
**INFLUENCE OF DIETARY KNOWLEDGE, DIETARY ATTITUDES AND
DIETARY PRACTICES ON NUTRITION STATUS AMONG AMATEUR MALE
BODYBUILDERS ATTENDING RAILWAY GYMNASIUM IN NAIROBI**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN APPLIED
HUMAN NUTRITION IN THE DEPARTMENT OF FOOD SCIENCE, NUTRITION
AND TECHNOLOGY OF THE UNIVERSITY OF NAIROBI.**

2015

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I, Muthui Jeff Wamiti, hereby declare that this is my original work and to the best of my knowledge has not been submitted to any other institution for any degree award.

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This work has been submitted by the approval of my supervisor;

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Dedication

This thesis is lovingly dedicated to my father Muthui Mwai and mother Grace M. Wamiti whose support was invaluable. Without their assistance I wouldn't be where I am today and I deeply appreciate their help

Acknowledgment

I would like to express my gratitude to my family and friends for the support they provided to me in completing this project successfully.

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List of Abbreviations

ANOVA – Analysis of Variance

BB – Bodybuilders

BCAA – Branched Chain Amino Acids

BMI – Body Mass Index

DF – Degrees of Freedom

EAA – Essential Amino Acids

FADH₂ – Flavin adenine dineuclotide 2

FFQ – Food Frequency Questionnaire

G – Grams

HDL – High Density Lipoproteins

KDHS – Kenya Demographic and Health Survey

KG – kilograms

LDL – Low Density Lipoproteins

NADH – Nicotinamide Adenine Dineuclotide

SO – Specific Objective

SPSS – Statistical Package for Social Sciences

WHO – World Health Organization

WHtR – Waist – Height Ratio

Operational Definitions

Amateur bodybuilders – People who aim to develop bigger and stronger skeletal muscles in their body but they lack in any professional guidance to attain their objective.

Biological Value – This is the percentage of absorbed protein from the food that is retained in the body and can therefore be used in protein synthesis in the cells of the organism

Dietary attitudes – A feeling or way of thinking about certain foods and dietary practices in regards to their importance to bodybuilding that affects their consumption by the amateur bodybuilders.

Dietary knowledge – What is known about nutrient requirements and dietary practice for bodybuilding based on any source of knowledge the amateur bodybuilders have access to.

Dietary practices – What the amateur bodybuilders actually eat based on their prior knowledge and available resources with the intention of optimizing muscle hypertrophy.

Muscle hypertrophy – An increase in size of skeletal muscle through an increase in the size of its component cells.

Overnutrition – This is a form of malnutrition in which nutrients are oversupplied relative to the amounts required for normal growth, development, physical activity and metabolism.

Abstract

Most amateur bodybuilders tend to have inadequate access to proper nutritional information that may result in them adopting poor dietary practices. This can lead to overnutrition and the resultant negative effects associated with overnutrition. This study was a cross-sectional study that involved identifying the dietary knowledge, dietary attitudes and dietary practices of amateur male bodybuilders. Data was collected regarding the dietary knowledge, dietary attitudes and dietary practices as well as anthropometric measurements from 162 randomly selected amateur male bodybuilders who worked out at Railway Gymnasium, Dagoretti North Constituency in Nairobi County. The anthropometric assessments included body fat percentage, the Body Mass Index (BMI) and the Waist – Height Ratio (WHtR). The data collected was analysed using descriptive statistics and inferential statistics. A P-value of <0.05 was considered significant in all the analyses.

The mean BMI of the respondents was 25.72 (± 0.41) which is classified as overweight, the mean body fat percentage was 14.09 (± 0.48) which is in the healthy range while the mean waist-height ratio (WHtR) was 0.49 (± 0.004) which is classified as healthy. The nutrition knowledge of the respondents was good with 91.4% of the respondents having good knowledge. However, 56.2% of the respondents had a negative attitude towards nutrition. Knowledge score of the respondents was significantly associated with their percent body fat ($P=0.013$) while attitude assessment score of the respondents was also significantly associated with their percent body fat ($P=0.037$).

There was a significant association between the knowledge of the respondents' and their frequency of consumption of meat products ($P=0.019$), fish ($P=0.001$) and deep fried foods ($P=0.032$). Attitude of the respondents was significantly associated with their frequency of consumption of nuts and peanut butter ($P=0.044$) and water ($P=0.037$). The nutrition status of the respondents was influenced unanimously among all 3 indices by the frequency of consumption of red meat; body fat ($P=0.041$), BMI ($P=0.001$) and WHtR ($P=0.004$).

The study concludes that dietary knowledge and dietary attitude of amateur male bodybuilders are determinants of dietary intake with regards to some foods.

Dietary attitude as well dietary knowledge are associated with nutrition status. Frequency of consumption of red meat and protein shakes are associated with the nutrition status of amateur male bodybuilders.

The information generated by this study will form the basis for developing an educational curriculum for bodybuilders in Nairobi to promote greater nutritional knowledge and healthier attitudes among bodybuilders. This is in the long run will help reduce the incidence of disease particularly chronic lifestyle diseases in the society.

Chapter 1

1.1 Background

Bodybuilding is the use of progressive resistance exercise to control and develop one's muscles. People who engage in this activity are called bodybuilders. The main approaches used to optimize hypertrophy of muscles are; strength training through weight lifting or resistance training, focused nutrition including extra proteins and recuperating through resting after and between workouts (Rennie, 2000)

To trigger high levels of muscle growth bodybuilders need a specialized diet. By and large bodybuilders require relatively higher amounts of calories to provide energy for engaging in the training as well as recovery and higher amounts of proteins to provide amino acids that stimulate protein metabolism in the muscle. (Rennie, 2000)

Therefore the main dietary objectives for active individuals including bodybuilders is to be adequately nourished to optimize health and sports performance (Berning, 2000) and to promote healthy dietary practices in the long-run. (Jonnalagadda, 2001).

Despite there being recommended daily intake amounts for the purposes of bodybuilding amateur bodybuilders may not have adequate access to this information or may not be able to understand the information fully for it to help them. This could result in a state of nutrient excess or nutrient deficiency with the associated potential negative health consequences, including impaired immune function (Ardawi, 2003), decreased oxygen transport capacity [sports anemia] (Yoshimura, 2000), and/or suboptimal muscle growth. In addition, excessive protein intake could potentially have negative health consequences. (Shane, 2006). Excessive caloric intake has been shown to cause problems of overnutrition and associated health complications including obesity, diabetes, cardiovascular disease among others. This is therefore an area that should be of prime public concern seeing the rapid increase in cases of lifestyle diseases within the country.

1.2 Problem statement

Amateur bodybuilders aim to develop their muscles and gain lean body weight through the three main approaches. However most of these amateurs tend to have inadequate access to proper nutritional information. Research has proven that trainers have more influence on the attitudes, subjective norms, and intentions of amateur trainees in regards to diet and supplement use for bodybuilding. (Dunn, 2001). Other sources of nutritional information include but are not limited to; fellow trainees in the gymnasium, unauthentic blogs and magazine entries. This may result in the amateur bodybuilders adopting poor dietary practices that may be either inadequate for their requirements or exceed their requirements. These can lead to undernutrition or overnutrition. Overnutrition may cause problems of overweightness, obesity and associated complications for example diabetes, cardiovascular disease and arthritis.

1.3 Justification

Amateur bodybuilders from low income societies have few educational resources and therefore may not enjoy sufficient knowledge of nutrition and sport supplements to make health conscious decisions. (Little, 2002) High protein intakes that exceed requirements may limit the percentage energy intake from carbohydrates and raise the energy intake from fats both of which are associated with increased health risks. (Insel, 2014)

In addition, high protein diets have also been associated with the advancements of renal dysfunction. (Shane, 2006)

1.4 Aim

To contribute towards developing a curriculum, training seminars and educational materials to promote greater knowledge and healthy attitudes among amateur bodybuilders. This in the long run will help improve the health and sports performance of the amateur bodybuilders and therefore reducing the incidence of illness in the society.

1.5 Purpose

To generate data on the nutrition status and dietary practices of amateur bodybuilders and factors that affect them.

1.6 Main objective

To establish the influence of dietary knowledge, dietary attitude and dietary practices on nutrition status of the selected participants among the amateur male bodybuilders training in Railway Gymnasium, Nairobi.

1.6.1 Sub objectives

1. To assess the Body Mass Index (BMI), waist – height ratio (WHtR) and body fat percentage of the study participants.
2. To establish the dietary practices of the study participants.
3. To determine the study participants dietary knowledge and dietary attitudes within the context of dietary practices.
4. To determine the influence of dietary practices on nutrition status of the study participants.

1.7 Hypothesis

1. There is no association between the study participants' dietary knowledge and dietary attitudes on their dietary practices.
2. There is no association between dietary intake of the study participants and their nutrition status.

1.8 Assumptions

It was assumed that the respondents would cooperate and that they would provide truthful information during data collection

1.9 Limitations

The study maybe confounded by genetic variations whereby some respondents' body dimensions and compositions are heavily influenced by genetic factors

Memory problems in some participants could pose another challenge whereby some respondents may not remember the previous day's diet. This may affect the results of the study.

1.10 Benefits

The entire bodybuilding fraternity stands to benefit from this project. Awareness will be created on the dietary intake by the amateur bodybuilders and the factors affecting it. This will help develop a curriculum that can be used to educate bodybuilders. This will help curb the rapidly increasing incidence of chronic lifestyle conditions.

Chapter 2: Literature Review

2.1 Skeletal muscle structure and growth

Muscles have about 40% of the total protein in the adult body and this accounts for between a third and a half of all protein turnover in the body. Muscle is important as a machine for the transduction of chemical energy into mechanical work. Muscle can be considered to be a store of energy and nitrogen during starvation and disease and after injury. (Zatsiorsky, 2006)

Once fully differentiated the number of muscle cells doesn't change. Growth and wasting therefore only occurs through hypertrophy and atrophy respectively of the existing cells. Resistance training results in micro-tears in the muscle being exercised. Repair to these micro-tears, also known as microtrauma, is what results in the desired muscle growth.

Resistance training results in muscle building by promoting two distinct forms of hypertrophy; myofibrillar hypertrophy and sarcoplasmic hypertrophy. Myofibrillar hypertrophy is prompted by lifting heavy weights with few repetitions while sarcoplasmic hypertrophy is generated by lifting relatively lighter weights but with more repetitions. Many bodybuilders alternate between the two forms. (Zatsiorsky, 2006)

Resistance training causes little change in amino acid oxidation but probably depresses protein synthesis and elevates breakdown acutely. After the exercise protein synthesis rebounds for less than or about 24 hours but breakdown remains elevated and net positive balance is achieved only if amino acid availability is increased. There is no evidence that habitual exercise increases protein requirements; indeed protein metabolism may become more efficient as a result of training. (Rennie, 2000)

During resistance training most of the body's energy is taken to the contractile elements of muscle and used for muscular work (weight lifting). The energy available for protein synthesis decreases, while protein degradation increases. Amino acid uptake from the blood into muscles decreases while training, while proteins catabolism while training exceeds the protein that is newly synthesized.

This causes the amount of muscle protein to decrease after a workout and the quantity of protein catabolized rises above its value at rest. Between workout sessions, synthesis of proteins is increased. Amino acid uptake from the blood into muscles is above values at rest. This process of enhanced degradation and contractile protein synthesis if done repeatedly may result in protein super-compensation. (Zatsiorsky, 2006)

The protein requirements of strength athletes have been a subject of debate for many years. Current recommendations for men >19 years of age are 0.86 and 0.85 grams per kilogram bodyweight per day ($\text{g}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$). Suggested protein intakes for strength athletes range widely from levels just above to approximately four times the current recommendations. This wide discrepancy may relate to differences in training intensity, energy and/or carbohydrate content of the diet, adaptation to a given training load (early training versus habitual) or possibly the confounding effects of anabolic steroids. (Bergstrom, 1990)

2.2 Protein requirements of strength trainers

There is a vast amount of attention among amateur and professional sports people (including bodybuilders) in the most favourable nutrition for improved performance, regardless of whether it is to improve endurance or increase muscle size, definition and strength. As such, there is a lot of mystery and wild imagination on the results of dietary modifications on muscle performance and development. (Rennie, 2000)

In a study carried out in Kent State University results showed that intensive bodybuilding program clearly increased dietary protein needs at least in the initial stages of training. The protein intake for zero nitrogen balance was $1.43 - 1.53 \text{ g}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ and the recommended protein intake was $1.63 - 1.73 \text{ g}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$. However despite this increased protein requirement increasing protein intake from 1.35 to $2.62 \text{ g}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ did not result in measurable muscle mass/strength gains at least over the 1st month of intensive bodybuilding exercise. (Lemon, 1995)

An acute bout of resistance training amplifies muscle protein synthesis more than breakdown, resulting in a net muscle protein balance that is increased.

