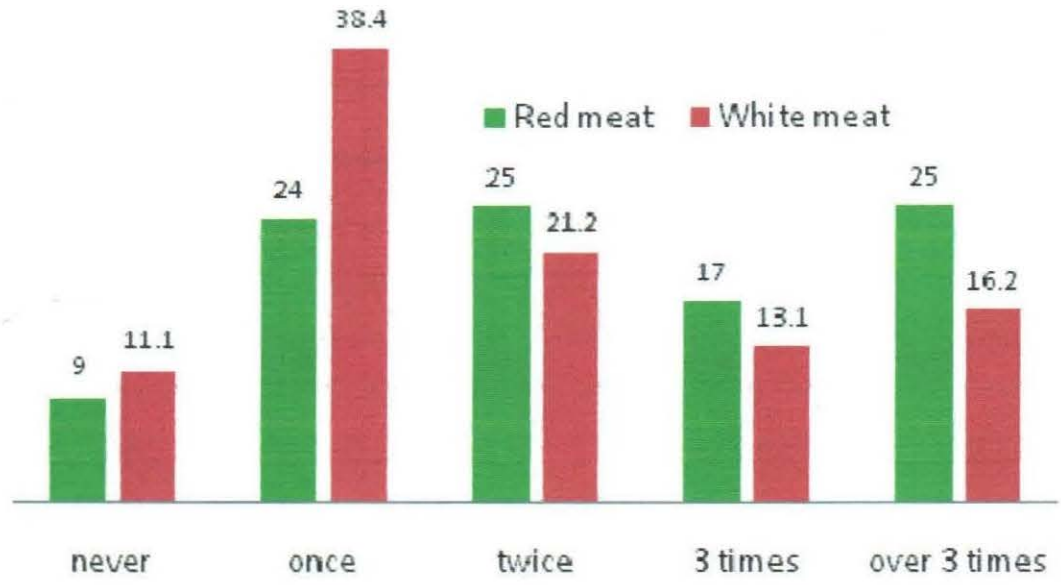


Figure 4.14: Weekly Meat Consumption

According to the findings, the many clients (38.4%) take white meat once a week. The percentage that take red meat once, twice and over three times a week were more or less the same percentage of about 25%. About 9.0% and 11.1% of the clients indicated that they never take red and white meat. One should obtain essential nutrients and protein from red meat and maintain weight by white meat though they should both be taken in balanced quantities to avoid

taking too much. The finding also contradicts with Sampateek (2013) who revealed that both red and white meat have lots of advantages and disadvantages. They should both be taken though it's necessary to mind about the preparation and choose lean cuts.

Table 4.11: Weekly Meat Consumption.

Sex of the respondent			Number of times in a week you take red meat		Number of times in a week you take white meat	
			Frequency	Percent	Frequency	Percent
Male	Valid	Never	6	11.3	7	13.5
		Once	11	20.8	16	30.8
		Twice	14	26.4	10	19.2
		Thrice	8	15.1	8	15.4
		More than thrice	14	26.4	11	21.2
		Total	**53**	**100.0**	**52**	**100.0**
Female	Valid	Never	3	6.4	4	8.5
		Once	13	27.7	22	46.8
		Twice	11	23.4	11	23.4
		Thrice	9	19.1	5	10.6
		More than thrice	11	23.4	5	10.6
		Total	**47**	**100.0**	**47**	**100.0**

On comparing the frequencies at which male and female clients take both red and white meat, it was established that the male took more meat of either type than their female counterparts. For instance, the percentages taking meat more than thrice a week were 26.4% and 21.2% of red and white meat respectively compared to 23.4% and 10.5% of the female clients as shown in Table 4.11. This research found out that the male eating more meat than their female counterparts was due to the fact that both genders associate eating meat with masculinity and strengths, characteristics that male or men are eager to cultivate. At the same time, male had more meat than female since they consider meatless meals as incomplete and generally believe that people are designed to eat a lot of meat.

4.5.6 Weekly Fried food Consumption

Clients were asked to indicate how frequently they took fried food, specifically chicken, fish and chips and the findings were as shown in Table 4.12. 39.6%, 52.8% and 50.9% of male clients indicated that they never take fried chicken, fish and chips respectively. As for the females,

(38.3%) take fried chicken once a week; 51.1% never take fried fish in a week; and 27.7% equally take fried fish one and twice a week.

Table 4.12: Comparison of taking fried foods between Male and Female clients

Sex of the respondent			fried chicken	fried fish	fried chips
Male	Valid	Never	39.6	52.8	50.9
		Once	22.6	22.6	26.4
		Twice	11.3	13.2	15.1
		Thrice	17.0	3.8	3.8
		More than thrice	7.5	7.5	3.8
		Total	**100.0**	**100.0**	**100.0**
Female	Valid	Never	34.0	51.1	25.5
		Once	38.3	34.0	27.7
		Twice	21.3	10.6	27.7
		Thrice	4.3	2.1	12.8
		More than thrice	2.1	2.1	6.4
		Total	**100.0**	**100.0**	**100.0**

Apparently, for both male and female clients, the percentages that take fried foods more than thrice were very low (3.8% male and 6.4% female) as shown in Table 4.12.

