ASSOCIATION OF NUTRITION KNOWLEDGE AND ATTITUDE WITH DIETARY PRACTICES AND NUTRITIONAL STATUS OF FEMALE UNDERGRADUATE STUDENTS ATTENDING UNIVERSITY COLLEGES WITHIN NAIROBI METROPOLIS

BY

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DEPARMENT OF FOOD SCIENCE, NUTRITION AND TECHNOLOGY

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DECLARATION

I **Lucy Wanja Kinyua** hereby declare that this dissertation is my original work and has not been submitted or presented for a degree in any other university.

_____   _____

Lucy Wanja Kinyua   Date

Bsc. (Foods Nutrition and Dietetics)

This dissertation has been submitted for examination with our approval as university supervisors.

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Declaration Form for Students

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This form must be completed and signed for all works submitted to the University for examination

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Title of the work   Association of Nutrition Knowledge and Attitude with Dietary practices and Nutrition Status of female undergraduate students attending University Colleges within Nairobi Metropolis

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DEDICATION

This dissertation is dedicated to my dear parents the Late John Kinyua in memory of his great inspiration and impartation of life values to my life and my mama Rudiah Marigu for her prayers and unwavering support in my life too. Proverb 31:28 "Her children arise and call her blessed".

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
CBD	Central Business District
FAO	Food and Agriculture Organization
FNB	Food and Nutrition Board
GoK	Government of Kenya
HSS	Humanities and Social Science
MOMS	Ministry Of Medical Services
IUNS	International Union of Nutritional Science
KDHS	Kenya Demographic and Health Survey
KeMU	Kenya Methodist University
KPUC	Kenya Polytechnic University College
NAS	National Academy of Sciences
SPSS	Statistical Package for Social Science
UON	University of Nairobi
WHO	World Health organization
X^2	Chi Square

OPERATIONAL DEFINITIONS

Attitude: A person's feeling toward aspects of nutritional object or events.

Dietary practices: Food choices, food consumption in terms of frequency and patterns of individuals.

Lifestyle: Way of life or standard of living commonly chosen as a means of survival or entertainment, or dictated by the environment, economy or religion.

Malnutrition: Malnutrition is any physical condition resulting either from an inappropriate or inadequate diet, such as a diet that either provides too much or too little of necessary nutrients or from a physical inability to absorb or metabolize nutrients.

Nutrition Knowledge: Refers to demonstrated ability to reproduce from memory facts and principles of nutrition related to general health of an individual.

Obesity: An excessive amount of fat in the body. It describes individuals with a BMI equal to or more than 30 kg/m^2.

Over weight: Body weight above acceptable standard defined in relation to height. It is defined by a BMI equal to or more than 25 to 29.9 kg/m^2.

Under nutrition: Where an individual has deficiency in the recommended nutrients and has BMI of less than 18.5 kg/m^2.

ABSTRACT

Good nutrition is important in promoting health and is dependent on quality of food eaten. Food choices are determined by many factors among the most important being nutrition knowledge and attitude towards nutrition. University female undergraduate students are at an important stage of their reproductive age and therefore good nutrition is desired for them especially to ensure healthy birth outcome. This study was therefore designed to assess nutritional knowledge and attitude, their associations on dietary practices and nutrition status of the female students in university colleges within the Nairobi Metropolis. A semi-structured and previously pretested questionnaire was used to interview 384 female undergraduate students from three university colleges. The information collected included socio-demographic characteristic, nutrition knowledge, nutrition attitude, dietary practices and nutrition status. The data was analyzed using SPSS software package with the P value for statistical significance being set at <0.05. Pearson's Chi Square was used to test significance and associations between categorical variables. One way Anova was used between categorical and continous variables while Mann Whitney U test and Bivariate correlation was used between continuous variables.

The results showed that female undergraduate students had average level of nutritional knowledge (54.1%) and exhibited positive attitude towards nutrition with average score of 47.1 out of a possible highest score of 60. The level of knowledge was significantly higher in Science students than Social Science students (p=0.000) and majority of the students (57.9%) identified school as the main source of nutrition information. On a 100 score scale the students mean on level of knowledge in macronutrients (56.3%) is higher than in micro nutrients knowledge (45.7%). The level of knowledge in both macro- nutrients (p= 0.004) and micro-nutrients (p= 0.001) is significantly higher in Science students than HSS students .

Most of the students (71.6%) exhibited normal nutritional status but prevalence of overweight and obesity was significantly higher in Social Science students compared to Science students (p=0.002).

Generally, students exhibited non optimal dietary practices. The average number of meals consumed in a day was three which is far below the recommended 5-6 meals inclusive of snacks. Fast food eateries (34.2%) and high sugar and highly refined cereal snacking products (41%) were most preferred by the students. The daily consumption of fruits (48.2%) and vegetables (44.1%) was low.

Further findings showed that there was no significant association between students nutrition knowledge and nutrition status (r= -0.032, p= 0.549) as well as between attitude of students and nutrition status (r=0.03, p=0.566). The study concluded that the students possessed average nutrition knowledge, positive attitude towards nutrition and normal nutritional status but had non-optimal dietary practices.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Development in nutrition science has continued to show a linkage between health and nutrition since the 20th century discovery on consequences of malnutrition (Gabra, 2001). Good nutrition is essential for growth, development and maintenance of health throughout life. Beyond negative impact malnutrition has on socio economic development, lack of sufficient foods and quality food undermines quality of health and the wellness of the population of all ages (Swaminathan, 1986). The nutrition status of a woman plays a key role in her health and is likely to affect negatively birth outcome of her children. Malnutrition in women can lead to low productivity and increase future risks of poor maternal health which consequently increases the nation's health burden (KNBS and ICF Macro, 2010).

Urbanization in developing countries has brought challenges in food systems and markets. To cope with feeding the growing urban population, food markets have attracted provision of a wide range of convenient foods and this has affected individual's food choices and eating habits (FAO, 2010). A shift towards consumption of fast and convenient foods characterized by high sugars and fat has been on the rise. Consumption of these foods coupled with sedentary lifestyles has been implicated in overweight, obesity and non-communicable diseases such as diabetes, cancers and cardiovascular diseases. These conditions have previously been associated with the developed world but currently developing and less affluent nations have recorded increasing cases as well (FAO/WHO, 2003).

1.2 PROBLEM STATEMENT

Studies in epidemiology show that changes in dietary practices over the recent past years have increased incidences of overweight, obesity, cancers, diabetes and cardiovascular related ailments (FAO/ WHO, 2003). Global nutrition transition has shifted dietary habits particularly in urban settings. Market systems have been infiltrated modernized convenient food culture leading to consumption of imported and processed foods some are highly refined, high in sugar, fats and salts. High consumption of these foods coupled with less physical activity greatly contribute to rising lifestyle chronic diseases even among young adults (Den Hartog *et al* 2006).