Conversely, the net response of muscle protein metabolism in the absence of food intake, to an acute bout of exercise remains negative. This is because breakdown exceeds synthesis, and hypertrophy can only take place if feeding were to occur 24–48 h after exercise. (Rennie, 2000)

Feeding a mixed meal results in an increase in the availability of food substrates and hormones. During resting, the key modulators of protein turnover are amino acid availability (This has a great stimulatory effect on protein synthesis and a tiny effect on breakdown) and insulin (it has a little effect on synthesis and a great hindering effect on breakdown).

Amino acid availability has a crucial function in the regulation of muscle protein metabolism. Hyperaminoacidemia during rest has an anabolic effect on muscle, primarily through stimulating muscle protein synthesis. It is also worth noting that hyperaminoacidemia after a workout results in an enhanced rate of muscle protein synthesis than hyperaminoacidemia at rest. (William, 2001)

In the elderly, despite depression of the basal rate of turnover, the capability to respond to training by increasing muscle protein synthesis is proportionate as in the young however the elderly cannot further increase protein synthesis in response to a high-protein meal.

The volume and composition of the muscle free amino acid pool relies on the body's nutritional status, the plasma amino acid availability, and the hormonal environment. At rest, right after a balanced meal, the delivery of amino acids to muscle surpasses its capacity to deposit them as protein. The intramuscular amino acid pool is expanded but not by as much as might be expected. (Bergstrom, 1990)

The branched chain amino acids (BCAAs) are quickly transaminated and, in the presence of ample pyruvate (from blood glucose), synthesis of alanine is stimulated. The net balance of other non-metabolized amino acids mirrors the protein balance. Protein synthesis reduces as the post absorptive stage continues and breakdown is accelerated. (Rennie, 2000) Muscle amino acid concentrations demonstrate a slight change with short-term workouts at low power outputs.

However, the intramuscular concentration of glutamate decreases radically in extended exercise or exercise at high rates of power output. (Katz, 1986) With increased production of amino acids that are not metabolized in muscle, the normal post-absorptive net negative amino acid balance is increased. If this is caused by increased protein breakdown and/or decreased protein synthesis both is not completely resolved. (Rennie, 2000)

2.3 Protein quality and requirements in the body

Relying on a number of studies assessing the protein requirements for strength athletes there is a consensus that the RDA ($0.8\text{--}2.0\text{g}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$) is inadequate. An intake of between $1.5\text{--}2.0\text{g}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$ is recommended for maintenance of a positive nitrogen balance in strength athletes. This is equal to about 112 – 150 grams of protein daily. (William, 2001)

To promote muscle hypertrophy it is therefore mandatory for the athlete to be in a positive nitrogen balance. Nitrogen status is assessed by determining the dietary nitrogen intake (protein is 16% nitrogen) and deducting nitrogen losses from the body either through sweat, urine or faecal losses. (William, 2001)

The quality of protein is a determinant of muscle hypertrophy. Proteins differ in their ability to promote growth. The main function of dietary protein is to provide nitrogen and essential and non-essential amino acids in amounts sufficient for tissue protein synthesis. All amino acids have to be present at the same time in ample amounts and proper proportions at the site muscle, for protein synthesis. A shortage in any one essential amino acid (EAA) limits protein synthesis equivalent to the extent of deficit (Lasztity, 1985). This has developed the concept of the limiting amino acid and this is used to determine dietary protein quality. Assuming the composition of an ideal protein is one that is completely used and doesn't have a deficit or excess of any EAA, the value of any other protein can be derived by computing the degree of deficit of each EAA, relative to that present in the ideal protein. The EAA in greatest deficit is the limiting amino acid and this can help determine the protein value. Sufficient amino acid intake can be attained through combining different protein sources so as to consume all the essential amino acids. Biological value is considered a good measure of protein quality since it is assumed the protein retained is used for protein synthesis. (Biolo, 1999)

Table 1: Protein quality of selected foods

Protein	Biological Value
Whey peptide blends	110 - 159
Whey concentrate	104
Whole egg (Raw)	100
Cow's milk	91
Egg white (albumin)	88
Fish	83
Beef	80
Chicken	79
Casein	77
Soy	74
Rice	59
Wheat	54
Beans	49

(William, 2001)

Biological value of a protein is a measure of how well a protein consumed can be absorbed and utilized in the body. The higher the biological value, the more nitrogen your body absorbs, retains and utilizes.

Biological value of a protein is determined through the following formula.

$$BV = (N_r / N_a) * 100$$

Where:

N_a = nitrogen absorbed in proteins on the test diet

N_r = nitrogen incorporated into the body on the test diet

N_r is measured indirectly from nitrogen excretion in urine. (Lasztity, 1985)

Biological value however has some shortfalls whereby it ignores the importance of factors that influence digestion of the protein and protein interaction with other dietary factors before absorption.

Another shortfall of this method is that proteins that are completely lacking of one EAA could still have a BV of nearly 40, due to the ability of organisms to conserve and recycle EAA as an adaptation of inadequate intake of that amino acid. In addition EAA needs for growth and maintenance differ. (Lasztity, 1985)

2.4 Role of carbohydrates and insulin release in bodybuilding

Proteins and amino acids aside, carbohydrates alone resulted in no increase in muscle protein synthesis in study rats after a treadmill workout.(Gautsch, 1998) In addition, 2g/kg body weight of carbohydrates taken in immediately after a workout, resulting in a substantial increase in insulin secretion, did not notably increase post-workout muscle protein synthesis in human beings.(Roy, 1998) This discovery reflects the thought that the postexercise increase in muscle protein breakdown might have been decreased by insulin, the secretion of which was stimulated by the consumed carbohydrate.(Biolo, 1999)

One important role of dietary carbohydrate (through pyruvate) is the replenishing of Krebs cycle intermediates which is referred to as anaplerosis.

The main function of this cycle is to make reduced forms of the enzymes NADH and FADH₂, transferring electrons with high energy to the mitochondrial electron transport chain

for utilization in the resynthesis of ATP. Five of the Krebs cycle's intermediates are engaged in other reactions which involve amino acids. They will be limited if inadequate carbohydrates are available. It is therefore important to intake carbohydrate. This is because its availability is inversely related to the rate of exercise protein catabolism. (Biolo, 1999)

The role of insulin postexercise is difficult to determine. For the period of recovery, insulin secretion ricochets to above basal values. Unless amino acids are consumed concurrently with insulin to reduce systemic effects, insulin secretion lessens protein breakdown in muscles and therefore restrains protein synthesis through a fall in amino acid availability. A possible explanation for this phenomenon is that insulin and contractile activity eventually employ the same signaling pathway to stimulate synthesis and the stimulation was maximal. (Rennie, 2000)

The presence of physiological levels of insulin is required for a rise in protein synthesis to occur after resistance training in study rats. (Fluckey, 1996) It appears that, the concentration of insulin necessary to permit the post-workout stimulation of muscle protein synthesis to take place is comparatively low and could be inversely dependent on the workout intensity.

In summary amino acids after a workout promote muscle anabolism through stimulating muscle protein synthesis. Insulin presence permits protein synthesis to take place but higher levels diminish the post-workout response of muscle protein breakdown. (Biolo, 1999) Therefore a combination of carbohydrates (to stimulate insulin) and amino acids provide the optimal post workout meal composition.

2.5 Protein Absorption Rates in Humans

Metabolism of dietary protein and amino acids is determined by the specific protein's composition, composition of the meal, timing of ingestion, as well as by the quantity of the protein or amino acids ingested. (Wolfe, 2002)

Rapidly absorbed amino acids stimulate greater protein synthesis but they also stimulate greater amino acid oxidation, and therefore result in a lower net protein gain, than slowly absorbed protein. (Bilsborough, 2006)

Therefore fast amino acid absorption is not strongly associated with a “maximal protein balance,” as wrongly interpreted by fitness enthusiasts, athletes and bodybuilders. (Wolfe, 2002)

Table 2: Absorption rates of different protein rich foods

Protein source	Absorption rate (grams/hour)
Egg protein raw	1.3
Pea flour	2.4
Egg protein cooked	2.8
Pea flour; globulins and albumins	3.4
Milk protein	3.5
Soy protein isolate	3.9
Free Amino Acid	4.3
Casein isolate	6.1
Free amino acid (same profile as casein)	7 – 7.5
Whey isolate	8 – 10

(Bilsborough, 2006)

Compelling evidence implies that increased protein intakes for strength-trained athletes can increase strength and recovery from exercise. (Lemon, 1995). There is however some substantiation that suggests that a diet with high protein content increases leucine oxidation. (Pacy, 1994; Bowtell, 1998). Some other research has shown that the slower digestion rate of protein, as well as the timing of protein ingestion and timing of resistance training promote muscle protein synthesis. (Boirie, 1997; Dangin, 2002; Tipton, 2001)

2.6 Excessive protein intake and associated health risks

Although excessive protein intake could potentially have negative health consequences this has not been documented in otherwise healthy strength athletes. However high protein intakes may decrease the percent energy intake from carbohydrates and increase the energy intake from fats both of which are associated with increased health risks. (Insel, 2014)

There is a hugely debate issue regarding the role of increased protein intake in the development and progression of renal dysfunction. Several case studies indicate a significant increase in the rate of advancement of renal dysfunction with increased protein digestion. It is unquestionable that in cases of impaired renal function, decreasing the amounts of protein intake can slow the progression to renal failure. (Shane, 2006)

2.7 Nutrition knowledge and attitude in athletes

Nutrition provides the basis to optimize physical performance. It avails the energy to do work and the chemicals for extracting and utilizing food's potential energy. (McArdle, 1999) In the past only professional athletes were appreciative of the role of nutrition in sports performance. In the present day most athletes appreciate that proper nutrition is a crucial component of training. (Kiens, 2004) Nevertheless most amateur athletes remain poorly educated on appropriate nutritional practices and are not adequately skilled in making appropriate nutrition choices. Amateur athletes often consult trainers or fellow athletes for nutrition advice many of whom have limited information concerning sports nutrition. (Schmalz, 2003) Athletes' major source of nutrition information is the internet or magazines that promote supplementation and unverified diet manipulations. (Rosenbloom, 2006)

Athletes are therefore interested in nutrition information and this nutrition information on sports is becoming progressively available. Amateur athletes however display lack of knowledge about the role of vitamins, proteins and supplementation with these nutrients. (Jonnalagadda, 2001). Male athletes are likely to believe that proteins avail instant energy and high-protein diets build muscle mass. (Jacobson, 2001)

In several studies done in the past the association between nutrition knowledge and attitudes and dietary practice has been unable to reach statistical significance making researchers question the importance of nutrition knowledge and attitude to food choice and further

question the importance of nutrition education campaigns. (Wardle, 2000) Other studies done in the past offer conflicting results. Wilta B established that nutrition knowledge and attitude were significantly associated with healthier dietary practices among athletes (Wilta, 1995) while Turner stated that there was a significant association between knowledge and attitude and dietary intake among athletes. (Turner, 2001)

These contradictory findings advocate for further research to learn whether knowledge and attitude are primary factors influencing athletes' dietary intake.