Clients were also asked if they take any other fried foods and the results are displayed in figure 4.15

Figure 4.15: Weekly Consumption of Fried food

When asked if they take any other fried foods, 97.0% indicated that they don't while only 2% and 1% take fried plantain ("ggonja") and sausages in that order. This implied that fried foods were not appealing much to the clients (Figure 4.15). According to Samantha (2013), a diet that regularly includes fried foods can lead to obesity. Fried fish and fried chicken can cause a problem by putting your health at risk. Roberto (2015) agreed with Samantha and stated that fried fish and chicken are linked to weight gain since frying food results in more intake of energy. Clients who take fried foods are at high risk of overweight and obesity compared those who do not take fired foods.

Clients were also asked to indicate the type of fat used for frying and results are displayed in table 4.13 bellow

Table 4.13: Fat used for Frying

		Frequency	Percent
Valid	Olive oil	21	21.0
	Kimbo	7	7.0
	Cow boy	4	4.0
	Friendship oil	66	66.0
	Other	2	2.0
	Total	**100**	**100.0**

According to Table 4.13, the majority of the clients (66.0%) indicated that their source of frying fat is friendship oil ("Mukwano"), Olive oil at 21.0%, the rest of the sources accounted for 13.0% collectively. This contradicts with Greg and Robert, (2015), and Joe (2012) that recommend olive oil as the best source of fat that is associated with lower risk of developing high blood pressure, high cholesterol or become obese. This meant that 21.0% of client who take olive oil stand reduced chances of becoming obese. The results from this study indicate that Friendship oil from Mukwano Company is the most used source of fat used for frying much as it is not recommended. This can be attributed to the fact that it is the most readily available for the majority of the population and it is also cheaper compared to the recommended olive oil.

4.5.7 Weekly Legumes, Nuts and Seed Consumption

Clients were asked to indicate how frequently they consumed legumes such as beans, peas, and soya; and nuts and seeds such as groundnuts and Simsim in a week. On comparing the frequencies, it was established that 38% consumed legumes more than thrice a week as shown in Table 4.14. 28% of the clients consumed Nuts and seeds twice a week.

Table 4.14: Weekly legumes, nuts and seed consumption

		Nuts & Seeds		Legumes	
		Frequency	**Percent**	**Frequency**	**Percent**
Valid	Never	5	5.0	2	2.0
	Once	34	34.0	11	11.0
	Twice	28	28.0	27	27.0
	Thrice	11	11.0	22	22.0
	More than thrice	22	22.0	38	38.0
	Total	**100**	**100.0**	**100**	**100.0**

Table 4.14 indicates that 22% and 38% took nuts and seeds and legumes respectively more than 3 times a week. According to AGHE (2013) revealed that nuts and seeds and legumes are high in energy, nutrients and dietary fibre thus associated with reduced risk of overweight and obesity. They are good altenatives of meat because they are naturally very low in fat, high in fibre, protein and vitamins and minerals (Public Health England,2016). 5% and 2% clients who never took nuts, seeds and legumes are associated with high risks of overweight and obesity.

4.5.8 Weekly Dairy Products Consumption

Clients were required to indicate weekly times they consumed yoghurt, cheese/butter, and milk. As for the first two categories, the highest of the score were those that never took them at 40.0% and 43.0% respectively. For milk, 38.0% of the clients consumed it more than thrice a week and this could be the reason why the majority (64.2% male and 83.9%) are overweight and obese as shown in Table 4.15

Table 4.15: Weekly dairy products consumption

		Yoghurt	Cheese, Butter	Milk
Valid	Never	40.0	43.0	25.0
	Once	26.0	26.0	16.0
	Twice	11.0	19.0	15.0
	Thrice	8.0	6.0	6.0
	More than thrice	15.0	6.0	38.0
	Total	**100.0**	**100.0**	**100.0**

According to the results 40%, 43% and 25% never took yoghurt, cheese/butter and milk respectively and according to the AGHE (2013), dairy products have various health benefits and a good source of many nutrients including calcium, protein, iodine, vitamin A, D, B, riboflavin and zinc. Public Health England (2016) also recommend that dairy products should be part of health and balanced diet but recommends lower fat, lower sugar, unsweetened and calcium fortified versions.