Poor dietary habits among the college students in Kenya have been reported as a lifestyle challenge they face while in college. A study at Kenyatta University indicated 96.33% of first year students exhibiting sub-optimal feeding habits. Unchecked poor dietary practices are likely to predispose them to overweight and obesity, risk factors associated with chronic lifestyle diseases (Wangeri *et al*, 2012). University nutrition education programmes have also based their priority on students pursuing nutrition or health related courses thereby closing out students from other courses, yet studies have shown students are not knowledgeable on their nutrient and diet requirements (O'Deal and Abraham, 2001) but those with better knowledge have shown to possess normal nutrition status and positive attitude toward nutrition (Gates and De Lucia 1998).

1.3 JUSTIFICATION

Female undergraduate students aged 19 to 25 years are among the immediate future mothers and caregivers to children in our nation. They have special nutrition needs due to their

eminent reproductive and productive roles in the society Poor dietary practices may lead to negative impact on their nutritional status predisposing them to future poor maternal health. Study findings indicate that female university students eat with consciousness of their weight, appearance and beauty and this is likely to influence their food choices (Stice *et al*, 2002). Promotion of nutrition knowledge therefore play a key role in enhancing positive attitudes with focus to influence healthy dietary habits and consequently improved nutritional and health status. Burden of lifestyle diseases among young adults caused by risk factors such as overweight, obesity and physical inactivity can be reduced by raising knowledge levels on accurate nutrition information that focus on dietary behavior change (Worsely, 2002).

Universities and tertiary institutions present an opportunity as key avenues for promotion of nutrition and health to a large number of students. However, Nutrition education in tertiary institutions of learning has been limited to nutrition and health courses. The current upsurge of nutrition and health information from sources such as advertising mass media and peer interaction has greatly influenced public food choices sometimes negatively because some of this information is inaccurate not scientifically authenticated. This contributes to the increased confusion and poor dietary practices which can endanger health and wellness. Young people particularly when image conscious, they eat food with consciousness of well-being, desirable figure and good appearance. This perception is contributed by food conscious society that set unrealistic ideals about body weight and favors slim bodies. In the context of unreliable nutrition information they are likely to develop unhealthy dietary habits such as skipping meals, intake of high energy but low nutrient dense foods and alcohol which are known to impact negatively on health (Williams, 1986; Whitney and Rolfes, 1999). University colleges selected contain a large female population with exposure to the same

urban environment influences therefore they are representative of colleges within Nairobi Metropolis.

1.4 OBJECTIVES

1.4.1 Main Objective

The main objective of the study was to assess the nutrition knowledge, nutrition attitude and their association with dietary practices and nutritional status of the female undergraduate students between the ages of 19-25 years attending universities and colleges within Nairobi metropolis.

1.4.2 Specific Objectives

1. To determine social demographic characteristic of the students.
2. To determine the nutrition knowledge of the students.
3. To determine the nutrition attitude of the students.
4. To determine the nutrition status of the students.
5. To assess the dietary practices of the students.

1.5 RESEARCH HYPOTHESIS

1. Nutrition knowledge of students is not associated with dietary practices and nutrition status.
2. Attitude of the students is not associated with dietary practices and nutrition status.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter contains a critical review of information on nutritional knowledge, attitude, dietary practices and nutritional status and how they associate with one another.

2.2 NUTRITIONAL KNOWLEDGE AND FOOD CHOICES

Nutrition knowledge has been shown to play an important role in influencing healthy food habits which ensure nutrient needs throughout lifecycle are met adequately since individual needs are determined by rate of growth. When an individual is aware on how to meet these nutritional needs this facilitates food choices that enhance health and wellness by preventing excess or less of intake of nutrients that could be associated with ill health (Worsely, 2002). To secure society health, nutrition security is an important factor to consider and means more than having adequate access to quality food and in adequate amounts but also encompasses the need for people to understand how to utilize a healthy diet for greater benefits to their health. Therefore nutrition education in community focus on food behavior patterns by increasing knowledge on food value so as to improve dietary practices and consequently to enhance nutrition status of an individual (FAO, 2010).

Nutrition education in communities is achieved through continuous extensive awareness efforts so as to promote changes such as dietary diversification. This becomes important since societies are experiencing shifts in dietary habits due to nutrition transition. Informal sources such as community traditional structures are facing challenge from social marketing which continue to be used widely. Other sources currently being used are print and electronic media,

peer as well as formal set ups through school curricula. The current upsurge of nutrition information has made society more food conscious (Vijayaraghavan, 2004).

In the recent past trends toward healthier diets have increased as the society becomes more food conscious. Dietary practices have also continued to change due the widening food choices. Food market systems continue to be infiltrated by both healthy and unhealthy food products. Consumers are facing dilemma in food choices in spite of current upsurge of nutrition information however in absence of correct knowledge consumer confusion and anxiety is likely to affect their food choices. To facilitate consumers to make healthy choices, empowerment with right nutrition information will help to promote society health (Contento, 2007).

Food choices continue to be influenced by wide range of factors such as advertising through social marketing, economic status and environmental concerns. The need to enhance consumer knowledge is being reflected in the changing lifestyle particularly in urban areas as more people continue to increasingly eat away from home. There is increased demand for food and markets on the other hand have responded to demand for foods by providing fast and convenient foods. This has also increased processed and imported foods which have continued to replace fresh and culturally accepted foods. Therefore food markets and choices are becoming complex and overcrowded. Therefore much attention should be given in enhancing right information and clear labeling of products to address concerns by consumers on intake of adequate nutrients and healthy choices (Contento, 2007).

2.3 NUTRITION ATTITUDE

Attitude has been described as a psychological determinant in food choice and consumption among other determinants such as physiological and nutritional needs. Attitude causes experience of emotions or may involve intellectual activities such as reasoning and purposive behavior. Some of the known attitudes associated with food are seen when food choices are triggered by external factors like sight rather than internal cues like hunger, dietary restraint or health and avoidance of novel foods. Unhealthy foods that are attractively packaged are likely to attract more purchase and health factors may not be a consideration in their choices rather the aesthetic value (Cox and Anderson, 2004).

Attitude towards food greatly influence nutrition efforts and dietary choices that people make and can be related to observed dietary patterns particularly when based on factors such as aesthetic values of food or scientific benefits of food to an individual. These factors aim to influence intention of an individual towards consumption of certain foods. Firm attitude towards healthy dietary practices acquired through nutrition knowledge are likely to exhibit positive healthy behavior over long term. Healthy outcome will result when positive attitudes strongly influence beliefs about consequences of actions taken in food choices. Therefore, positive attitude shaped by the benefits such as health may produce better practices. Some of the practices like eating healthy regular meals and keeping weight under control have been identified to have positive effect on ones age. Positive attitude toward healthy food choices have been shown to be influenced by nature of environment. School set ups provide such a conducive environment to promote positive attitude and lifestyle choices in enhancing society health for students are viewed as change agents (Contento, 2007 and FNB, 2007).