2.8 Nutrition and disease

Overnutrition, which is the excessive intake of nutrients, is damaging to the body. Weight gain occurs progressively when there is low physical activity and a high caloric intake. Obesity and overweightness therefore are majorly caused by overeating and inactivity. Obesity and overweightness have been associated with higher rates of diabetes type 2 as well diseases of the circulatory system and renal system. Obesity and overweightness can also contribute to adding to the complications of already existing complications such as arthritis. (Wadhwa, 2002)

2.9 Gaps in Knowledge

No studies have been done in Kenya on the nutrition status of amateur male bodybuilders and the factors that affect them. In addition, studies done in the past on the association between dietary knowledge and attitudes offer conflicting results

2.10 Conceptual Framework

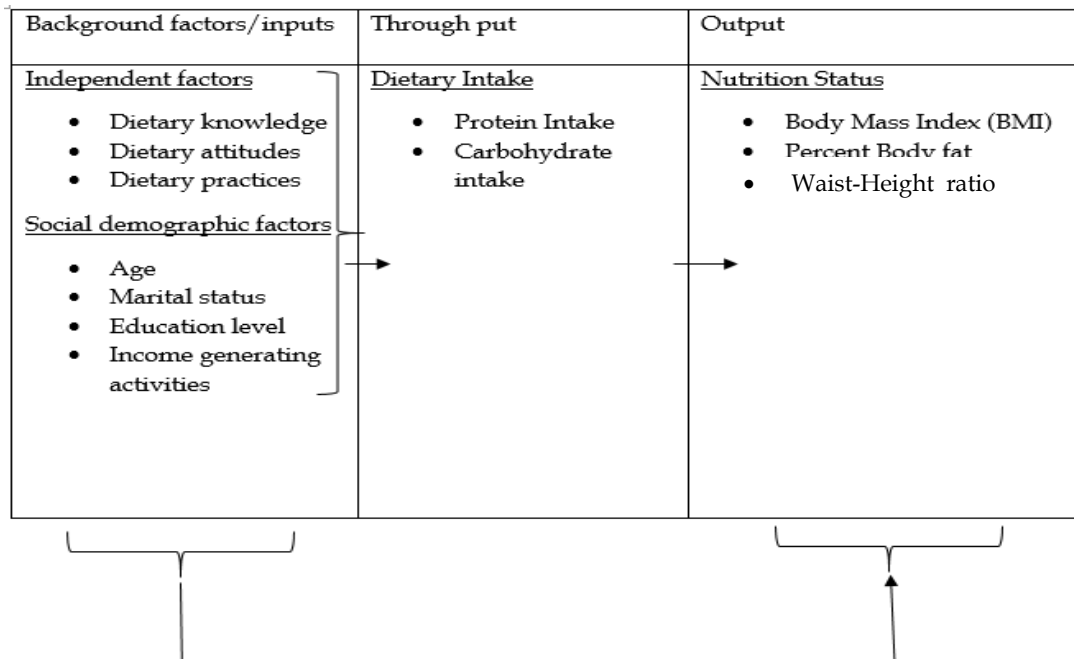


Figure 1: The conceptual framework for this study

This study will look at the influence of the background factors on the through put until the final output. The study will also look at whether the background factors can directly influence the output. The background factors are divided into; independent factors and social demographic factors.

Independent factors include the study participants' dietary knowledge, dietary attitudes and dietary practices while the social demographic factors are the study participants' age, sex, marital status, education level and income generating activities.

The throughput comprises of the study participants' dietary intake that includes; protein intake and carbohydrate intake. The output is the study participants' percent body fat and body mass index (BMI)

Chapter 3: Methodology

3.1 Study setting and population

3.1.1 Study area

3.1.1.1 Administrative and political

The study was carried out in Railway gymnasium which is located in Dagoretti North constituency in Nairobi the capital of Kenya. Nairobi has an estimated land area of about 696 square kilometres and it is 1795 metres above sea level. Nairobi came to be because of the railway that was built by engineers in 1899 from Mombasa to Kisumu. After the 1st World War that ended in 1918 Nairobi became increasingly a base government business. (Wikipedia, 2014)

Nairobi has seventeen constituencies and eighty five wards. The county has a county government consisting of a county assembly and county executive. The county is represented by a senator in the upper house (senate) and each individual constituency has a member of parliament. These seats are all elective. (Wikipedia, 2014)

3.1.1.2 Population and demographic characteristics

Nairobi is a cosmopolitan with a multicultural composition. As off 2009 Nairobi has a population of 3,138,369 with an annual population growth rate of 4.1%. Of the current population, 51.1% are male and 48.9% are female. The population density of Nairobi is 4,515 people per km². There are about 985,016 households in the county and the age distribution is 0 – 14 years (30.3%), 15 – 64 years (68.5%) and 65+ years (1.2%). (myaspirantmyleader.com 2014)

3.1.1.3 Railway Gymnasium

The gymnasium is located off Haile Selassie Avenue in the Railway Club just next to the monumental Uhuru Park in Dagoretti North Constituency, Nairobi County. The gymnasium lies in land owned by the Kenya Railways. Nairobi County is an urban setup and the main economic activity in is formal and informal employment.

The gymnasium is about 20 by 15 feet squared in area with only one floor. It is partly constructed with iron sheets and partly by stone. The floor is made from stone and is plastered with cement. There is also a rubber carpet at some points in the facility.

The gymnasium has several facilities at the disposal of the clients including; several free weights for lifting, metal bars, dumbbell weights, benches and racks. There are also machines that have pulley systems that supplement the well-stocked facility. The gymnasium has changing rooms separate for males and females that have hot water showers, water closet (WC) toilets and urinals for the male cloakroom. The changing room floors have tiles and solid stone walls. The gymnasium has piped water and electricity. Some moonlighters at times come to the gym and sell boiled eggs, supplement ratios and training gear including shoes and belts. The gymnasium however distinctly lacks any first aid kit and there is no nutrition expert at the gymnasium's disposal.

Railway gymnasium was established in circa 1978 as a gymnasium mainly targeted for students from the University of Nairobi (UON). But as the population of Nairobi grew, more people outside of the UON began to patronize the gymnasium. Today the gymnasium is patronized by many people mainly men who aim to gain lean body mass regardless of their age or career. The gymnasium also works in partnership with several rugby clubs (both male and female clubs) in Nairobi to train and condition their players. The gymnasium's prices are relatively lower compared to other gymnasiums of the same standard in Nairobi and has subsidized rates for students. This makes it attract many clients particularly from the middle and lower class of society. The gymnasium is open from Monday to Saturday. On weekdays business hours are from 4.30AM to about 8.30PM.

On Saturday the gym opens at the usual time but closes at 2PM. This flexible timings allows for people with other commitments to be able to access the facility at their own leisure.

The gymnasium is owned by an individual who pays rental fee to the management of the Kenya Railways club. The gymnasium owner has hired two trainers who work in different shifts to assist the clientele train. They are also charged with the responsibility of collecting the fee payments and any other administrative work required in the gymnasium.

3.2 Study population and sampling frame

The study population included amateur bodybuilders in the county of Nairobi. The sampling frame included amateur bodybuilders who had their workouts at the Railway gymnasium, Nairobi.

3.3 Study design

A cross sectional study with both descriptive and analytical components was conducted in the railway gymnasium. It involved questionnaires that were filled by the respondents through face to face interviews. The study undertook to collect socio-demographic information, anthropometric measures and conduct dietary intake assessments as well as knowledge assessments.

3.3.1 Sample size calculation

The population in this study was 257 bodybuilders. Mugenda and Mugenda therefore recommended the following formula for samples less than 10,000:

$$n_f = n / (1 + n/N)$$

Where:

n_f = desired sample size when the population is less than 10,000,

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

N = estimate of the population size.

$$n = \frac{z^2 pq}{d^2}$$

Where:

n = Desired sample size

z = Standard normal deviate set at 1.96 which corresponds to 95% of confidence interval

p = Assumed to be 0.5

q = (1-p) Assumed to be 0.5

d = Degree of accuracy desired set at 0.05

Therefore:

$$\frac{1.96^2 * 0.5 * 0.5}{0.05^2} = 384.16$$

Our sample is therefore:

$$n_f = 384 / (1 + 384/257) = 153.99 = 154$$

An attrition rate of 5% was applied resulting in a sample of 162 bodybuilders.

3.3.2 Sampling procedure

Purposive sampling was used to select the Nairobi County as well as the railway gymnasium. The gymnasium had a total population of 257 bodybuilders. The sampling frame was the attendance register for the gym. Randomizing software provided free on random.org was used to provide a list of 162 random numbers. These numbers were then compared with the names on the gymnasium attendance register to get the participants for the study.

3.3.2.1 Inclusion criteria

1. The selected participants must have been between 17 – 41 years of age.
2. The study subjects must have been practising bodybuilding for at least six months prior to when the study commenced

3.3.2.2 Exclusion criteria

1. Bodybuilders who had eating disorders such as bulimia and anorexia weren't included in the study.

3.4 Research tools and equipment

Research tools that were used for this study included; questionnaires, height board, weight scales, body fat scale and non-stretch tape measure.

3.4.1 Questionnaire

A pre-tested semi-structured questionnaire was used to obtain information on socio-demographic characteristics of the amateur bodybuilders such as age, marital status, socioeconomic status and education level. A Knowledge Assessment Quiz was used to assess dietary knowledge and an Attitude Assessment Quiz was used to determine the study participants' dietary attitude. A food frequency questionnaire and anthropometric measures were included in the questionnaire. Coded options were offered for some of the questions.

3.5 Recruitment and training of research assistants

3.5.1 Recruitment of research assistants

Two assistants were hired and trained to gather, record and corroborate the information. The research assistants were KCSE certificate holders with a minimum of D+, they were both 18

years and above, fluent in Swahili and English, they each had a certificate of good conduct, they were residents of Nairobi and had basic computer knowledge.

3.5.2 Training of research assistants

The research assistants were introduced to the project, study tools and study objectives. Their communication skills were improved as well as the skill required to carry out the interviews and assessments. In addition the assistants were trained on techniques of proper data collection and how to administer and fill in the questionnaires. Finally they were trained on ethics in fieldwork.

3.6 Pretesting of research tools

10 bodybuilders were randomly selected then interviewed face to face to test for their understanding of the questions by watching out for a sense of confusion, ambiguity or hesitation in the respondents. Responses to open ended questions were also dully noted. Where there were very few comments, the wording, positioning or spacing of the items may have not been sufficient and was adjusted.

The pretesting also aimed to find out how long it took to complete the questionnaire being aware that a questionnaire that took too long to answer alienated the respondents.

3.7 Quantitative data collection procedures

3.7.1 Height measurement

Standing height is a measure of maximum vertical size of people who are able to stand unassisted. Standing height was measured with the use of a stadiometer with a fixed vertical backboard and an adjustable head piece.

The procedure required a research assistant to direct the study subject to the stadiometer platform. The subject was then requested to stand up straight against the backboard with his body weight evenly distributed on both feet and both the feet flat on the platform. The study subject was then requested to stand with both heels together and toes apart. The toes pointed slightly outward at approximately a 60°angle. An assistant made sure that the back of the head, shoulder blades, buttocks and heels made contact with the backboard.

The next step was to ensure that the head of the subject was in the Frankfort horizontal plane. This was when the horizontal line from the ear canal to the lower border of the orbit of the eye was parallel to the floor and perpendicular to the vertical backboard.

Finally, the head piece was lowered so that it lied flat on top of the subjects head, ensuring adequate pressure was applied to compress the hair. The subject stood tall, took a deep breath and held it. The deep breath helped straighten the spine to result in a reliable and reproducible stature dimension. This procedure was repeated for the same subject to get two measurements then an average between the two measurements was computed and recorded. (NHANES, 2007)

3.7.2 Weight measurement

For weight measurement, the study subject was requested to step up onto the scale and stand still on the centre of the scale with their body weight evenly distributed on both feet. The subject's arms hang freely by the sides of the body, with palms facing the thighs. The subject held their head up, and face forward.

Weight was recorded to the nearest 0.1 kilograms using the recommended scale preferably with a digital readout. This procedure was repeated for the same subject to get three measurements then an average between the three measurements was computed and recorded. (NHANES, 2007)

3.7.3 Body fat measurement

Skinfold measurements at a single site can be used to estimate the percentage body fat. However, the most representative site is not the same between people of different sexes and ages. The most representative sites for adult males are the subscapular and midaxillary sites. (Gibson, 2005) This study chose to use the midaxillary site for all the respondents. Figure 2 below shows the surface anatomy of the human thorax.