4.5.9 Snacking

Clients were asked whether they take snacks results are displayed in Figure 4.16

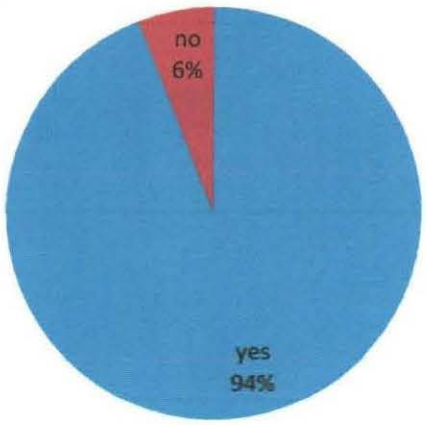


Figure 4.16: whether clients take snacks or not

The results show that 94.0% of the clients responded in affirmative. Of the types of snacks taken bananas (80%) were the most popular followed by nuts (72%) and then bread (65%).

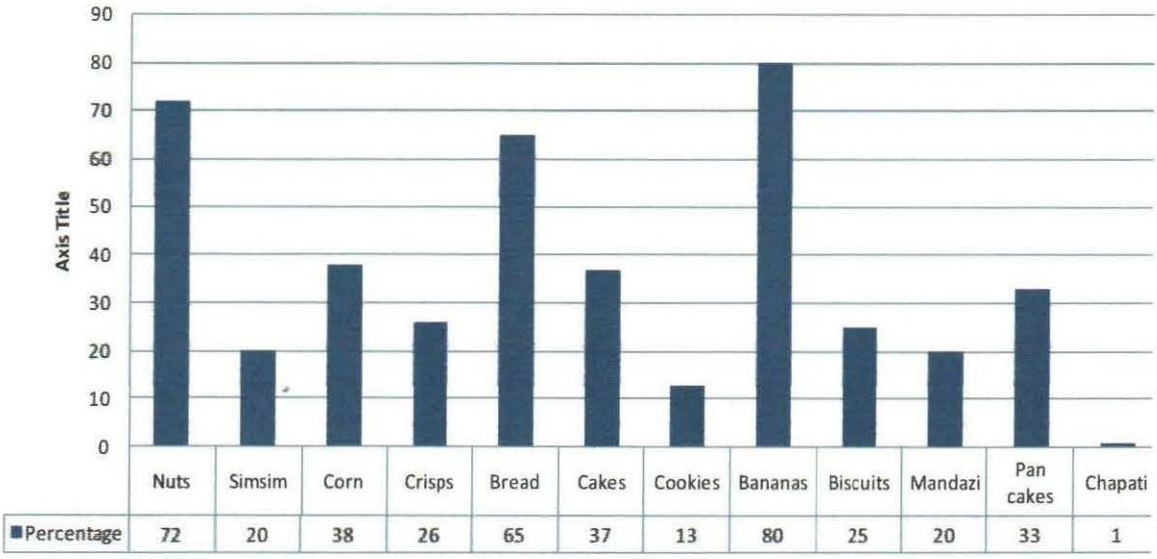


Figure 4.17: Snacks often taken by the clients

Most of the snacks that were mostly taken are unhealthy snacks such as crisps, cakes, cookies, biscuits, Mandazi, pan cakes and chapati. They are high in fat and sugar and contain lots of energy when one takes large servings (Puclic Health England, 2016).

4.5.10 Water Consumption

Clients were asked to indicate how many glasses of water they took and the findings of the male and female clients are shown in Table 4.16

Table 4.16: Number of Glasses of Water Taken Daily

Sex of the clients			Frequency	Percent
Male	Valid	1-2 glasses	2	3.8
		3-4 glasses	13	24.5
		5-6 glasses	11	20.8
		more than 6 glasses	27	50.9
		Total	**53**	**100.0**
Female	Valid	1-2 glasses	8	17.0
		3-4 glasses	15	31.9
		5-6 glasses	12	25.5
		more than 6 glasses	12	25.5
		Total	**47**	**100.0**

The findings indicate that more male clients (50.9%) take more than 6 glasses of water per day than the female clients (25.5%). This is in line with Public Health England, (2016) that recommends 6-8 glasses of water. On the other hand, the percentage of female to male clients who take 1-2 glasses of water daily was 17.0% to 3.8%. The 50.9% male and 25.5% female clients who take more than 6 glasses of water per day comply with AGHE (2013) that recommends that it is necessary to take plenty of water as adequate fluid consumption is an integral component of a healthy diet and water is a good source of fluid and has the advantage of not adding energy to the diet. In agreement, Jenny (2015) also reported that consumption of water is one strategy for decreasing the energy density of the diet as water contributes weight to food with limited energy.

4.5.11 Alcohol Consumption

Clients were required to indicate the number of bottles of beer they took per week and it was established that the majority (59.0%) do not take alcohol as shown in Figure 4.18. This was followed by those who take 1 to 2 bottles at 17.0% those who take the largest number of bottles of beer (over 4) accounted for 14.0%. The analysis here is that, most of the clients are either non-alcoholic consumers or light consumers of alcohol.