2.4 DIETARY PRACTICES

One of the factors that contribute to a healthy lifestyle is good dietary practices. When frequently consumed foods consist mainly of cereals and legumes and less of animal products, vegetables and fruits nutrient imbalance can cause micro nutrient deficiencies. Poor diet combinations synergized by risk factors such as inactivity can easily result to poor health. Current shifts in diets have been observed where more energy carbonated soft drinks together with refined grain products containing high fat and sugar are being increasingly consumed with less consumption of whole grain products and fresh fruits and vegetables (Schiff, 2009). Future mothers need to watch their dietary patterns not only during pregnancy but also at least three months before conception. Studies with non pregnant women of child bearing age have revealed the specific vitamins and minerals whose adequate intake is essential to a healthy pregnancy (Gail, 2008). Period before conception becomes crucial for promoting healthy nutrition practices to help build adequate maternal stores. Good nutrition practices have been found to positively affect a woman's nutritional status, menstruation, ovulation and the likelihood of conception as well as outcome of pregnancy (NAS, 1975). Nutrition habits and lifestyle choices may influence their ability to conceive and may be limited by malnutrition and food deprivation practices by women seeking sliming diets. For example, young women who diet excessively or in severe case of under-nutrition may develop amenorrhea (Whitney and Rolfes, 1999).

2.4.1 Urbanization and Dietary Habits

In urban centres of developing countries people are consuming less fresh foods and eating more of processed and convenient foods. More foods are also eaten away from home and at irregular times. There is usually tendency to consume foods and snacks high in fats and sugar due to their palatability and convenience. This pattern of food consumption over a long

period has potential for negative health outcome of an individual. Kenya Food Pyramid guidelines adapted from United States Department of Agriculture on healthy food consumption indicate less consumption of such foods and more consumption of foods that are rich in complex carbohydrates and less fat (Contento, 2007 and MOMS, 2010).

Food habits in most societies are also dependent on the specific culture of communities which determine preparation methods and restrictions to certain foods particularly animal foods on gender and this can contribute to adequacy on dietary intake and society health at large (Cox and Anderson, 2004). The nutrition transition in urban has eroded traditional food practices and replaced them with modernized food habits in our society. In urban areas traditional foods are in short supply and expensive due to poor market systems. As a result urban people are more receptive to foods that are easy and quick to prepare since there is not always enough time to accommodate lengthy food preparation (Den Hartog *et al, 2006*). Food habits in adults are also influenced by various factors such as attitude, cost, food availability and accessibility. This is illustrated by the Shepherd's conceptual model shown in the Figure 1
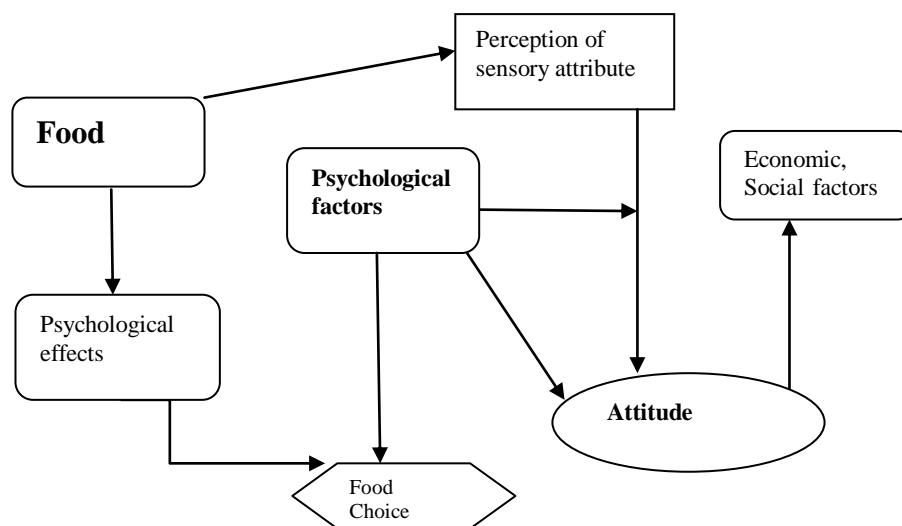
Source: Cox and Anderson 2004

Figure 1: Shepherds conceptual model of factors associated with food choice

Other factors likely to influence food habits are socio-demographic variables such as age, gender and social class. Young people are likely to be vulnerable to consumption of low nutrient dense foods as opposed to high nutrient dense foods in comparison to older adults. Such habits over a long time predispose them to risk factors of lifestyle disease. Table 1 shows proportions of consumers' preference for low and high nutrient and how it differs by age groups.

Table 1: Food preference by age group.

Age(years)	16-24	25-34	35-44
Eat crisps once/day	39	27	18
Eat root Vegetables 5 or more time/week	16	20	23
Eats sweet or chocolate once/day	39	33	24
Drinks soft drinks once/day	46	32	19

Source: Scottish Health Survey, 1995

2.5 DIETARY ASSESSMENT METHODS

An individual dietary assessment is done using a variety of methods. The methods used are twenty four hour recall method, use of food frequency questionnaire, use of dietary history method and food record methods. The twenty four hour recall method provides a written list of food intake over previous 24 hour. Details of dish, ingredients and the actual food portion size consumed are recorded. Information can be collected over several days however the subject burden of recalling is greater than a one day recall. A disadvantage of this method is the possibility of the respondent forgetting information and difficulty of food portion size

description. However photographs and food models are used by the interviewer (Bingham, 2007).

The method using food frequency questionnaire records how often an individual eats specific foods. This method provides food items consumed over a specific time. It consists of simple and defined food categories and foods. It is easy to administer and obtain results and gives fewer burdens to the subject being interviewed. The information collected highlights food groups therefore nutrients eaten in excess or deficient can be picked out for example those in never category indicates nutrient deficiency (Gibson, 2005).

The other commonly used method is dietary history method which provides more detailed information on usual eating pattern. A detailed description of foods, portion sizes and frequency of consumption is obtained using household measures such as common utensils. A disadvantage of this method is that it requires face to face interview and consumes more time and may be costly to carry out in resource constraint set ups (Gibson, 2005).