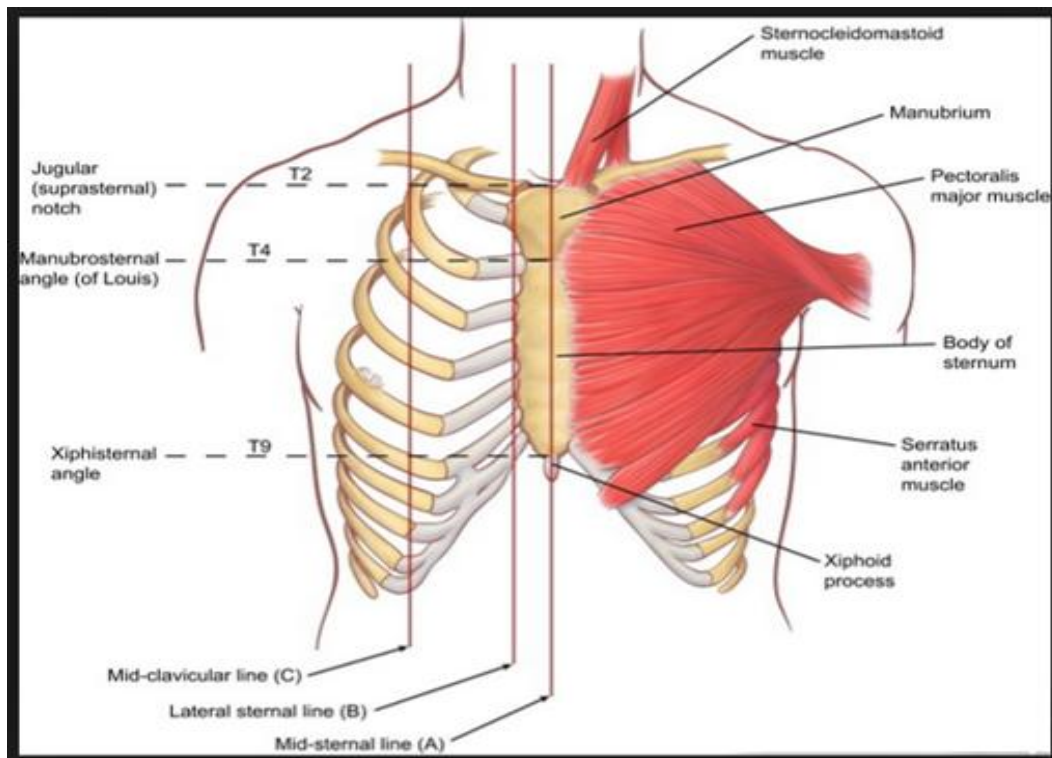


Figure 2: Surface anatomy of the thorax (Sayeed, 2007)

Using the thumb and index finger, a horizontal skinfold was taken approximately 2.0 cm beside the level of the xiphoid process bordering the midaxillary line. The skinfold included skin and subcutaneous adipose tissue.

While still holding the skinfold, the measurer placed the tips of the calliper jaws completely over the skinfold. He made sure that the jaws sat perpendicular to the skinfold and the mark remained centred between the tips. While still maintaining the grip on the skinfold in place, the measurer slowly released the calliper handle to apply complete tension on the skinfold. Finally the measurer waited for 4 seconds for the calliper needle dial to settle on a precise measurement then he made the reading to the nearest 0.1 cm. After the reading was made the calliper points were removed and then the measurer let go of the skinfold. (NHANES, 2007)

This procedure was repeated for the same subject to get three measurements then an average between the three measurements was computed and recorded.

3.7.4 Waist circumference

Waist circumference was measured by use of a measuring tape. While the study subject was holding their clothing above the waist level the measurer was on the participant's right side. The examiner ran his hand around the hip area to trace the right ilium of the pelvis.

He then etched a horizontal line just above the uppermost lateral border of the right ilium. The measuring tape was then spread around the waist of the study subject. Care was observed to maintain the tape in a horizontal plane at the measurement mark level. As the examiner was on the subject's right side, the designated recorder confirmed the placement of the tape. He ensured the tape sat parallel to the floor and it was not compressing the skin of the study participant. The measurer positioned the zero end of the tape just below the part with the measurement value. The measurement was then taken at the end of the subject's normal expiration to the nearest 0.1 cm. This procedure was repeated for the same subject to get three measurements then an average between the three measurements was computed and recorded. (NHANES, 2007)

3.7.5 Knowledge Assessment

Knowledge was assessed using a Knowledge Assessment Quiz which was part of the questionnaire administered to the study participants. The quiz included five questions which assessed the study participants' knowledge on food and nutrients, the causes of poor nutrition status and the possible consequences of poor nutrition status. For each correct response a score of 2 points was given while each wrong response was given 0 points. The quiz was scored out of 10. Depending on the total score respondents were graded as either having poor knowledge ($KS \leq 4$), moderate knowledge ($5 < KS \leq 7$) or having good knowledge ($KS \geq 8$). See Appendix 2 to view the Knowledge Assessment Quiz.

3.7.6 Attitude Assessment

Attitude of the respondents was assessed using an Attitude Assessment Questionnaire. The questionnaire had 5 questions that assessed nutrition attitude in context of perceived benefits of good nutrition, perceived severity of poor nutrition, self-confidence of the participants and perceived barriers of adoption of good nutrition practices. For each question, a positive response elicited 1 point while a negative or impartial answer elicited a score of 0 points. Participants were ranked as having a negative attitude (≤ 2), moderately positive attitude ($2 < AA \leq 3$) or a positive attitude (> 3). See Appendix 2 to view the Attitude Assessment Questionnaire.

3.7.7 Dietary Practice Assessment

Dietary practice of the study participants was assessed using a Food Frequency Questionnaire. Several foods were listed on the questionnaire and frequency of consumption options were included. The frequency of consumption options included; Never/rarely, monthly, fortnight, 1 – 2 times a week, 3 – 4 times a week, 5 – 6 times a week and daily. Depending on the frequency of consumption of a specific food the study participants chose only one option. See Appendix 2 to view the Food Frequency Questionnaire.

3.8 Data quality control

This involved properly training the field assistants for the task at hand. To ensure accurate measurements a minimum of three measurements were collected and the average between the three recorded. If any two measurements had a difference of greater than 0.5 they were both discarded and fresh ones taken.

Methods and protocols for capturing observations were standardized alongside recording forms with clear instructions. Before terminating the interview, data completeness was confirmed and finally errors made during transcription corrected.

3.9 Ethical considerations

Ethical consent was sought from Kenyatta National Hospital Ethic Review Committee (KNH-ERC), the gymnasium owner and the administrators. A research permit was also obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Participants were informed on the purpose of the study, study objectives and possible benefits of the study. Each participant signed a consent form prior to initiation of the assessment. View Appendix 7 and 8 to view the Research Permit and the Ethical Clearance respectively.

3.10 Data entry, cleaning and analysis

Data from the questionnaire was first cleaned then analysed using Statistical Package for Social Sciences (SPSS). Data from the scores of the knowledge and attitude assessment was first analysed using the methodology then the data was entered in SPSS for further analysis.

Descriptive statistics (means, medians, modes, percentages and standard deviations) were computed for socio-demographic characteristics as well as nutrition status indicators. A p-value of <0.05 was considered significant in all the analyses. Chi-square and Fisher's exact test were used to determine associations.

Chapter 4 Results

4.1 Introduction

This chapter presents results from the study. The results are based on the specific objectives of the study and are founded on analysis of data from a total of 162 amateur male bodybuilders training in Railway Gymnasium.

4.2 Socio-demographic and economic data

From the 162 respondents who were interviewed, most (76.6%) of them were aged between 20 – 30 years old. Most of the respondents (76.5%) were single in terms of their marital status. Majority of the respondents in this study (90.7%) had attained college/university level of education. Table 3 shows the socio-demographic and economic characteristics of the respondents

Table 3: Socio-demographic and economic characteristics of the respondents

Characteristics	N	Percent
Age (Years)		
17 – 19	10	6.2
20 – 29	114	70.4
30 – 39	33	20.4
40 - 41	5	3.1
N	162	100
Marital status		
Single	124	76.5
Married	34	21.0
Separated	2	1.2
Widowed	1	0.6
N/A	1	0.6
N	162	100
Education levels		
Completed secondary	147	9.3
College/university	15	90.7
N	162	100
Source of income		
Full time employment	51	31.5
Part time employment	23	14.2
Self-employment	33	20.4
Not in paid employment	55	34.0
N	162	100

4.3 Anthropometric measurements

4.3.1 Body Mass Index (BMI)

BMI is an index of weight-for-height that is used to classify adults as either underweight, normal, overweight or obese. It is calculated by dividing the body weight in kilograms by the square of the height in metres (kg/m^2). The mean BMI was 25.72.

None of the respondents was underweight while those in normal and overweight ranges were both 42.6%. The remaining 14.8% was represented by obese participants. Table 4 shows the distribution of the respondents' BMI.

Table 4: Distribution of the respondents by BMI

	Frequency	Percent
Underweight (<18.5)	0	0
Normal (18.5 – 24.9)	69	42.6
Overweight (25 – 29.9)	69	42.6
Obese (≥ 30)	24	14.8
Total	162	100.0

4.3.2 Body fat

Body fat was estimated using skinfold callipers. The mean measurement was 14.09 which is within the healthy range. 61.1% of the respondents were within the healthy range while 18.5% were classified as underfat. Only a total of 8 respondents out of the 162 were obese. Table 5 displays the distribution of the respondents' body fat percentage.

Table 5: Distribution of respondents by body fat percentage

	Frequency	Percent
Underfat (<8%)	30	18.5
Healthy range ($8 \leq \text{BF} < 19\%$)	99	61.1
Overweight ($19 < \text{BF} \leq 25\%$)	25	15.4
Obese ($> 25\%$)	8	4.9
Total	162	100.0

4.3.3 Waist-height ratio (WHtR)

The waist-to-height ratio (WHtR) was used to measure the respondents' body fat distribution. A high WHtR was associated with abdominal obesity. The WHtR classifies individuals as either underweight (<0.43), healthy ($0.43 - 0.52$), overweight ($0.53 - 0.62$) or obese (>0.63).

As shown in Figure 2, 72.2% of the respondents were within the healthy range while 21.6% were overweight. There were no obese participants using this classification but 6.2% of the participants were on the other far extreme of underweight.

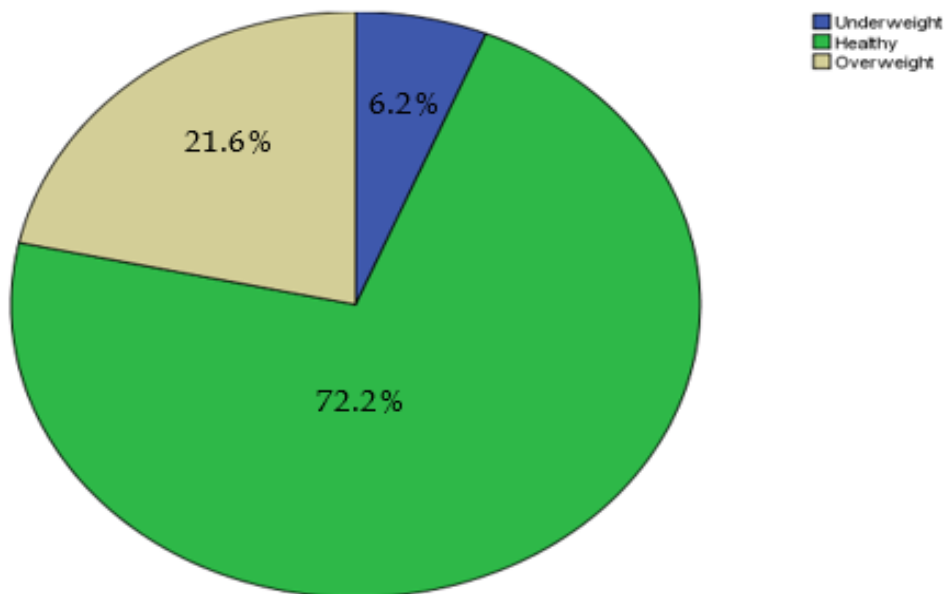


Figure 3: Distribution of the respondents by waist –height ratio

4.4 Source of Nutrition Information

Respondents in this study were required to select their main source of nutrition information from a list provided in the questionnaire. A participant could only select one option. As shown below in figure 4, 24.1% of the participants listed the gymnasium instructor to be their main source of nutrition information. The respondents who used their own knowledge to guide their feeding practices represented 22.2% of the respondents. Internet sources were also very popular among the respondents representing 21.6% of the sample. Qualified nutritionists were only consulted by 3.1% of the respondents.