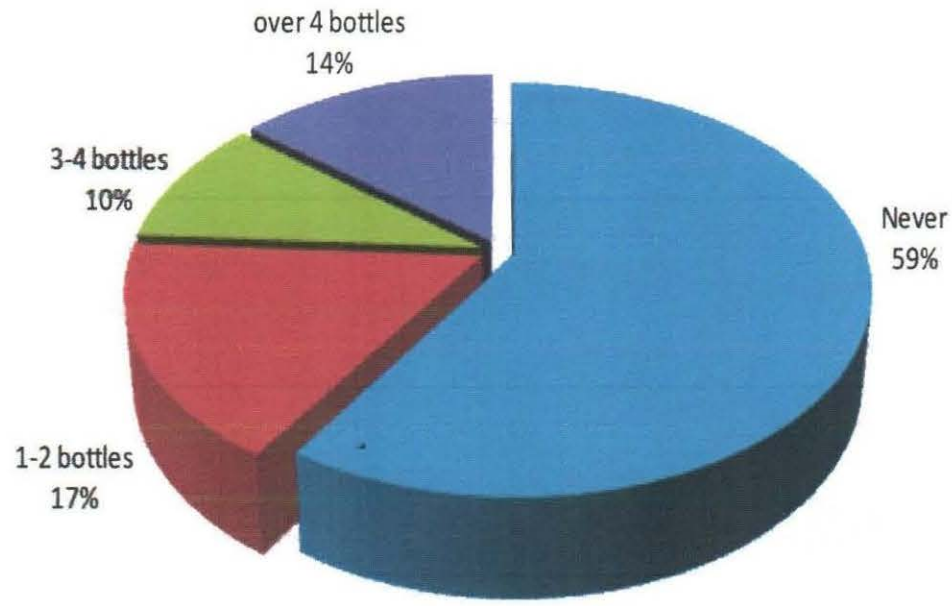


Figure 4.18: Daily beer consumption

Figure 4.18 shows that (59.0%) do not take alcohol and those who take 1-2 bottles were 17.0% and those who take the largest number of bottles of beer (over 4) accounted for 14.0%. The majority of the clients in the study do not take alcohol and those who took it limited it much as possible and this finding is in agreement with AGHE (2013) and public Health England (2016) who recommend that consumption of alcohol regularly at an intake of one standard drink per day for women and 1.5 to 2 per day for men is associated with a reduced risk of cardiovascular disease morbidity and mortality. However Lelbowitz (2007) and AGHE (2013) revealed that alcohol use would seem to be a contributing factor to individual weight gain due to the high caloric content of most alcoholic beverages. Lelbowitz (2007) added that it stimulates metabolism which can lead to overeating and inhibits the body's ability to burn fat as the liver converts alcohol into acetate which is released into the bloodstream and used by the body as an energy source. As acetate levels rise, the body begins to burn more acetate and less fat leading to overweight and this could be a reason why male have a high waist to hip circumference than females.

On comparing the male and female clients, it was established that 70.2% of the female do not take beer compared to 49.1% of their male counterparts. On the other hand, while only 6.4% of the females take more than 4 beers a week, the percentage of the males was more than triple this (20.8%) as shown in Table 4.17.

Table 4.17: Bottles of Beer clients Take Daily

Sex of the clients			Frequency	Percent
Male	Valid	Never	26	49.1
		1-2 bottles	10	18.9
		3-4 bottles	6	11.3
		more than 4 bottles	11	20.8
		Total	**53**	**100.0**
Female	Valid	Never	33	70.2
		1-2 bottles	7	14.9
		3-4 bottles	4	8.5
		more than 4 bottles	3	6.4
		Total	**47**	**100.0**

Clients were asked to indicate whether they take spirits or wine and results are displayed in figure 4.19 below.

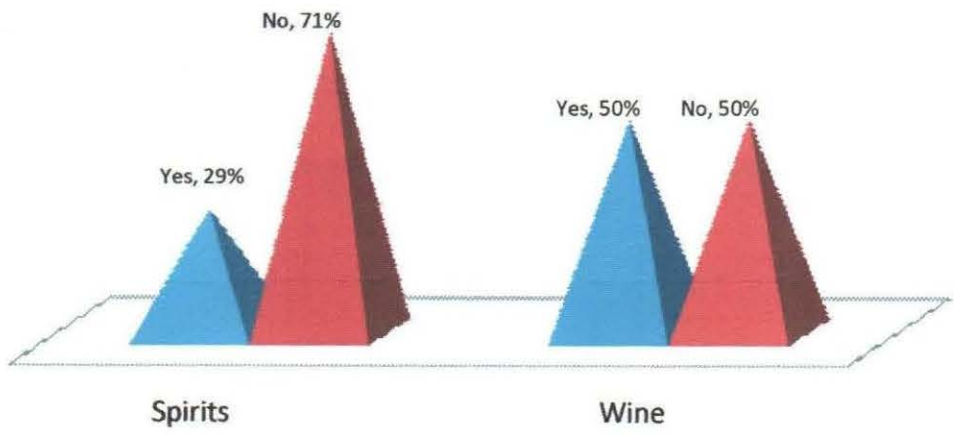


Figure 4.19: Spirits and Wine consumption

With respect to spirits or wine, the findings indicate that only 29% of the clients take spirits compared to 50% of those who take wine.