There are two food record methods used; estimated food records or weighed food records. Estimated food records require the subject to record all the foods, beverages or snacks during meal intake. Mixed dishes raw ingredients are recorded as well as the final weight of the dish and the weight of the consumed food. Portion size of the foods is estimated using household measures and requires conversion of volume to weights. Weighed food records require all foods eaten by the respondents to be weighed while a duplicate portion of foods eaten away be obtained and weighed. One of its disadvantages is that it requires literate and motivated subjects. Both of these methods have a high respondent burden therefore under reporting is common. Among the two methods Weighed food records is considered the most accurate

method of the two for the actual food portion is weighed but a risk of the subject change in their usual intake to make the process easy may arise (Gibson, 2005).

2.6 NUTRITION STATUS

Nutrition status of an individual is a result of interrelated factors influenced by quality and quantity of food consumed and the physical health. A young female adult nutritional status has important implications for her health and that of her children and plays a key role in breaking effects of malnutrition cycle. Anthropometric indices indicate cumulative effect of quality and quantity of food as well as other health factors. Low or high body mass index or short stature in an individual can point to nutrition status. Therefore nutritional status is powerful indicator of nutrition security of women as it relates to   pregnancy outcomes and productivity (KNBS and ICF Macro, 2008).

2.6.1 Importance of Weight Prior to conception

The weight of a woman prior to conception influences fetal growth. Even with some weight gain during pregnancy, underweight women tend to have smaller babies than heavier women. The underweight woman has even higher risk of having a low birth weight infant if she is unable to gain sufficient weight during pregnancy. The rate of preterm births and infant deaths has been reported to be higher for underweight women. There is therefore need to emphasize on achievement of appropriate weight and optimal nutrient stores prior to pregnancy to take care of the needs for the very early stages of the pregnancy (Goldenberg and Tamura, 1996).

Being overweight before conception has also been recognized as a risk factor to complications during pregnancy and childbirth. Women are overweight have an increased

high risk of medical complications such as hypertension in pregnancy, gestational diabetes and post-partum infections (Goldenberg and Tamura, 1996).   According to Kenya demographic and Health Survey 2008, the prevalence of overweight or obese among the educated women who are above secondary education was 34.1%. Some of the factors that have been associated with overweight or obesity are increase in age, education level and wealth (KNBS and ICF Macro, 2008).

2.6.2 Assessment of Nutritional Status

Assessment of the nutrition status evaluates an individual's health and helps to identify individuals at risk and those malnourished. The main methods used for assessing nutritional status include dietary, clinical, biochemical and anthropometric assessments. This study used anthropometric assessment and it is therefore covered largely.

2.6.2.1 Biochemical assessment

This assessment method involves laboratory tests of body fluids and substances containing nutrients, enzymes and metabolites to help reflect what is going on in the inside of the body and the nutrition status of an individual. This method is more useful when coupled with other methods. Biochemical analysis reveals more on proteins and micronutrient status (Trustwell, 2007)

2.6.2.2 Clinical assessment

This method involves physical examination of the body tissues and organs to help search for abnormal changes that reflect nutrient deficiency or toxicity. This method requires knowledge and skill because many signs and symptoms are non-specific however it is useful for confirming other assessments (Whitney and Rolfes, 1999).

2.6.2.3 Dietary assessment

Dietary assessment method involves taking a diet history to provide a record of foods eaten and eating behavior. Assessment is done using various tools such as food frequency checklist, 24hour recall, food record and usual intake record. Measuring devices, food models or photos are used to help an individual identify food type and amount consumed (Bingham, 2007).

2.6.2.4 Anthropometric assessment

Anthropometric assessment is a commonly used method that uses body weight, height and proportions to indicate under nutrition and over nutrition. Quetelet index or BMI is an international standard that is used for adults and uses weight and height to classify nutrition assessment (WHO, 2000). BMI is calculated as weight in kilogram per metre squared height of a person. It is classified as:

Table 2: BMI WHO classification table

BMI (Kg/M^2)	Classification
<18.5	Underweight
18.5-24.99	Normal
25- 29.99	Overweight
30- 34.99	Obesity class 1
35-39.99	Obesity class 11
>40	Obesity class 111

Other anthropometric methods commonly used are waist-hip ratio, waist circumference and skin fold thickness. Waist-to hip ratio (WHR) has been used in adults to determine central adiposity. The ratio distinguishes fat in the lower trunk (hip and buttocks) and upper area (abdomen and waist). It is obtained by dividing waist by hip circumference. High risk WHR

greater than 0.80 for females and 0.95 for males indicates central (upper body) obesity and is considered high risk   while WHR below these cut-off levels is considered low risk to chronic diseases such as diabetes and cardio metabolic diseases (Gibson, 2005).

Skin-fold thickness estimates the size of subcutaneous fat deposits and indicates total body fat. However skin fold measurements vary with sex, race and age as well. Measurements are taken at the abdomen, triceps and sub- scapular sites using special calipers. Body fat equal to or greater than 32% in women less than 40 years and 25% in men less than 50 indicates obesity (Gibson, 2005).

2.6.3 Nutrition Status of Women in Kenya

According to Kenya National Bureau of Statistics 2010, the mean BMI for females aged 20-29 years nationally was 22.6 with the prevalence of underweight and obesity being 10.5%, and 4.7% while that of overweight and/or obese was 22.5%. Among those educated to secondary school level and above, the prevalence of underweight and overweight and/or obesity was 7.5% and 34.1% respectively. In Nairobi the prevalence of underweight and obesity among women was 3.2% and 11.2 % respectively.

CHAPTER THREE: STUDY SETTING AND RESEARCH METHODOLOGY

3.1 STUDY SETTING

The study was carried out in three university colleges located in Nairobi Metropolis at the heart of the capital city of Kenya and the largest urban center. The institutions included University of Nairobi College of Humanities and Social Science and College of Health Sciences, Kenya Polytechnic University College and Kenya Methodist University Nairobi Campus.

3.1.1 University of Nairobi Colleges

University of Nairobi (UON) began in 1956 and has six colleges located within Nairobi and its environs headed by principals. They are; College of Health Sciences, College of Architecture and Engineering, College of Agriculture and Veterinary Sciences, College of Biological and physical Sciences, College of Education and External studies and College of Humanities and Social Sciences. The respondents were drawn from the Colleges of Health Sciences and College of Humanities and Social Sciences located at Chiromo and Main campus respectively. The college of Health Sciences offer courses in Biochemistry, Medicine and Surgery, Medical laboratory and Technology, Pharmacy, Dental Surgery and Nursing. The College of Humanities and Social sciences offer courses in Arts, Commerce, Laws, Anthropology, Journalism and Media studies, Economics and Statistics. The total female population for UON was 12,068, for College of Humanities and Social Science was 6842 and college of Health Sciences was 1433 for module II and II at the time of study.