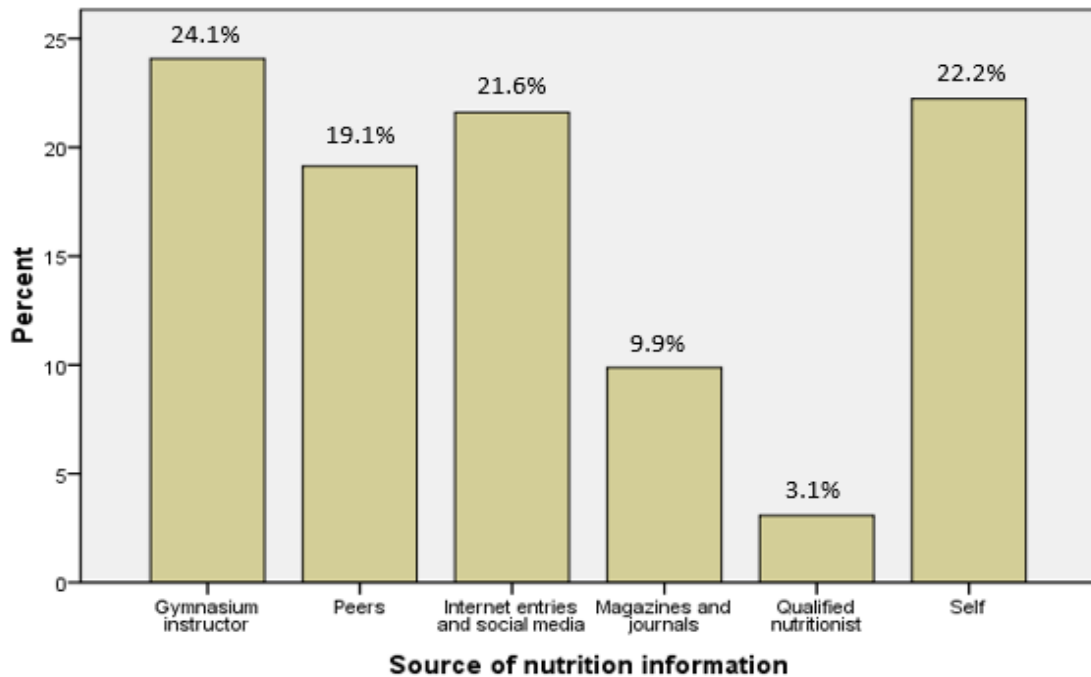


Figure 4: Distribution of the respondents by source of nutrition information

4.5 Nutrition Knowledge score (KS)

Nutrition knowledge was assessed using a short quiz with 5 questions. Each response was graded and the total score recorded. The mean knowledge score was 9.2. The minimum score was 6 while the highest score was 10 out of a possible 10. Most of the participants had good knowledge with only 8.6% of them having moderate knowledge as shown below in Table 6. The remaining 91.4% all had good knowledge. None of the respondents had poor knowledge.

Table 6: Distribution of the respondents by knowledge score

Knowledge Score		
	Frequency	Percent
Moderate knowledge	14	8.6
Good knowledge	148	91.4
Total	162	100.0

4.6 Attitude assessment score

Attitude of the respondents was assessed using an attitude assessment questionnaire. The mean attitude score was 2.37 ± 0.10 while both the mode and median attitude score was 2. From the respondents 56.2% had a negative attitude towards nutrition while 22.2% had a positive attitude. The remaining 21.6% had a moderately positive attitude towards nutrition. Figure 5 below shows the distribution of the respondents' attitude assessment score.

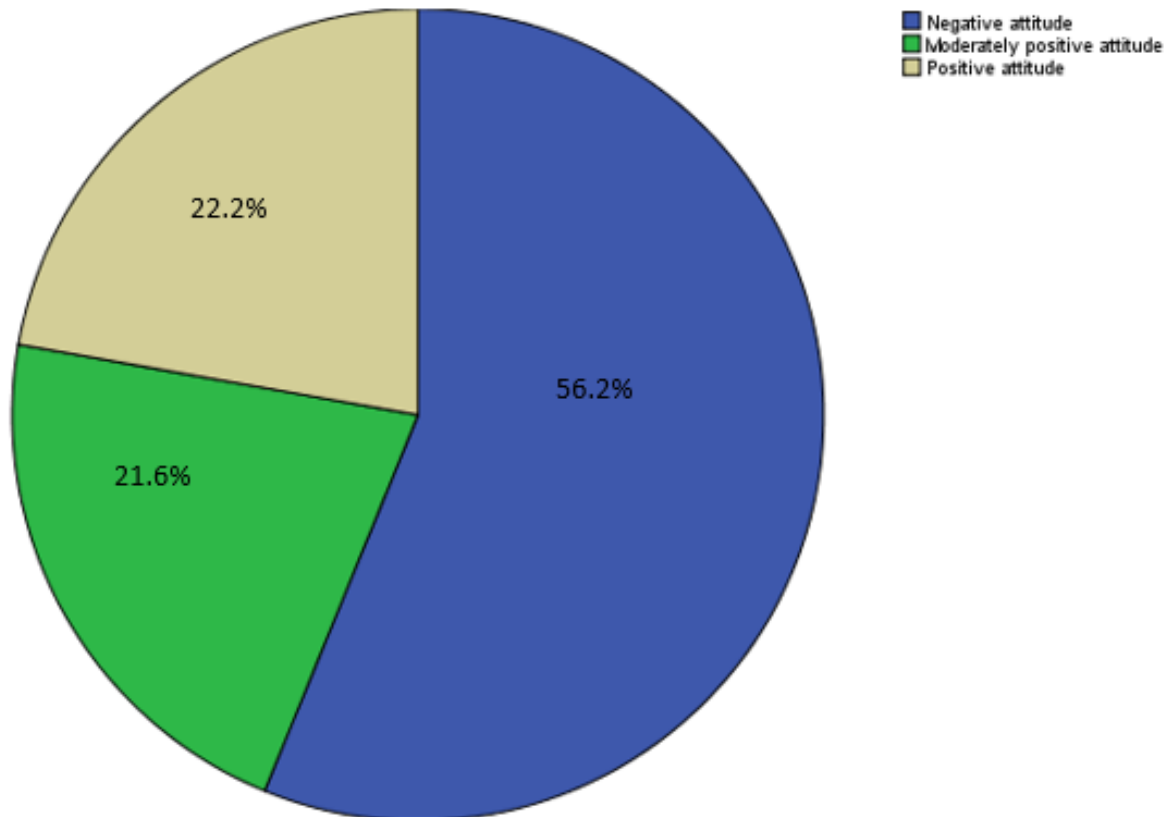


Figure 5: Distribution of respondents by attitude score

Individual attitude assessment questions were analysed to determine the proportion of responses to each question by the respondents. Majority of the respondents (85.8%) thought obesity was a serious problem. From the respondents, 77.2% of them felt that their body proportions and composition were in a good state while 7.2% thought theirs was not in a good state. Table 7 below shows the distribution of responses for individual attitude assessment questions.

Table 7: Distribution of responses for individual attitude assessment questions.

AA1. How important do you think it is to limit carbohydrate intake to between 55 – 60% of total energy intake?	Not Important	Not sure	Important	Total
	8.6%	38.9%	52.5%	100%
AA2. How serious do you think it is to be overweight?	Not really serious	Moderately serious	Serious	Total
	1.9%	12.3%	85.8%	100%
AA3. What state do you think your body proportions and composition are in?	Not good	Not sure	Good	Total
	7.4%	15.4%	77.2%	100%
AA4. In the context of bodybuilding how good do you think it is to limit protein intake to between 1.5 – 2.0 g kg⁻¹day⁻¹?	Not good	Not sure	Good	Total
	15.4%	46.3%	38.3%	100%
AA5. How difficult is it for you to limit your protein intake to between 1.5 – 2.0 g kg⁻¹day⁻¹?	Not difficult	Relatively difficult	Difficult	Total
	52.5%	37.0%	10.5%	100%

Respondents' body fat percentage was compared with their beliefs on the state of their body proportions and composition. Among the participants who thought their body proportions and compositions were in a good state 46.9% of them were within the healthy range while 10.5% were overweight and 3.1% were obese. It was also noted that 3.7% of the participants who were in the healthy range thought their body proportions and compositions were not in a good state. Table 8 below shows the distribution of the respondents by body fat and their thoughts on their body proportions and composition.

Table 8: Distribution of the respondents by body fat and their thoughts on their body proportions and composition

What state do you think your body proportions and composition are in?					
	Body fat				Total
	Underfat	Healthy range	Overweight	Obese	
Not good	0.0%	3.7%	2.5%	1.2%	7.4%
You're not sure	1.9%	10.5%	2.5%	0.6%	15.4%
Good	16.7%	46.9%	10.5%	3.1%	77.2%
Count	18.5%	61.1%	15.4%	4.9%	100.0%

4.7 Association between knowledge of the respondents and their nutrition status

Nutrition status was cross-tabulated against Knowledge Score. 63 of the 69 participants whose BMI was overweight had good knowledge. It was also noted that 93 of the 99 participants whose body fat percentage was within the healthy range had good knowledge. However, 2 of the 35 participants whose WHtR was overweight had moderate knowledge. Table 9 below shows the distribution of the respondents' nutrition status by knowledge score.

Table 9: Distribution of the respondents' nutrition status by knowledge score.

		Knowledge Score				N	%
		Moderate Knowledge		Good Knowledge			
		N	%	N	%		
BMI	Normal	7	4.3	62	38.3	69	42.6
	Overweight	6	3.7	63	38.9	69	42.6
	Obese	1	0.6	23	14.2	24	14.8
	N	14	8.6	148	91.4	162	100
Body fat %	Underfat	6	3.7	24	14.8	30	18.5
	Healthy Range	6	3.7	93	57.4	99	61.1
	Overweight	0	0	25	15.4	25	15.4
	Obese	2	1.2	6	3.7	8	4.9
	N	14	8.6	148	91.4	162	100
WHtR	Underweight	2	1.2	8	4.9	10	6.2
	Healthy Range	10	6.2	107	66	117	72.2
	Overweight	2	1.2	33	20.4	35	21.6
	N	14	8.6	148	91.4	162	100

A Pearson's Chi-Square test was conducted to determine whether there was a significant association between attitude score of the respondents and their nutrition status. Knowledge score of the respondents was significantly associated with their percent body fat ($\chi^2=10.814$ DF=3 P=0.013) Table 10 below shows the association between knowledge score of the respondents and their nutrition status.

Table 10: Association between knowledge score of the respondents and their nutrition status

	Chi-Square	DF	P-Value
BMI	0.806	2	0.668
Body fat %	10.814	3	0.013
WHtR	2.015	2	0.365

4.8 Association between attitude score of the respondents and their nutrition status

Nutrition status was cross-tabulated against attitude score of the respondents. 33 of the 69 respondents whose BMI was overweight had a negative attitude. It was also noted that 6 out of the 8 respondents whose body fat percentage was classified as obese also had a negative attitude towards nutrition. In addition, 25 of the 117 respondents who were within the healthy range of WHtR had a positive attitude towards nutrition. Table 11 below shows the distribution of the respondents' nutrition status by attitude score.

Table 11: Distribution of the respondents' nutrition status by attitude score.

		Attitude Score						N	%
		Negative attitude		Moderately Positive attitude		Positive attitude			
		N	%	N	%	N	%		
BMI	Normal	44	27.2	15	9.3	10	6.2	69	42.6
	Overweight	33	20.4	14	8.6	22	13.6	69	42.6
	Obese	14	8.6	6	3.7	4	2.5	24	14.8
	N	91	56.2	35	21.6	36	22.2	162	100
Body fat %	Underfat	20	12.3	6	3.7	4	2.5	30	18.5
	Healthy Range	46	28.4	25	15.4	28	17.3	99	61.1
	Overweight	19	11.7	3	1.9	3	1.9	25	15.4
	Obese	6	3.7	1	0.6	1	0.6	8	4.9
	N	91	56.2	35	21.6	36	22.2	162	100
WHtR	Underweight	8	4.9	1	0.6	1	0.6	10	6.2
	Healthy	64	39.5	28	17.3	25	15.4	117	72.2
	Overweight	19	11.7	6	3.7	10	6.2	35	21.6
	N	91	56.2	35	21.6	36	22.2	162	100

A Pearson's Chi-Square test was conducted to determine whether there was a significant association between attitude score of the respondents and their nutrition status. Attitude score of the respondents was significantly associated with their percent body fat ($\chi^2=10.742$ DF=6 P=0.037). Table 12 below shows the association between attitude score of the respondents and their nutrition status. To view individual attitude scores view Appendix 5.