In relation to gender, Table 4.18 shows that 32.1% and 45.3% of the male clients take spirits and wine respectively. And 25.5% and 55.3% female clients take spirits and wine respectively. This implies that more women than men take wine while the opposite is true for spirits. According to Mediterranean diet, taking moderate amounts of wine reduce the risk of developing high blood pressure, high cholesterol or becoming obese (Estruck et al 2015). Therefore more women stand fewer risks than their male counterparts.

Table 4.18: Spirits and wine consumption in relation to gender

Sex of the respondent			spirits		wine	
			Frequency	Percent	Frequency	Percent
Male	Valid	Yes	17	32.1	24	45.3
		No	36	67.9	29	54.7
		Total	**53**	**100.0**	**53**	**100.0**
Female	Valid	Yes	12	25.5	26	55.3
		No	35	74.5	21	44.7
		Total	**47**	**100.0**	**47**	**100.0**

4.5.12 Daily Meals

Clients were asked to state how many times they took the four major meals, breakfast, lunch, dinner and supper per week.

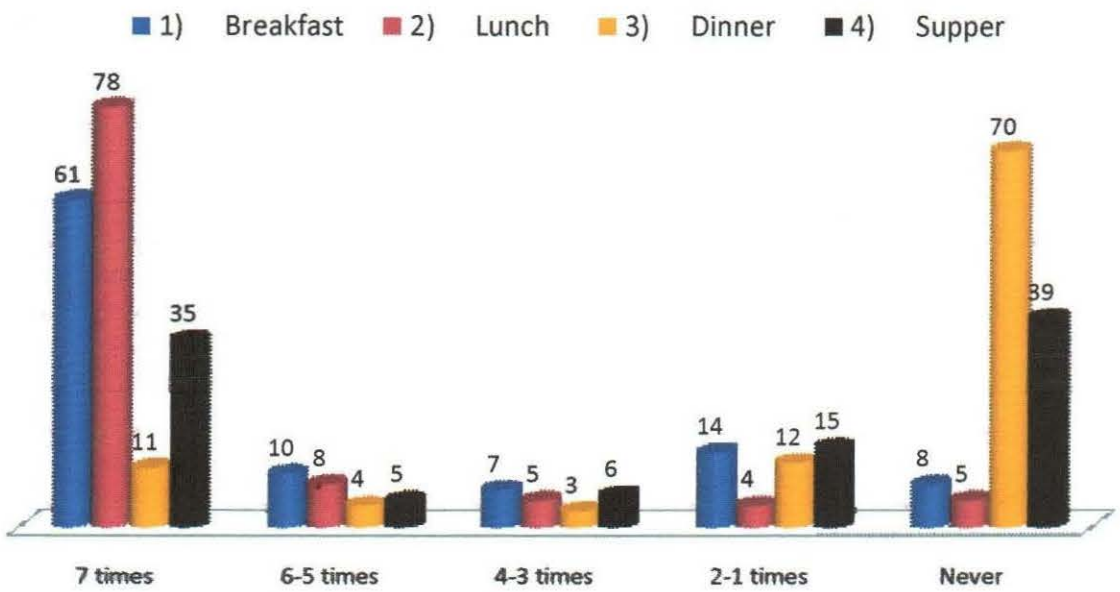


Figure 4.20: Daily meals taken by clients

Figure 4.20 shows that lunch is the most taken meal per week where 78% of the clients indicated that they take lunch daily, this was followed by breakfast at 61% and supper at 35%. Dinner was the least taken as majority (70%) of the clients indicated that they never take it. From the findings, it was clear that very few clients took any of the meals between one to six times a week.

On splitting the findings between male and female, it was established that patterns were fairly similar although there were some marked difference in some cases as seen in Table 4.19. According to the findings from the study, lunch was the most taken meal per week.

Table 4.19: Daily Meals taken by clients

Sex of the respondent			Breakfast Percent	Lunch Percent	Dinner Percent	Supper Percent
Male	Valid	7 times	60.4	79.2	11.3	32.1
		6-5 times	9.4	5.7	5.7	7.5
		4.3 times	9.4	5.7	3.8	7.5
		2-1 times	11.3	3.8	15.1	13.2
		Never	9.4	5.7	64.2	39.6
		Total	**100.0**	**100.0**	**100.0**	**100.0**
Female	Valid	7 times	61.7	76.6	10.6	38.3
		6-5 times	10.6	10.6	2.1	2.1
		4.3 times	4.3	4.3	2.1	4.3
		2-1 times	17.0	4.3	8.5	17.0
		Never	6.4	4.3	76.6	38.3
		Total	**100.0**	**100.0**	**100.0**	**100.0**