3.1.2 Kenya Methodist University

KeMU is a chartered Christian University. Nairobi campus is one of the four KeMU campuses and the main campus is located at Meru County. Nairobi campus is situated on Koinange Street within Central Business District. The university has two schools and two faculties namely; School of Health Science, school of Business and management studies, Faculty of Science and Technology and Faculty of Education and Social sciences. Nairobi campus offers limited programmes compared to those offered at the main campus. The undergraduate courses offered at Nairobi campus are Business Information, Microfinance, Business administration, Computer Information Systems, Journalism and Counselling. Kenya Methodist University had over 9000 students and a population of 2683 female undergraduate students in Nairobi campus by the time of study.

3.1.3 Kenya Polytechnic University College

The University College began in 2007 as a constituent of UON and was upgraded to provide degree courses in their area of specialization. There are three faculties namely; Applied Science and Technology, Engineering and Built Environmental and Liberal and Professional Studies. The courses are offered from the nine Schools established. At the time of study the total of female undergraduate students was 543.

3.2 STUDY DESIGN

A cross-sectional study was carried out with both descriptive and analytical components at UON, KeMU and KPUC from the month of July to August 2012.

3.3 STUDY POPULATION

The study population comprised of female undergraduate students in all university colleges in Nairobi. The sampling frame comprised of female undergraduate students aged 19 to 25 years at UON, KeMU and KPUC in Nairobi metropolis.

3.4 SAMPLING

3.4.1 Sample Size Determination

Sample size was determined using Fischer formula (Fischer *et al*, 1991) as the population from which the sample size was drawn was more than 10,000.The strength of this formula is that acceptable degree of accuracy is set.

$$n = z^2pq/d^2$$ Where:

n = the desired sample size

z = the standard normal deviate at the required confidence level (**95%**) = **1.96**

p = the proportion in the target population estimated to have characteristics being measured. KDHS, 2008 national prevalence of overweight or obesity among the educated population from secondary education and above = **34**%

q =Proportion not expected to be suffering from overweight and obesity 1-p = (1-0.34 = **0.66**)

d = the degree of accuracy set **0.05**

Sample Size;

Therefore n $= \dfrac{(1.96^2)(0.34)(0.66)}{(0.05)^2}$

$= $ **345**

Considering Non response rate of 10%

Total desired sample size = the obtained sample size/ (1- Non response rate)

n = 345 / (1-0.1) = 383

3.4.1 Inclusion Criteria

The female undergraduate students aged 19 to 25 years old attending the three universities who agreed to participate in the study and signed the consent form (Annexure 1).

3.4.2 Exclusion Criteria

The female undergraduate students excluded from the study were those outside the age range and those aged 19 to 25 years who are pregnant or with known chronic diseases.

3.5 SAMPLING PROCEDURE

Nairobi metropolis was purposively selected because of its diversity and contained majority of the university colleges. The universities purposively selected for the study included University of Nairobi, Kenya Methodist University and Kenya Polytechnic University College. They had the characteristics desired and they offered more than three science fields together with humanities and social sciences. The total number of universities within the city was eleven. Probability Proportion to size sampling was used to determine the sample size for each University college. Courses were purposively selected and sample size for each university was equally shared between Science, Humanities and Social sciences. Random sampling was used to select the respondents present during classes. This was done using pieces of paper written numbers of the total respondents required and others written 'Zero' depending on the female students present in a particular course. University of Nairobi shared equally the total sample size for the subsidiary campus selected. Fig 3.1 summarizes the sampling procedure;
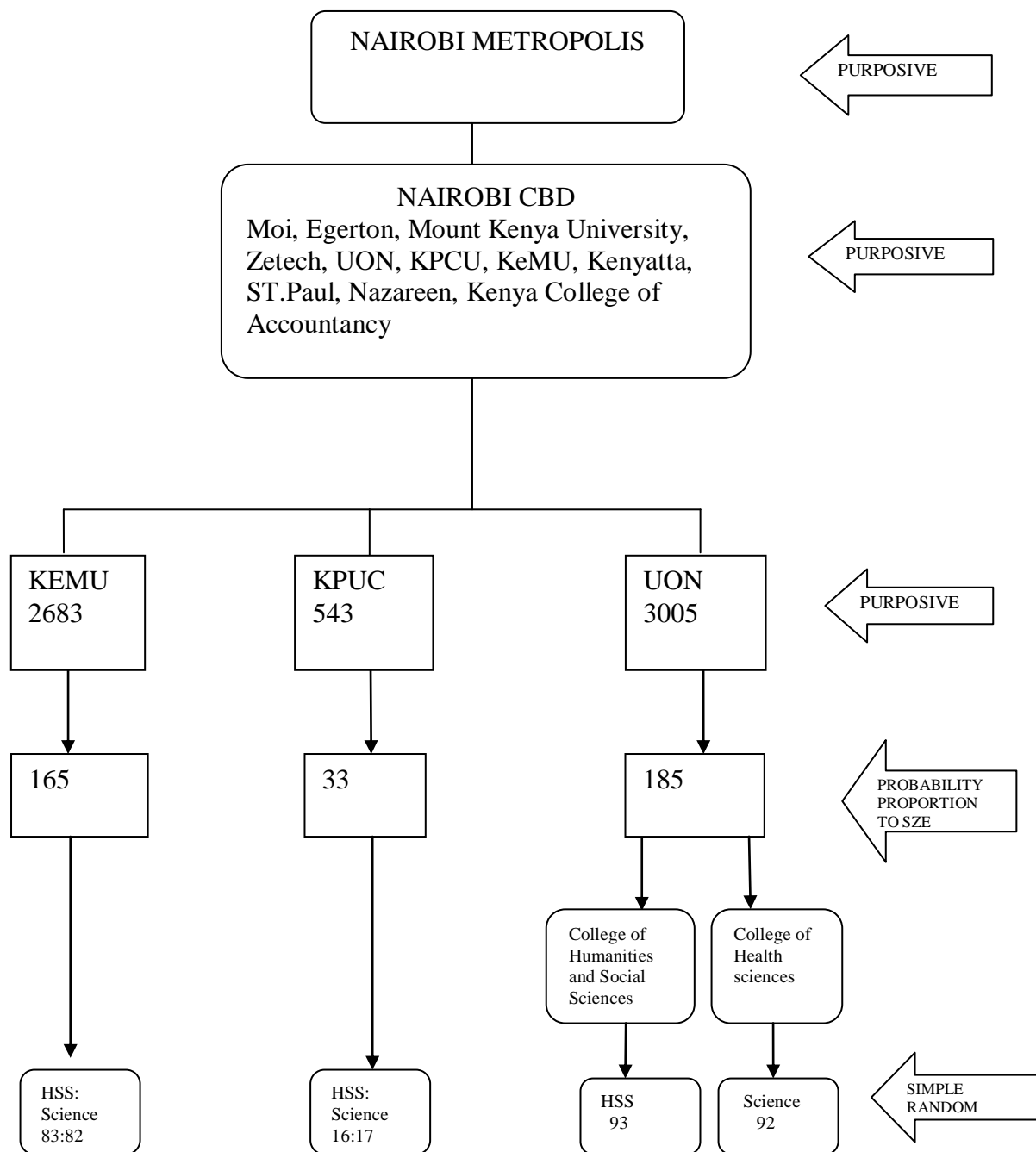
Figure 2: Sampling procedure schema