Table 12: Association between attitude score of the respondents and their nutrition status

	Chi-Square	DF	P-Value
BMI	6.855	4	0.144
Body fat %	10.742	6	0.037
WHtR	3.663	4	0.454

4.9 Dietary practice

Dietary practice was determined using a Food Frequency Questionnaire (FFQ). The FFQ assessed the frequency with which the respondents consumed selected foods. Percentage frequencies were generated for each frequency option. The percentage frequencies were not cumulative. Therefore, for example, daily frequencies were not represented in weekly frequencies instead weekly frequencies only represented foods consumed once a week. As shown below in Table 13, the most frequently consumed food protein source was milk and milk products at a frequency of 39.5% consumption daily. The least frequently consumed food protein source was fish with 1.9% of the respondents consuming it daily while 19.1% of the respondents consumed it monthly. Eggs, which have a biological value of 100, and are recommended for bodybuilders as a good source of protein are consumed by most respondents between 1 – 2 times a week (34%) and 3 – 4 times a week (34%)

Protein shakes, are a supplementary source of high quality proteins recommended for use by bodybuilders to meet their protein requirements. Only a mere 6.8% of the respondents used the protein shakes on a daily basis. A vast majority of 63% of the respondents never/rarely used the protein shakes. Legumes, which are another source of proteins are consumed 3 – 4 times a week by 40.1% of the respondents. While 5.6% of the respondents rarely/never consume legumes.

Cereals, which are a rich source of energy, were consumed by 43.7% of the respondents daily and by 25.5% of the respondents between 5 – 6 times a week. Jointly, 84.6% of the respondents consumed cereals between 3 – 7 times a week. Energy bars which are an energy supplement for athletes were only consumed by 3.7% of the respondents daily. The energy bars were however never/rarely consumed by 66.7% of the participants. Deep fried consumed were only consumed by 3.1% of the selected participants on a daily basis while 38.9% consumed deep fried foods 1 – 2 times a week.

Water was drunk on a daily basis by 84.0% of the respondents. Alcoholic drinks were consumed by 18.5% of selected respondents 1 – 2 times a week. None of the respondents' drunk alcohol on a daily basis and 53.7% of the respondents never/rarely consumed alcohol.

Table 13: Respondents' food frequency data

	Never/rarely (%)	Monthly (%)	Fortnight (%)	1-2 times a week (%)	3-4 times a week (%)	5-6 times a week (%)	Daily (%)	N	Total percentage
Milk& milk products	1.2	2.5	0	21.6	22.8	12.3	39.5	160	100
Red meat	3.7	5.6	7.4	35.8	31.5	8.0	8.0	156	100
Meat products	3.7	5.6	7.4	35.8	31.5	8.0	8.0	156	100
Poultry	11.1	11.1	13.6	36.4	20.4	4.9	2.5	146	100
Fish	15.4	19.1	14.2	38.9	8.6	1.9	1.9	137	100
Eggs	3.7	1.2	4.3	34.0	34.0	12.3	10.5	156	100
Legumes	5.6	5.6	4.3	22.8	40.1	11.1	10.5	153	100
Nuts& Peanut butter	11.7	12.3	6.8	22.8	20.4	6.8	19.1	145	100
Cereals	0.6	1.4	2.4	11.0	15.4	25.5	43.7	162	100
Fruits& Vegetables	1.2	1.2	3.7	11.1	23.5	20.4	38.9	160	100
Spreads	21.6	4.3	1.9	20.4	8.6	11.7	31.5	127	100
Soft drinks	17.3	6.8	11.1	32.1	21.6	2.5	8.6	134	100
Sports drinks	54.3	11.7	8.6	14.8	5.6	1.2	3.7	74	100
Energy bars	66.7	11.1	1.9	8.0	6.2	2.5	3.7	54	100
Protein shakes	63	9.3	3.1	9.3	8.0	0.6	6.8	60	100
Alcohol	53.7	7.4	13.6	18.5	4.9	1.9	0	75	100
Deep fried foods	19.8	7.4	15.4	38.9	11.7	3.7	3.1	130	100
Water	0	0.6	0.6	0.7	1.2	12.9	84.0	162	100

4.10 Association between knowledge and attitude of the respondents and their dietary practices

The Fisher's exact test was conducted to determine whether there was a significant association between knowledge and attitude of the respondents' and their dietary practices. The Pearson's Chi-Square test could not be used because in most of the correlations, more than 20% of the cells had an expected count of less than 5 and therefore the Pearson's Chi-Square assumption was violated. The level of significance was set at 0.05.

There was an association between the knowledge of the respondents' and their frequency of consumption of meat products (P=0.019), fish (P=0.001) and deep fried foods (P=0.032). Attitude of the respondents was associated with their frequency of consumption of nuts and peanut butter (P=0.044) and water (P=0.037). Table 14 below shows the association between the respondents' dietary practices and their knowledge and attitude. To view the distribution of the respondents by knowledge and attitude scores and their dietary practice view Appendix 4.

Table 14: Association between knowledge and attitude of the respondents and their dietary practices

Dietary practice	N	P -Values	
		Knowledge score	Attitude score
Milk and milk products	160	0.618	0.396
Red meat	156	0.711	0.914
Meat Products	139	0.006	0.984
Poultry	146	0.524	0.268
Fish	137	0.002	0.317
Eggs	156	0.160	0.270
Legumes	143	0.712	0.336
Nuts, peanut butter	143	0.462	0.044
Cereals	148	0.111	0.090
Fruits and vegetables	160	0.254	0.601
Spreads	127	0.380	0.253
Soft drinks	134	0.237	0.375
Sports drinks	74	0.084	0.274
Energy bars/shakes	54	0.709	0.427
Protein shakes	60	0.851	0.351
Alcoholic beverages	76	0.527	0.899
Deep fried foods	130	0.032	0.460
Water	161	0.097	0.037

4.11 Association between dietary practice and nutrition status

The Fishers exact test was conducted to determine whether there was a statistically significant association between dietary practice of the respondents' and their nutrition status. The Pearson's Chi-Square test could not be used because in most of the correlations, more than 20% of the cells had an expected count of less than 5. Therefore the Pearson's Chi-Square assumption was violated. The level of significance was set at 0.05.

Body fat percentage of the respondents was significantly associated with their frequency of consumption of red meat (P=0.041) and protein shakes (P=0.035). The BMI of the respondents was significantly associated with their frequency of consumption of milk and milk products (P=0.007), red meat (P=0.001), fish (P=0.013) and protein shakes (P=0.024). The waist-height ratio of the respondents was significantly associated with their frequency of consumption of milk and milk products (P=0.021), red meat (P=0.004), eggs (P=0.039), cereals (P=0.019) and alcoholic beverages (P=0.041). Table 15 below shows the association between the respondents' dietary practices and their nutrition status. To view distribution of the respondents by nutrition status and their dietary practice view Appendix 5.

Table 15: Association between the respondents' dietary practice and their nutrition status

Dietary practice	N	P - Values		
		Body fat percentage	BMI	WHtR
Milk and milk products	160	0.410	0.007	0.021
Red meat	156	0.041	0.001	0.004
Meat Products	139	0.345	0.319	0.506
Poultry	146	0.937	0.261	0.660
Fish	137	0.475	0.013	0.625
Eggs	156	0.261	0.154	0.039
Legumes	143	0.247	0.578	0.274
Nuts, peanut butter	143	0.945	0.388	0.868
Cereals	148	0.137	0.226	0.019
Fruits and vegetables	160	0.241	0.133	0.109
Spreads	127	0.245	0.124	0.325
Soft drinks	134	0.348	0.667	0.777
Sports drinks	74	0.236	0.052	0.144
Energy bars/shakes	54	0.258	0.510	0.118
Protein shakes	60	0.035	0.024	0.071
Alcoholic beverages	76	0.533	0.266	0.041
Deep fried foods	130	0.137	0.172	0.534
Water	161	0.566	0.130	0.104

Chapter 5: Discussion

5.1 Introduction

Most amateur bodybuilders tend to have inadequate access to proper nutritional information that may result in them adopting poor dietary practices. The present study aimed at generating data on the nutrition status and dietary practices of amateur bodybuilders at Railway gymnasium and factors that affect them.

5.2 Socio-demographic and economic characteristics

The proportion of respondents aged between 20 – 29 years old was 76.6% while those aged \geq 40 years old is only 2.5%. This can be attributed to the high rate of unemployment (85.5%) amongst respondents aged between the ages of 20 – 29 years. This affords them the time to participate in bodybuilding activities. In addition some websites online such as livestrong.com urge bodybuilders to take advantage of the age between 20 – 30 years to bulk up because they will be less affected in the future by the gradual loss of muscle that occurs naturally with aging. The internet was responsible for a great proportion of the respondents' source of information regarding bodybuilding.

Most of the participants (76.5%) were single in their marital status. This is higher than the national results reported in KDHS 08 – 09 in which 46.8% of the male population were not married. All the respondents were well educated with 90.7% having attained tertiary education and the remaining 9.3% having completed secondary education. This can be explained by the fact that majority of the gym attendants used to attend or are still attending school at the nearby University of Nairobi and Technical University of Kenya (formerly Kenya Polytechnic).

5.3 Anthropometric measurements

BMI of the respondents was calculated and compared with the set threshold levels. The mean BMI was 25.72 and the mode was 25.14.

These values lie within the range of overweight (25.00 – 29.99) which is associated with an increased disease risk (WHO, 2000). This can however be explained by the fact that bodybuilders aim to gain in lean body mass and cut down on body fat.

However BMI cannot distinguish between weight associated with muscle and weight associated with body fat (Webster-Gandy, 2012). Hence for bodybuilders a high BMI may result from excessive adiposity or muscularity. BMI was noted to be associated with age with a large proportion of those who were overweight and obese aged 20 – 29 years. The underlying determinants of a shifting BMI distribution are complex, but are telling of adverse societal and environmental conditions which promote inactivity, excessive energy intake leading to malnutrition.

With body fat percentage, 61.1% of the respondents body fat lay within the healthy range of between $8 \leq \text{BF} < 19$. In addition, the mean body fat percentage was 14.09% and the mode was 7.2% which is classified as underfat. Most of the respondents therefore had healthy body fat percentages. This can be attributed to the fact that rigorous physical activity burns excess calories in the body. Fat is the main storage form of energy in the body and is sensitive to acute malnutrition. (Gibson R. 2005) There was a proportion of the respondents (4.9%) who were within the obese classification of body fat. This was a very small proportion of the respondents and it can be explained by participants who were new in the gymnasium or hadn't been training consistently.

The waist-to-height ratio (WHtR) that is used to measure abdominal obesity indicated 21.6% of the respondents were overweight which implied that their abdominal girth was too big. This may be attributed to the rising increase in the junk food industry over the past few years. Unhealthy eating practices seem to be rampant among the youth and it is evident that it is taking a toll on their health. According to Dr Vincent Onywera, a lecturer at Kenyatta University's Exercise, Recreation and Sports Science department, youth obesity is a major problem in Kenya. The increase in youth obesity is a concern at the Ministry of Health so much so that the ministry is developing a policy to incorporate more exercise, healthy eating and responsible living.