The results from the study are in disagreement with Wabuyabo & Wamukoya (2009) who recommends that three meals should be eaten a day for good nutrition. Most clients (60.4% male, 61.7% female) and (79.2% male & 76.6% female) took breakfast and lunch daily. According to Alexandra (2013) and Amy (2014) people should not skip breakfast as a good meal in the morning since it helps the body prepare for the day to come and lowers the risk of obesity. Yet the findings showed that some clients never took breakfast which may impact on their weight. Alexandra (2013) further recommends that it is good to eat light lunch as fueling up makes sense earlier in the day when the body needs most calories for energy. Most clients indicated that lunch is the major meal. He further noted that eating a heavy dinner you are not as likely to get rid of those calories and food is likely to be stored as fat since the body is less active at night and recommended light dinner. However most of the clients (70%) never took dinner. On contrary, Fitschen (2015) stated that meal frequency does not appear to have an effect on weight maintenance or weight loss when calorie intake is matched.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

5.1.1 Body Weight Status Summary.

With respect to BMI, majority of male and female clients were overweight or obese. More female were either overweight or obese than male clients and indeed, none of the male respondents was rated as being extremely obese unlike the female category where it was noted to be so. With respect to Waist Circumference of clients, this study established that more female than male clients were obese because their waist circumferences exceeded the cut off measurements of 88cm. Despite the fact that more female than male were considered to be obese because of their waist circumferences, the findings of this study indicated that more male clients had a high waist to hip ratio (WHR) which puts them at risk of metabolic-related diseases compared the female clients.

There was a positive statistically significant correlation between the WC and BMI for both the male and the female clients at 99% confidence level. Based on the findings, the hypothesis that, "there would be no significant relationship between BMI and WC scores of clients in Kampala city health clubs", is rejected. There was no statistically significant correlation between BMI and WHR for both the male and the female clients. Based on the findings, the hypothesis that, "There would be no significant relationship between BMI and WHR, scores of clients in Kampala city health clubs", is accepted. There was a statistically significant difference between the weight of male and female clients at 99% confidence level. Based on the findings, the hypothesis that, "There would be no significant difference between the weight status of female and male clients in Kampala City health clubs", is rejected

5.1.2 Exercise Routines of Clients Attending Health Clubs in Kampala

It was established that about 75.0% of the clients complied with recommended standards of exercising at least three times in a week and that more male (49.1%) than female (31.9%) clients exercised for more than thrice in a week. This implies that more women stand a chance of succumbing to the risk of overweight and obesity compared to men. In general, 96.0% of the clients complied with the recommended 20 -30 minutes of intense exercise in order for one to improve cardiorespiratory endurance and get optimal results by spending not less than 30 minutes doing exercises whenever they attended the health clubs. However, 97.0% of the respondents were able to talk during the training sessions meaning that the exercises they were undertaking were of moderate intensity. The most popular activities that were undertaken by more than 50% of the clients were aerobics, treadmill and cycling which are good cardio exercises that help in reducing weight.

5.1.3 Nutritional Patterns of Clients Attending Health Clubs in Kampala

Majority of the clients did not have consistent meals but rather had only one proper or standard meal per day. Either lunch with no breakfast, or breakfast with no lunch, then supper. Therefore, majority of the clients had a very unbalanced / unsteady nutritional pattern. On the other hand, majority of those who had regular meals rather lacked a balanced diet since they either ate junk food or only had a single food type. They also took foods high in calories, saturated fat, refined sugars, low in nutrients and fiber thus more likely to become overweight or obese forxample about half of the clients of either sex were established to be taking 1-2 servings of fruits daily against the recommended minimum of 5 servings daily necessary for health eating. It was established that only 19.0% of the clients take the recommended number of daily 5 servings of vegetables which could be the reason why the majority are overweight or obese.

About 24.5% of the male and 21.3% of the female clients do not take eggs and about one third of the male and one fifth of the female eat more than four eggs in a week despite the numerous benefits of eating eggs as establish by other researches. It was established that male took more meat of either type (red or white) than their female counterparts and that about 10% of either never took both types of meat. However, majority of the male 39.6%, 52.8%, and 50.9% indicated that they never take fried chicken, fish and chips respectively while majority of the

female (38.3%) takes fried chicken once a week. Apparently, the percentages that take these fried foods more than thrice were very low with the highest percentage being 7.5% for both male and female clients.

The study further established that the majority of the clients (38.0%) consumed milk more than thrice a week while those other dairy products such as yoghurt, cheese, blue band, and butter were less commonly consumed. On the other hand, 94.0% of the clients indicated take snacks. While more male than female clients take more than 6 glasses of water per day, about 70% of the female do not take beer compared to 49% of their male counterparts. Finally, it was established that about three quarters of the clients take lunch seven times a week while dinner was the least taken daily as indicated by 70% of the clients.