3.6 DATA COLLECTION METHODS

3.6.1 Data Collection Tools and Materials

The study applied quantitative research tool using a semi structured previously pretested questionnaire and nutrition knowledge and attitude marking guide. The questionnaire

administered gathered information on socio demographic characteristic, nutritional knowledge, nutritional attitude, dietary practices and nutrition assessment (Annexure 2). For anthropometric measurement bathroom scales and standiometer were used to take weight and height respectively of the respondents.

3.6.2 Study Variables

A period of two weeks was allocated to each university for data collection to ensure convenient time of the students. Anthropometric measurements were taken using standiometre and electronic weighing scale. Information on nutritional knowledge, attitude and dietary practices were obtained using self administered questionnaires to respondents. Each questionnaire was coded with a unique number to represent each university and respondent. The questionnaire was used to collect the following information;

3.6.2.1 Socio- demographic characteristics

This comprised of information on age, course undertaken, year of study and the name of the university the respondents attended and this provided background information of students recruited to the study.

3.6.2.2 Nutritional knowledge

This section collected information on female student's general nutrition knowledge in the area of macronutrients, micronutrients, water intake, diet and disease using a multiple choice answers. Each question had one mark for every correct response chosen. An additional question was incorporated to establish the main source of nutrition information. Using a marking scheme for nutritional knowledge test (Annexure 4) the scores were rated on score

percentages using eight cut off points and respondents were graded according to their responses (Nazni and Vimala, 2010). The eight cut off points used are in the table below;

Table 3: Knowledge score classification table

Standard score	Classification
>80	Excellent
70-79	Very good
60-69	Good
50-59	Satisfactorily
40-49	regular
30-39	Poor
20-29	Very poor
<20	Bad

3.6.2.3 Nutrition attitude

A questionnaire with four point Likert scale attitude statements was used to determine direction and strength of the attitude toward nutrition by students. The respondents indicated how much they agreed or disagreed with each of the given statements. Using attitude score guide, Likert items were summed up using reverse scoring method to create a composite score of all statements for each respondent. Correct response was determine for each statement and summed up to create average score for the test. Correct response average score was used as the cut off and compared to overall average summative score for the students to determine strength and direction of the attitudes (Boone and Boone, 2012). Composite score equal to or above average test score was rated positive attitudes while that below average test score was rated negative attitude (Annexure 5).

3.6.2.4 Nutrition status

The weight and height of the students were measured and the values used to calculate the BMI. Evaluation of the nutrition status using BMI was based on the following WHO criteria (WHO, 2000).

Table 4: BMI WHO classification table

BMI (Kg/M^2)	Classification
<18.5	Underweight
18.5-24.99	Normal
25- 29.99	Overweight
30- 34.99	Obesity class 1
35-39.99	Obesity class II
>40	Obesity class III

3.6.2.5 Dietary practices assessment

Data was collected on number of meals consumed daily, meal patterns, snacking habits, source of meals taken while in college, alcohol intake and weekly food frequency consumption of nine food groups among the 8-12 recommended. The evaluation for the number of meals consumed in a day was based on (5-6) times as recommended by World Health Organization (WHO, 2002).

3.6.3 Recruitment and Training of Research Assistants

Two research assistant were recruited for data collection and were supervised by the principal investigator. The research assistants were recruited based on criteria that they had attained formal education at least secondary school education, were fluent in written and spoken

English and Kiswahili, good communication skills, outgoing personality and teamwork ability. The research assistants were trained for one day on various aspects of data collection exercise in order so to ensure accuracy and competence as outlined in the training schedule in Annexure 3. The training topics covered nature of study and its objectives, data collection method and materials, code of conduct and work schedule in the field. They were trained on how to accurately take measurements on weight and height, record them accurately and check for questionnaire completeness. During the training sample questionnaire were administered to each other (role play) and any challenge arising addressed. The lecture, role plays and demonstration methods were used during training.

3.6.4 Pretesting of Questionnaire and Calibration of the Equipments

Before actual data collection, tools and equipments were pre-tested and validated at Moi University town campus. Ten respondents were selected to participate in the exercise. Data gathered in this exercise was used to evaluate validity of the tools. Modification of the tools was done based on the pretest and questions which were not well understood corrected while irrelevant questions were omitted. The equipments were tested for accuracy to ensure correct readings were observed.

3.7 ETHICAL CONSIDERATIONS

A letter to conduct the study was obtained from the administration of the researcher's university following the proposal approval. A research permit was also procured from the National Council for Science and Technology while authorization to conduct research from three selected universities was obtained from the university colleges (Annexure 7, 8 and 9). During data collection the participants were informed of the study purpose and their consent

obtained. The questionnaires were self-administered and names of respondents were not indicated to ensure confidentiality.

3.8 DATA QUALITY ASSURANCE

The research assistants were trained on data collection techniques, correct use of equipments and accurate recording of measurements to minimize errors. Calibration of weighing scales was carried out daily by placing a 2kg item to obtain an accurate reading. The respondents were assured of the confidentiality of all information given to enable the respondents provide correct information. The researcher closely supervised the data collection exercise as she was part of the field exercise and addressed any challenges encountered. The questionnaires were checked for completeness and proper filling of data as well as correct recording of measurements. The principal researcher was also supervised once by the university supervisor while carrying out data collection exercise.

3.9 DATA MANAGEMENT AND ANALYSIS

After data collection exercise, all data that was not coded was coded before data entry into computers as variables. Anthropometric data was entered in Ms Excel to calculate BMI inices after which it was entered in SPSS. The Statistical Package SPSS version 16.0 was used to enter data, clean and analyze. Descriptive statistics were done to provide general characteristic of the data. Quantitative data was explored to check for outliers. This was done by running frequencies, means, and dispersion and cross tabulation. This was to ensure correct information had been entered and extreme values were set at mean value by transformation. Shapiro -Wilk test for normality was done for knowledge score, attitude score and BMI as continuous variables to determine the type of analytical tests for hypothesis and associations of the study. Where p-value was less than 0.05 non-parametric tests were used.