5.4 Source of nutrition information

The gymnasium instructors were the most frequently consulted people in regards to nutrition information. They however do not have any professional training in nutrition. This can however be explained by the fact that the gymnasium instructors have trained several people and assisted them body build. This built the respondents' confidence in their ability to give

them the right information. In addition, the respondents considered them the most accessible source of nutrition because they are always at the gym and inexpensive because once the membership fee for the gym is renewed they would not require to pay the instructor any more money for the services they offer. A great proportion of the respondents consulted internet entries and social media. This can be attributed to the fact that the internet has become easily accessible to most people and is a relatively inexpensive source of information. Some websites such as bodybuilding.com, t-nation.com, as well as muscleandbrawn.com are accessible freely and provide a lot of information regarding bodybuilding routines as well as nutrition for bodybuilders. However this information has not been authenticated to prove whether it is accurate or otherwise. Magazines and journals are consulted by a small proportion of the respondents which is a testament to the decline of print media and the continued rise in preference for the digital and online information. Qualified nutritionists were consulted by a mere 3.1% of the respondents. This may be due to the cost involved in consulting a nutritionist as well as their inaccessibility to the respondents.

5.5 Nutrition knowledge score

A great majority of the respondents had good nutrition knowledge. This can be attributed to the fact that the lowest educated respondent had completed secondary education while the vast majority were college/university graduates. It was however noted that knowledge of the respondents was significantly associated with nutrition status using body fat percentage as an indicator. It would appear that most of the respondents with good knowledge on nutrition used the knowledge to eat correctly. There was an association between knowledge score and the frequency in consumption of meat products, fish and deep fried foods. These could be attributed to the awareness created on the nutrient content of deep fried foods and processed meat products as well as that of fish.

5.6 Attitude assessment score

Attitude in the context of nutrition can be defined as the expression of favour or disfavour towards appropriate nutrition practice formed from past and present experiences. (Allport, 1995) In this study, attitude was a factor of; perceived benefits of good nutrition, perceived severity of poor nutrition, self-confidence of the participants and perceived barriers of adoption of good nutrition practices. Most of the respondents had a negative attitude towards nutrition. This was heavily influenced by a high number of neutral responses particularly in

questions related to the importance of limiting nutrient intake (proteins and carbohydrates). This may have been caused by an internal thought process influenced by the knowledge that limiting nutrient intake to specific proportions is healthy versus the belief that to body build one is required to eat large unrestricted amounts of protein and carbohydrate.

There was a significant association between the attitude assessment score of the study participants and their percent body fat. This implied that nutrition attitude had an influence on dietary practice and by extension nutrition status.

In addition on the question regarding the thoughts of the respondents on the state of their body proportions and composition 30.2% of those who thought their body proportions and compositions were in a good state were not within the healthy range. Among bodybuilders in Railway Gymnasium some of them are highly obsessed with muscle leanness that may cause them to have unhealthily low body fat percentages. Other bodybuilders in the gym are obsessed with bulking up regardless of whether it is lean muscle or body fat.

5.7 Frequency of food consumption

The least frequently consumed protein food sources by the respondents was fish and poultry. This can be attributed to their relative cost compared with that of other protein sources such as eggs, red meat as well as milk which were frequently consumed. Food supplements such as energy bars, protein shakes and sports drinks were very rarely consumed by majority of the respondents and this can be attributed to their cost as well as ignorance by some of the respondents on their existence.

Deep fried foods were consumed by a vast majority of the respondents but only 6.8% of them consumed the deep fried foods more than 5 times in a week. This is because most of the respondents had good nutrition knowledge and were aware of the dangers of consuming such foods frequently. Water was frequently consumed by majority of the respondents. Water is a universal hydrant and when the water levels in the body drop a feeling of thirst is experienced which drives an individual to crave for fluids to quench the thirst. Fruits and vegetables were consumed by more than half the respondents on more than 5 days a week. This could also be attributed to the good nutrition knowledge among the respondents on the benefits of fruits and vegetables in healthy eating practices.

Alcoholic beverages were consumed by 46.3% of the respondents however none of them consumed it daily. This can be owed to the public awareness campaigns on the dangers of excessive consumption of alcohol.

5.8 Association between dietary practices and nutrition status

The nutrition status of the respondents using the 3 indices in the study was limited to influence from the frequency of consumption of very few foods however consistently among all the three indices was red meat. Red meat is high in saturated fat and transfatty acids. Transfatty acids levels in red meat can reach up to 123mg/100g of the meat. (Droulez, 2002) Trans fats have bad health effects in that they raise the Low Density Lipoproteins (LDL) levels and lower High Density Lipoproteins (HDL) levels. LDL is considered dangerous because it contributes to plaque, a thick, hard deposit that can clog arteries and make them less flexible. If a clot forms and blocks a narrowed artery, heart attack or stroke can result. HDL on the other hand acts as a scavenger, carrying LDL cholesterol away from the arteries and back to the liver, where it is broken down and passed from the body. Eating trans fats therefore increases the risk of developing heart disease and stroke. It's also associated with a higher risk of developing type 2 diabetes. (Mozaffarian, 2006) In addition, red meat can have anywhere between 107 – 236 Kcal/100g depending on the species of the animal, the part of the animal where the meat was obtained and whether the meat was trimmed or untrimmed. (Chan, 1995).

Most of the others food did not have an association with the nutrition status of the respondents. Nutrition status of a person is a factor dependent on dietary energy intake over energy expenditure. Therefore in obesity both an increase in energy intake and a decrease in expenditure lead to excess calories being stored as fat and ultimately to obesity. Energy imbalance is however determined by a complex multifaceted system of determinants where no single influence dominates. (Butland, 2007) These determinants include; genetic factors, foetal programming and obesogenic environment.

Obesity tends to run in families but shared environments factors (meals and levels of activity) probably contribute more to obesity than common genetic factors and the current, rapid increase in obesity prevalence cannot be explained by the gene pool changing so quickly.

However, it is probable that some people are genetically more susceptible to effects of an obesogenic environment. A study done reported that BMI was majorly due to genes and only 25% variation was due to environmental influences. (Wardle, 2008)

Obesogenic environment is defined as the sum of influences that the surroundings, opportunities or conditions of life have on promoting obesity in individuals or populations. These influences include; the physical, socio-cultural and political environments relating to physical activity and food. Environmental influences on food may include; access to fast-food restaurants and supermarkets. Environmental influence on physical activity may include; access to recreational parks and walk ways.

Foetal programming is a determinant for energy imbalance whereby the Barker hypothesis suggests that undernutrition in pregnancy may permanently damage the foetus causing to the programming of ill health that includes; increased susceptibility to obesity in adulthood. In addition rapid catch up growth in infancy that follows foetal nutrition restriction increases disease risk. WHO estimates that in the world, 30 million babies are born with low birth weight annually and most of these are in low-income countries (e.g. Kenya) which contributes to their rising prevalence of obesity.

Chapter 6: Conclusion and Recommendations

Conclusion

This study established the dietary knowledge, dietary attitudes and dietary practices of amateur male bodybuilders and the influence they had on their nutrition status. The first hypothesis, ‘There is no association between the study participants’ dietary knowledge and dietary attitudes on their dietary practices’ is rejected. There is a significant association between the dietary knowledge and dietary attitudes of amateur male bodybuilders and their dietary practice with regards to some foods.

The second hypothesis, ‘There is no association between dietary intake of the study participants and their nutrition status’ is also rejected. Dietary intake of the study participants is significantly associated with their nutrition status with regards to some foods including red meat and protein shakes.

This study therefore concludes that there is an association between the dietary knowledge, dietary attitude and dietary practice of amateur male bodybuilders and their nutrition status.

Recommendations

The data generated by this study provides information on the dietary knowledge, dietary attitude and dietary practices as well as nutrition status of amateur male bodybuilder attending Railway Gymnasium. This information will form the basis of developing an educational curriculum for bodybuilders in Nairobi to promote greater nutritional knowledge and healthier attitudes among bodybuilders. This is in the long run will help reduce the incidence of disease particularly chronic lifestyle diseases in the society.

This study also recommends that BMI should not be used as an indicator of nutrition status among bodybuilders. This is because BMI cannot distinguish between weight associated with muscle and weight associated with body fat. Hence for bodybuilders a high BMI may result from excessive adiposity or muscularity.

Follow up studies should be done to assess the composition of protein shakes and their effects on the body. This is because protein shakes were significantly associated with the body fat percentage of the study participants.

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Appendices

Appendix 1: Consent Information sheet and consent form

Information sheet

Influence of dietary practices on nutrition status among amateur male bodybuilders attending Railway Gymnasium in Nairobi.

You are being invited to take part in a research study assessing the dietary knowledge, dietary attitudes and dietary practices of amateur male bodybuilders working out in Railway gymnasium, Nairobi.

The study aims to contribute towards developing a curriculum and educational materials to promote greater nutritional knowledge and healthy attitudes among amateur male bodybuilders. I am Jeff Wamiti, the primary investigator from the University of Nairobi and my supervisor is Prof. E. G. Karuri from the University of Nairobi.

In this study, you will be asked to take part in an anthropometric assessment to assess body fat percentage of the total body mass. This will involve measuring body weight using a weighing scale, measuring height using a stadiometer and estimating body fat through skinfold thickness assessment using skinfold callipers. You will also be required to provide information regarding your dietary practices, dietary knowledge and dietary attitudes as guided by the structured questionnaire.

The study will take between 10 to 12 minutes to complete. You may decide to stop participating in the study at any time. You have the right to demand that any data provided until that point be withdrawn/destroyed. Feel free to ask questions at any point. If you have any questions as a result of reading this information sheet, you should ask the investigator before the study begins.

This study poses no known risks to you. The study will benefit the entire bodybuilding fraternity through creating awareness on the dietary knowledge and intake of amateur male bodybuilders. Through this a curriculum will be developed to help educate amateur male bodybuilders on the right diet to eat to meet their dietary requirements and avoid harmful consequences of not eating right. Your participation in this study is purely voluntary. There will be no compensation for participation.

The data collected will only be seen by members of University of Nairobi affiliated with the study, and will not be linked to any identifying information such as name, address or other personal details that you supplied. The data collected will be presented at conferences,

academic presentations and in academic publications, however, only data averaged over many participants will be presented. Your individual data will not be identifiable.

Respondent Number: _____

CONSENT FORM

Influence of dietary practices on nutrition status among amateur male bodybuilders attending Railway Gymnasium in Nairobi.

Principal Investigator: Muthui Jeff Wamiti

Kindly tick where appropriate

1. I confirm that I have read and understood the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had the questions answered satisfactorily
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected.
3. I understand that relevant sections of my anthropometric information and data collected during the study may be looked at by individuals from University of Nairobi where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.
4. I agree to take part in the above study.

Name of Respondent _____

Date _____

Signature _____

Appendix 2: Questionnaire

Greetings, my name is Jeff Wamiti. I am a student at the University of Nairobi studying MsC. Applied Human Nutrition. In order to acquire information about the influence of dietary practices on nutrition status among male bodybuilders attending Railway gymnasium in Nairobi we are conducting a survey in this gymnasium and you have been selected by chance from all the other bodybuilders in this gymnasium.

The information you provide will be useful in finding the dietary knowledge, dietary attitudes and dietary practices of male bodybuilders in relation to their nutrition status. A copy of this report will be submitted to the gymnasium management who may use it for planning of nutrition education programs and other unspecified interventions in the gymnasium.

All information you give will be confidential. The information will be used to prepare a general report but will not include any specific names. We encourage you to participate in this study and your cooperation will be highly appreciated.

If it is okay with you may we proceed to ask you some questions related to your dietary knowledge, dietary attitudes and dietary practices in relation to bodybuilding?

Respondent agreed to be interviewed _____ 1 = Yes 2 = No

1. DEMOGRAPHIC CHARACTERISTICS

IDENTIFICATION

Constituency _____ Estate _____

Name of interviewer _____ Date of interview ____/____/____

Respondent's name _____

S/No	Name	Occupation	Age (Years)	Marital status -codes-	Education -codes-	Source of income

Marital Status	Education	Source of income
1=Married 2=Separated 3=Widowed 4=Single 5=Divorced 6=N/A	1=College/University 2=Completed secondary 3=Completed primary 4=Dropped from primary 5=In primary 6=In secondary 7=Adult education 8= Illiterate 9 = N/A (Preschool)	1. Full time employment 2. Part time employment 3. Self-employment 4. Self-funded retiree 5. Pension 6. Not in paid employment 7. Other (specify)

2 ANTHROPOMETRY FOR THE BODYBUILDERS

Height (Metres)	Weight (Kilograms)	Waist circumference	% body fat	Lean body mass	BMI

3. SOURCE OF NUTRITION INFORMATION

What is your source of knowledge and information on bodybuilding in regards to workout routines and dietary information?