5.2 Conclusions

Conclusions of this study as drawn from the findings of the study, the body weight status, the differences in the findings between the male and the female clients, the exercise routines of the clients and the nutritional practices of the clients, are as follows

(i) Overweight and obesity are prevalent among clients in Kampala city health clubs. Less than half of both sexes were rated as having a normal Body mass index (BMI) and basing on the BMI readings, more female were either overweight or obese than male. Using the waist circumference, again more female than male were considered to be obese while basing on the waist to hip ratio (WHR) as a measure of body fat distribution more male clients had a high WHR despite the fact that more female were considered to be obese. The study also concluded that there is a significant relationship between BMI and WC scores of clients in Kampala city health clubs. Also there is no significant relationship between BMI and WHR scores of clients in Kampala city health clubs. Lastly on the differences in the findings between the male and the female clients, the study found out that there is a significant difference between the weight status of female and male clients in Kampala City health clubs.

(ii) As far as the exercises were concerned, three quarters of the clients complied with recommended standards of exercising of at least three times in a week and that 96.0% of them complied with the recommended 20-30 minutes of intense exercise, the most preferred activities clients engaged in were aerobics, treadmill and cycling which are all cardio activities. However, to lose weight, achieve or maintain a healthy body weight status, they need to do a training program that suits their goal, capacity and level of fitness. Most clients in the study concentrated so much on cardio training which may not produce ideal results alone. It should be combined with weight training together with healthy, balanced diet so as to attain optimal results. It can therefore be concluded that they were overweight and obese because of doing wrong training.

(iii) It can be concluded that majority of the clients did not have consistent meals but rather had only one proper or standard meal per day. Either lunch with no breakfast, or breakfast with no lunch, then supper. Therefore, majority of the clients had a very unbalanced / unsteady nutritional pattern. Majority of those who had regular meals rather lacked a balanced diet since they either ate junk food or only had a single food type. Most of the foods they took were high in calories, saturated fat, refined sugars, low in nutrients and fiber thus more likely to become overweight or obese. Generally their eating habits were not healthy and this could be the reason why the majority were overweight and obese.

5.3 Recommendations

The study recommended the following to the targeted key beneficiaries.

- The clients need to engage more in healthy feeding styles and physical exercises so as to improve their physical wellbeing and minimize their susceptibility of obese related diseases. They should eat more local foods and cut down on the amount of fat they put in the foods.

- To achieve maximum benefits from the health clubs, clients should seek for advice from the experts as which exercises they should embark on. This wil help them get value for their money and maximum health benefits.

- Considering that there are many exercises that anyone can undertake as seen in the findings and that there are many health clubs, policy makers for example Ministry of health may need to draft policies that can guide the health clubs in their useful contribution towards attaining a healthy population as they offer their services to the clients.

- The fitness and health professionals employed in health clubs may need to guide clients to set body weight targets that are realistic and attainable and guide them on how to achieve them through exercising and nutritional management.

- The Government through the Ministry of Health should educate the citizens on the benefits of exercising and dietary regulations so as to help curb preventable illnesses that arise from poor weight and dietary control

5.4 Areas of Further Research

Considering that this study was limited in many aspects such as time, geographical and financial, all issues related to physical fitness and health could not be explored to fully inform national policies. As such, the following are the areas that may need to be explored by other researcher to add value to the findings of this study:

i) The impact on the health of the clients attending health clubs by the different types of physical exercises engaged in

ii) The physical fitness of rural based and urban based adults taking into consideration the types of exercises they engage in and the meals they feed on.

iii) The prevalence of obesity in Uganda among clients who visit health clubs to do exercise

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APPENDICES
APPENDIX I: Introductory Letter

KYAMBOGO UNIVERSITY

P.O Box 1 Kyambogo
KAMPALA – UGANDA

Phone: 285001/2
DIR Line: 285272
Fax No: 256-041-220464

FACULTY OF SCIENCE
Department of Sportscience

27-02-2015

To whom it may concern

Dear Sir / Madam

INTRODUCTION OF MASTER OF SCIENCE RESEARCH STUDENT

The bear of this letter, ***Ms. Nahwera Loyce*** is a M.Sc. Sportscience research student (Reg.No. 13/U/2095/GMSS/PE) in the Sportscience Department.

She is conducting research for her M .Sc. in Sportscience titled, ***" Body Weight Status, Exercise Routines and Nutritional Patterns of clients in Health Clubs in Kampala City, Uganda."***

The purpose of this letter is to introduce to you the student and request you assist her conduct research in your organization.

Looking forward to your cooperation,

Yours faithfully,

Dr. Eunice Kateshumbwa
Head of Department [Sportscience Department]

APPENDIX II: Questionnaire

BODY WEIGHT STATUS, EXERCISE ROUTINES AND NUTRITIONAL PATTERNS OF CLIENTS IN HEALTH CLUBS IN KAMPALA CITY, UGANDA

This study aims at proposing appropriate exercise and nutritional guidelines for clients in kampala city health clubs, Uganda. You have been selected to participate in this study by kindly filling this questionnaire. The information you give will be treated with confidentiality and solely for study purposes and there is no need for personal identification.