Using Chi square test, significant association was checked for water intake knowledge, attitude, nutrition practice consideration and nutrition status by course were determined. Fisher Exact test was done to test significant association where cells had less than five counts. This was done in alcohol consumption by course and association of knowledge and frequency of food consumption. Man Whitney u test was used to compare means of overall knowledge score, macro and micro nutrient knowledge by course. One way Anova tests was used to test significant differences in attitude and frequency of food consumption. Bivariate Spearman's rank order correlation was done to determine significance for associations between knowledge and nutrition status, knowledge and number of meals, attitude and nutrition status and between attitude and number of meals. The level of statistical significance set at $p < 0.05$.

CHAPTER FOUR: RESULTS

4.1 SOCIO - DEMOGRAPHIC CHARACTERISTIC

The distribution of the respondents by university and course is shown in Table 5. Majority of students were from University of Nairobi (UON) at 48.7 % and Kenya Methodist University (KeMu) at (43%) while the lowest proportion was the Kenya Polytechnic University College (KPUC) at 8.3%.

Table 5: Distribution of female students by the university and by course

University	HSS n = 182	Science n=181	N= 363
UON	89	88	177
KeMU	80	76	156
KPUC	13	17	30
Total	182	181	363

The age of the students is shown in Table 6. The mean age was 21.3 (SD 1.5) years. Majority of the students were aged 19 to 23 years, while those aged 24 and 25 years comprised 5.0% and 2.8 % of the respondents respectively.

Table 6: Distribution of the students by age

Age (Years)	Frequency	Percent (%)
19	56	15.4
20	69	19.0
21	76	20.9
22	86	23.7
23	48	13.2
24	18	5.0
25	10	2.8
Total	**363**	**100.0**

4.2 NUTRITIONAL KNOWLEDGE

4.2.1 General Nutritional Knowledge

The results show generally that, students had a mean score of 54.1% $\pm$16.1 with a maximum score of 93% and minimum score of 11%. Table 7 shows the level of knowledge in nutrition of the selected student participants and performance and by discipline (HSS and Science). The mean knowledge score of Social Science based students (n=182) was 50.5(SD 14.4) while Science based students (n=181) was 57.7 (SD 16.9). Using Mann- Whitney U test there was a significant difference between the mean of the two disciplines (p=0.000).

Table 7: General nutrition knowledge of the students

Standard Scores Percentage (%)

	Excellent >80	Very Good 70-79	Good 60-69	Satisfactorily 50-59	Regular 40-49	Poor 30-39	Very poor 20-29	Bad <20
HSS (n=182)	1.7	4.1	9.4	10.7	15.2	5.2	3.9	0
Science (n=181)	6.1	6.9	15.2	5.8	10.7	1.4	3.3	0.6
Total (N= 363)	7.7	11.0	24.5	16.5	25.9	6.6	7.2	0.6

4.2.2 Knowledge in Macronutrient and Micronutrients.

Figure 3 show overall good performance in macro nutrients knowledge than in micro nutrients knowledge. The mean macro-nutrient knowledge score was 56.3% (SD 20) while for micro nutrients was 45.7% (SD 22.8). As Figure 3 shows majority (58.4%) of the students had low knowledge in micronutrient compared to knowledge in macronutrient (36.6%). Results on knowledge further showed majority of respondents (66.9%) had knowledge on daily estimate of water requirement for a healthy female adult while 33.1% of the respondents did not have the knowledge. Table 8 shows there is no significant difference in knowledge between the courses.

Table 8: Water intake knowledge by course

course	Water intake knowledge		
	correct	Incorrect	Statistical test
HSS (n=182)	33.9	16.3	Chi Square
Science (n= 181)	33.1	16.8	X^2 0.068[a], df 1
Total (N=363)	66.9%	33.1%	P = 0.795
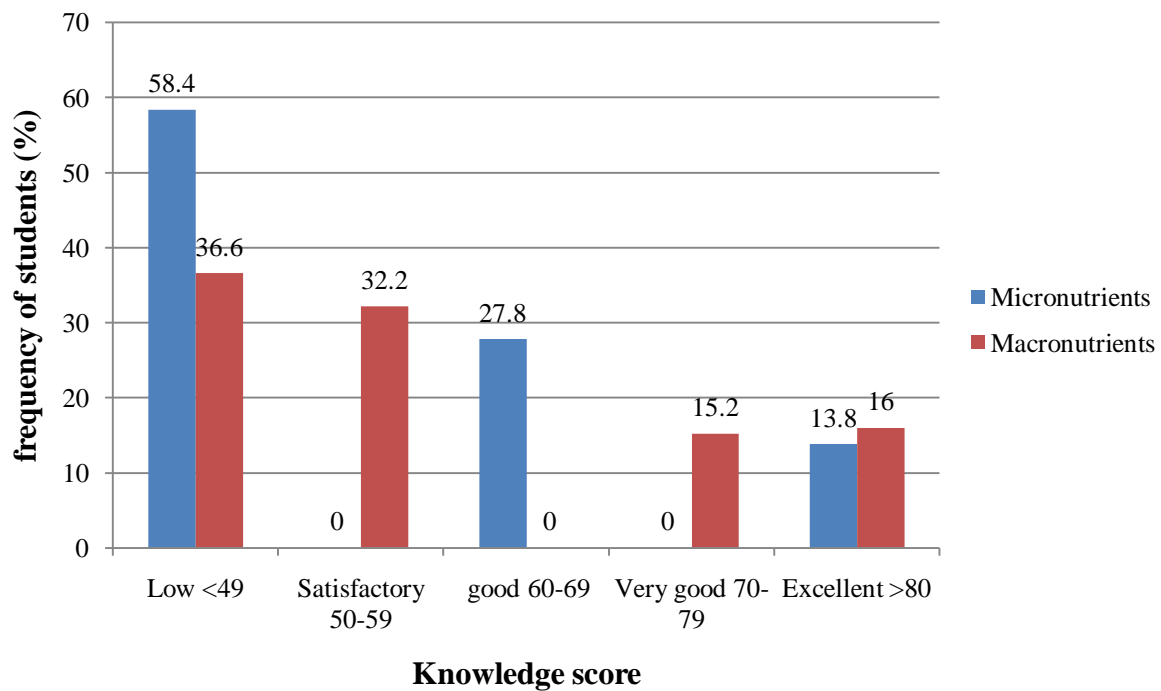
Figure 3: Knowledge on macro and micro-nutrients