- A. Gymnasium instructor
- B. Peers
- C. Internet entries and social media
- D. Magazines and journals
- E. Qualified nutritionist
- F. Self

4. KNOWLEDGE ASSESSMENT (Tick the most appropriate)

I. What do you think are the most important macronutrient(s) required for bodybuilding?

II. What are examples of food sources of high quality proteins?

III. Can you tell me the reasons why some people are overweight or obese?

- A. Excessive intake of energy-dense foods that are high in fat and/or sugar
- B. Lack of or decreased physical activity
- C. Other_____
- D. Don't know

IV. What are the health problems that can occur when a person is overweight or obese?

- A. Increased risk of chronic conditions (such as heart/cardiovascular disease, high blood pressure and diabetes, stroke, certain types of cancer, respiratory difficulties, chronic musculoskeletal problems, skin problems and infertility)
- B. Reduced quality of life
- C. Premature death
- D. Other_____
- E. Don't know

V. How can people prevent overweightness and obesity?

- A. Reduce energy intake (less high-energy foods and drinks)/reduce the intake of fatty and sugary foods
- B. Eat vegetables and fruits more often
- C. Eat legumes/whole-grain products more often
- D. Increase physical activity level/engage in regular physical activity
- E. Other_____
- F. Don't know

5. ATTITUDE ASSESSMENT

I. How important do you think it is to limit carbohydrate intake to between 55–60% of total energy intake?

- A. Not important
- B. You're not sure
- C. important

If not important:

Can you tell me the reason why it is not important?

II. How serious do you think it is to be overweight or obese?

- A. Not really serious
- B. Moderately serious
- C. Serious

If not really serious:

Can you tell me the reason why it is not really serious?

III. What state do you think your body proportions and composition are in?

- A. Not good
- B. You're not sure
- C. Good

If not good:

Can you tell me the reasons why they are not good?

IV. In the context of bodybuilding how good do you think it is to limit protein intake to between 1.5 – 2.0g.kg⁻¹day⁻¹?

- A. Not good
- B. You're not sure
- C. Good

If not good:

Can you tell me the reasons why it is not good?

V. How difficult is it for you to limit your protein intake to between 1.5 – 2.0g.kg⁻¹day⁻¹?

- A. Not difficult
- B. Relatively difficult
- C. Difficult

If difficult:

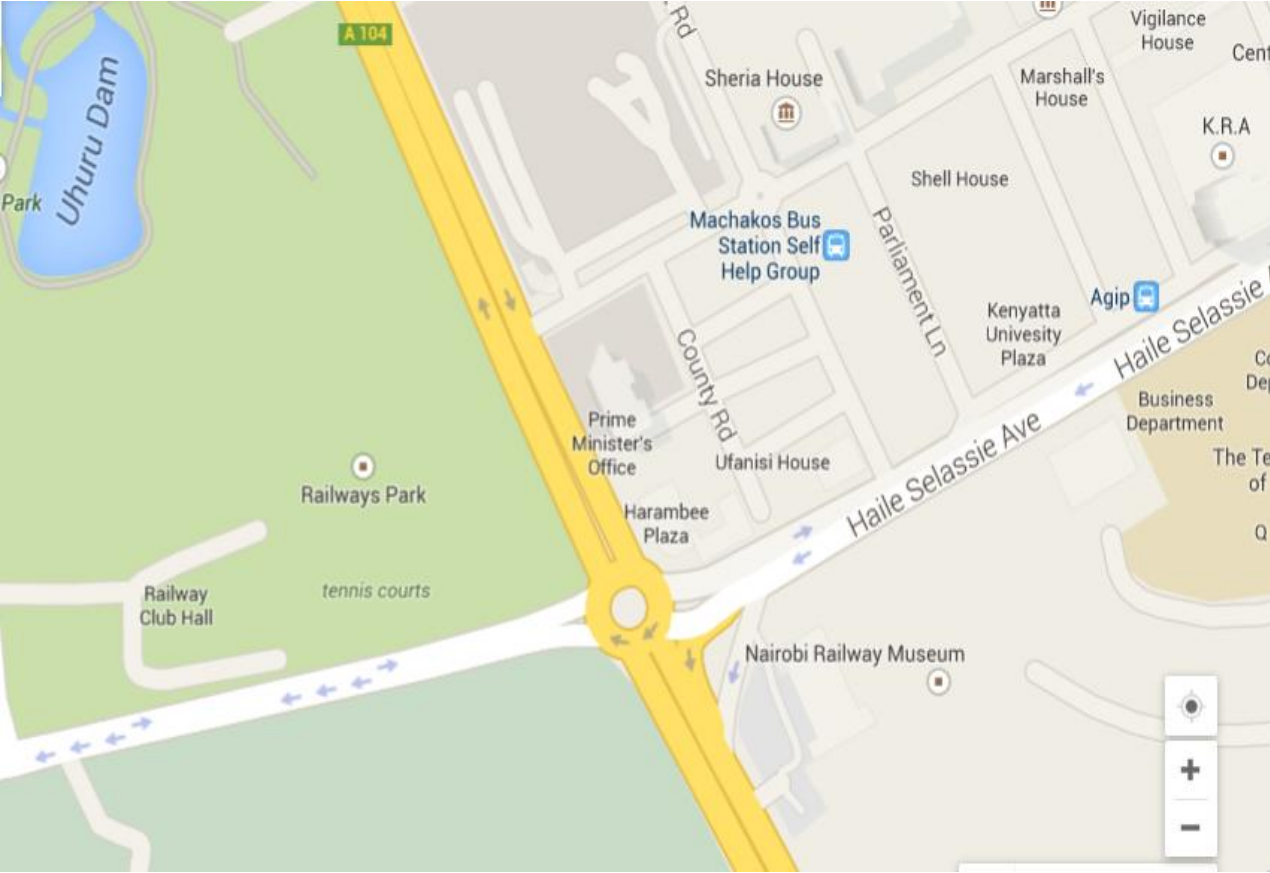
Can you tell me the reason why it is difficult?

6. FOOD FREQUENCY QUESTIONNAIRE

Please check the frequency with which you consume the following items

Food	1-2 times a week	3- 4 times a week	5 -6 times a week	Weekly	Fortnight	Monthly	Never/rarely
Milk and milk products							
Red meat							
Meat products (sausages, ham)							
Poultry							
Fish							
Eggs							
Legumes (Beans, peas)							
Nuts, peanut butter							
Cereals							
Fruits & vegetables							
Spreads (margarine, butter)							
Soft drinks (sodas & juices)							
Sports drinks							
Energy bars/shakes							
Protein shakes							
Alcoholic beverages							
Deep fried foods							
Water							

Appendix 3: Map of Railway Club



Appendix 4: Distribution of the respondents by knowledge and attitude scores and their dietary practice

Dietary Practice	Knowledge Score			Attitude Score			
	Moderate	Good	N	Negative	Moderately positive	Positive	N
Milk and milk products	14	146	160	90	35	35	160
Red meat	14	142	156	88	33	35	156
Meat Products	12	127	139	80	28	31	139
Poultry	15	131	146	80	31	35	146
Fish	12	125	137	77	26	34	137
Eggs	14	142	156	90	32	34	156
Legumes	14	139	143	78	31	34	143
Nuts, peanut butter	13	130	143	79	30	34	143
Cereals	13	135	148	81	32	35	148
Fruits and vegetables	14	146	160	91	34	35	160
Spreads	11	116	127	75	24	28	127
Soft drinks	13	121	134	74	29	31	134
Sports drinks	6	68	74	36	19	19	74
Energy bars/shakes	5	49	54	28	12	14	54
Protein shakes	8	52	60	37	9	14	60
Alcoholic beverages	6	69	76	41	16	18	76
Deep fried foods	13	117	130	74	28	28	130
Water	13	148	161	90	35	36	161

Appendix 5: Distribution of the respondents by nutrition status and their dietary practice

Dietary Practice	BMI				Body fat percentage					WHtR			
	Normal	Overweight	Obese	N	Underfat	Healthy Range	Overweight	Obese	N	Underweight	Healthy	Overweight	N
Milk and milk products	67	69	24	160	30	97	25	8	160	9	116	35	160
Red meat	66	66	24	156	29	95	24	8	156	9	112	35	156
Meat Products	58	60	21	139	23	87	21	8	139	8	99	32	139
Poultry	60	64	20	146	26	89	22	7	146	9	104	31	146
Fish	54	60	20	137	22	86	22	27	137	8	98	31	137
Eggs	66	66	24	156	30	94	24	8	156	10	113	33	156
Legumes	64	66	23	143	30	91	24	8	143	9	110	34	143
Nuts, peanut butter	58	60	22	143	27	88	21	7	143	9	102	32	143
Cereals	61	66	21	148	26	91	24	7	148	8	108	32	148
Fruits and vegetables	69	68	23	160	30	98	24	8	160	10	116	34	160
Spreads	52	56	19	127	24	77	20	6	127	7	107	27	127
Soft drinks	56	57	21	134	26	85	16	7	134	8	95	31	134
Sports drinks	28	34	12	74	12	52	9	1	74	5	49	20	74
Energy bars/shakes	17	30	17	54	9	35	9	1	54	4	33	17	54
Protein shakes	23	32	5	60	13	37	8	2	60	4	42	14	60
Alcoholic beverages	33	33	9	76	15	44	10	6	76	4	55	16	76
Deep fried foods	54	57	19	130	20	83	19	8	130	6	94	30	130
Water	69	68	24	161	30	98	25	8	161	10	116	35	161

Appendix 6: Data Analysis Matrix

Specific objective (SO)	Question to respond to with analysis	Variables/ Indicators	Descriptive Statistic	Inferential Statistics (Parametric)
SO1 To establish the Body Mass Index (BMI), WHtR and body fat percentage of the study participants.	How many bodybuilders are overweight and have high body fat percentage?	BMI, Body fat percentage, WHtR	Means Median	Chi Square
SO2: To establish the dietary practices of the study participants	What do the amateur bodybuilders eat and in what frequency?	Quantities of food consumed	Means Median	Chi Square
SO3: To determine the study participants dietary knowledge and dietary attitudes within the context of dietary practices .	What is the relationship between dietary knowledge and dietary attitudes of the bodybuilders and their dietary practices.	Dietary Knowledge, dietary attitudes, dietary practices	Means Median	Fisher's Exact Test chi square
SO4 To determine the influence of dietary practices on nutrition status of the study participants.	Does dietary intake affect nutrition status of the bodybuilders	BMI, quantities of food consumed	Means Median	Fisher's Exact Test chi square

Appendix 7: Research Permit



**NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION**

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Website: www.nacosti.go.ke
When replying please quote

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Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref No.

Date:

24th November, 2014

NACOSTI/P/14/8931/1868

Jeff Wamiti Muthui
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Dietary knowledge, attitude and practices of the amateur male bodybuilders in association with overnutrition: A case study of Railway Gymnasium, Nairobi,"* I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for a period ending **15th December, 2014.**

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

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


DR. S. K. LANGAT, OGW
FOR: SECRETARY/CEO

Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

Appendix 7: Ethical Clearance



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

Ref: KNH-ERC/A/317

Link: www.uonbi.ac.ke/activities/KNHJoN



KNH/UoN-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke



KENYATTA NATIONAL HOSPITAL
P O BOX 28723 Code 00202
Tel: 726308-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

17th September 2014

Muthi Jeff Wamiti
Dept. of Food Science, Nutrition and Technology
College of Agriculture and Veterinary Science
University of Nairobi

Dear Jeff

Research proposal - Influence of dietary practices on nutrition status among amateur male bodybuilders attending railway Gymnasium in Nairobi (P393/06/2014)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 17th September 2014 to 16th September 2015.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- g) Submission of an executive summary report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHJoN.

Protect to Discover

Yours sincerely



PROF.M.L. CHINDIA
SECRETARY, KNH/UON-ERC

- c.c. The Principal, College of Health Sciences, UoN
The Deputy Director CS, KNH
The Chair, KNH/UoN-ERC
The Assistant Director, Health Information, KNH
Supervisor: Prof. E.G. Karuri, Dept. of Food Science and Technology, UoN