Instructions: Please do not indicate your name anywhere in this questionnaire.
Tick or fill the space provided with the most appropriate response.

Section 1: Demographic information and exercise routines						
1.1	Sex	Male		Female		
1.2	Marital status	Married		Single		Divorced
1.3	Age	Less than 20		20-30	30-40	Over 40
1.4 (a)	Number of days you exercise in a health club in a week	Once	Twice	Three	More than 3	
1.4(a)	Duration of exercise you do in a health club	Less than 30 min.		30 min.	More than 30 min.	
1.5	**Intensity of exercise.** As I am doing exercise, am:	able to talk		unable to talk		
1.6	Activities you engage in, in a gym: (1) Aerobics..... (2) Treadmill..... (3) Cycling..... (4) Spinning..... (5) Rope skipping..... (6) Others specify....., ..., ..., ...					

Section 2: Measurements (Researcher measures and records)						
2.1	Weight (kgs)					
2.2	Height (m)					
2.3	Waist circumference (cm)					
2.4	Hip circumference (cm)					
Section 3 Nutrition						
3.1.	Whole meal foods you take in a week	Never	1-2 times	3-4 times	5-6 times	7 times
	1. Brown rice					
	2. Millet					
	3. White posho					
	4. Unprocessed/brown posho or porridge					

	5. "Matooke"					
	Others specify…… ……					
3.2	(a) Number of servings of fruits taken daily	Never	1-2	3-4	5	
	(b) Give two common examples of fruits you take	1…… 2……				
3.3	(a) Number of servings of vegetables taken daily	Never	1-2	3-4	5	
	(b) Give two common examples of vegetables you take	1…… 2……				
3.4	How many eggs do you take in **A WEEK**?	None	1-2	3-4	more than 4	
3.5	Number of times in a week you take a. Red meat e.g. beef, pork b.White meat e.g. chicken, fish	Never	Once	Twice	3 times	More than 3
3.6 (a)	Number of times you take fried ……in a week	Never	Once	Twice	3 times	More than 3
	1. Chips					
	2. Chicken					
	3. Fish					
	Other fried foods please specify…… …… …					
(b)	Major source of fat used for frying	Olive oil	Kimbo	Cowboy	Mukwano oil	
	Others specify					
3.7	Number of times you consume……..in a week	Never	Once	twice	Three	More than 3
	1.Legumes e.g. beans, peas, soya					
	2. Nuts and seeds e.g. groundnuts, simsim, pumpkin seeds					
3.8	Number of times you take dairy products in a week					
	1. Milk					
	2. Cheese/blue band/ butter					
	3. Yogurt					

	Others specify				
3.9 (a)	Do you snack?	Yes …….. No……			
(b)	If yes, specify the snacks you often take 1. Nuts 2. Simsim 3. Corn 4. Crisps 5. Bread 6. Cakes 7. Cookies 8. Banana 9. Biscuits 10. Mandazi 11. Pan cakes Others specify				
3.9.1	(a)Number of glasses of water you take daily	1-2	3-4	5-6	More than 6
	(b)Bottles of beer you take daily	Never	1-2	3-4	More than 4
	(c)Do you take spirits e.g. waragi?	Yes …… No……			
	(d) Do you take wine	Yes…… No……			

3.9.2	Number of times you take ….. in a week	7	6-5	4-3	2-1	Never
	1. Breakfast					
	2. Lunch					
	3. Dinner					
	4. Super					
	Others specify					

Thank you

APPENDIX III: Informed Consent Form

Department of Sportscience
Kyambogo University

Title: Body Weight Status, Exercise Routines and Nutritional Patterns of clients in health clubs in Kampala City, Uganda

Principal investigators

i. Principal supervisor: Dr. Mukana Roland
ii. Second supervisor : Dr. Constance Nsibambi
iii. Researcher : Nahwera Loyce

I have agreed to volunteer to participate in the study being conducted by the above mentioned investigators. I understand I will have to answer the questionnaire, have my weight, height, waist and hip circumferences measured. The research procedure has been explained and the tests do not involve injury risks or torture.

By this consent the researcher will:

i. Take only the measurements stipulated in the letter of procedure
ii. Ensure confidentiality with respect to the data obtained. All individual information will be coded and at no time my personal identity will be revealed.
iii. Provide me with information on my measurements to help me understand my own health fitness.

Participants signature.....

Date .....

APPENDIX IV: Data Entry Form

ID No:.....

Weight .....

Height .....

Waist circumference .....

Hip circumference .....

Body mass index (BMI) .....

Waist to hip ratio (WHR).....

Researcher: .....
Name:.....
Telephone No:.....
Date:.....