4.2.3 Knowledge of Macro nutrients and Micro nutrients by Discipline

Figure 4 and 5 shows results of macro and micro nutrients by HSS (n- 182) and Science (n=181) discipline. The mean macro-nutrient knowledge score for Science students was 59.3% (SD 20) while for HSS was 53.4% (SD 18). Using Man Whitney U test there was a significant difference between the means (p= 0.004). The mean micro-nutrient knowledge score for Science students was 49.8% (SD 23) while for HSS was 41.5% (SD 20). Using Man Whitney U test there was a significant difference between the means (p= 0.001).
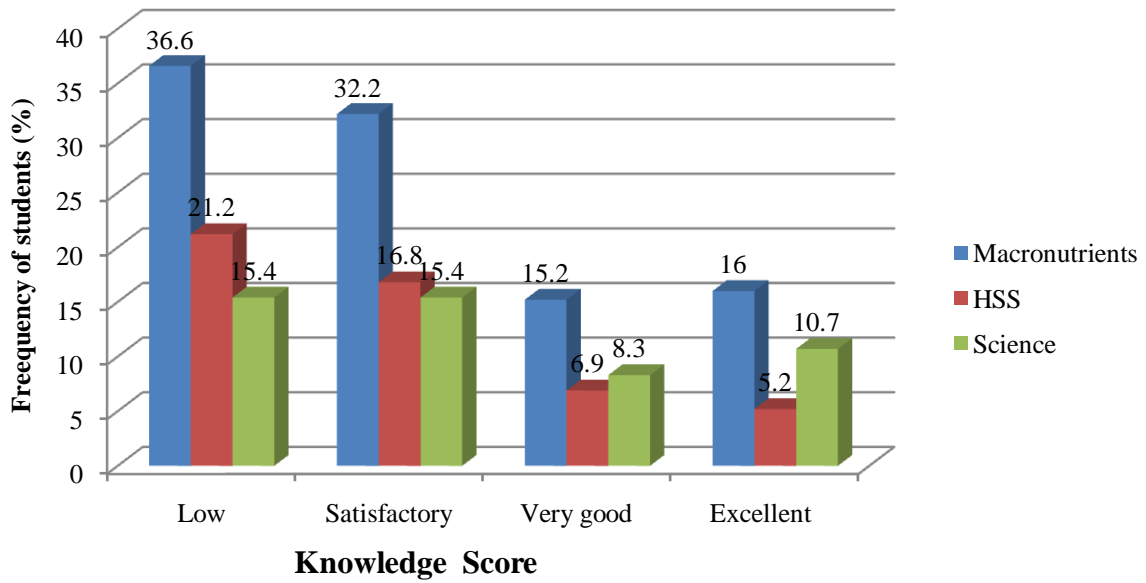
Figure 4: Macro nutrient knowledge by course
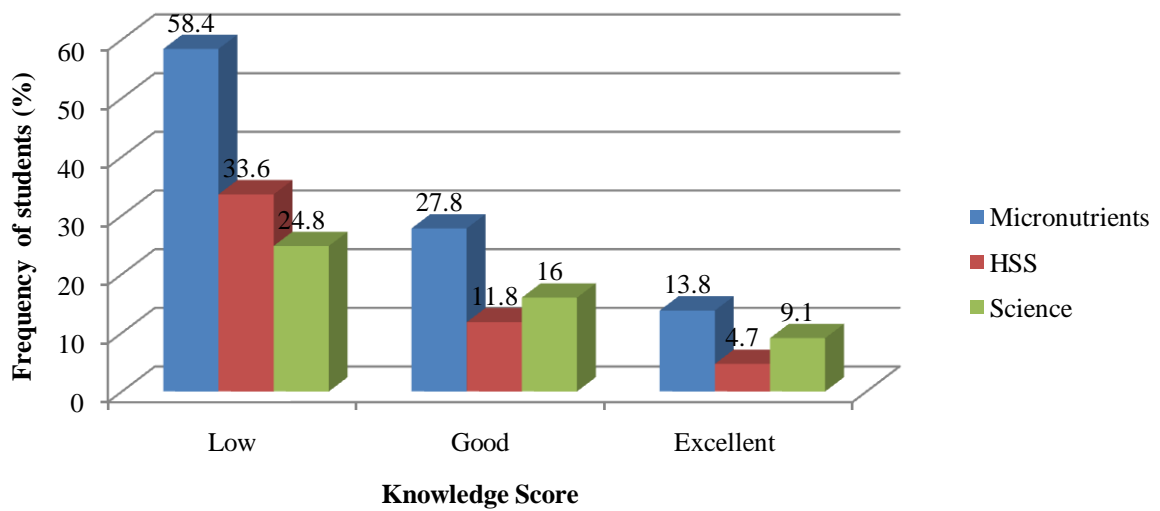
Figure 5: Micronutrients knowledge by course

4.2.4 Knowledge on Diet and Disease

Figure 6 shows results of diet and diseases knowledge. Students proportion with high knowledge (scored 100%) were 41.6% while 42.4% had low knowledge (scored 50%) and 16% had no knowledge at all (scored 0).
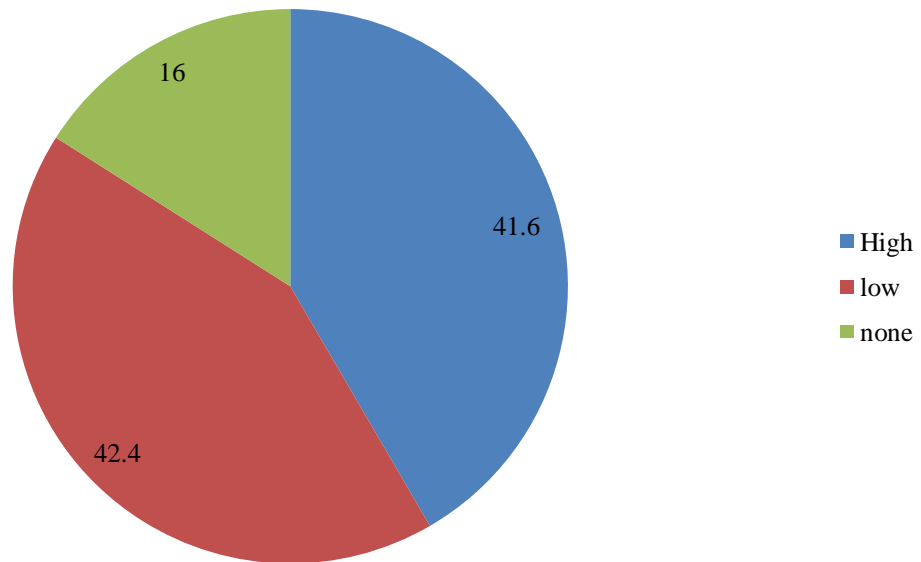
Figure 6: Diet and disease knowledge

4.2.5 Source of Nutrition Knowledge by Respondents

Figure 7 show the source of nutrition information by the students. Majority of respondents (57.9%) had gained nutritional knowledge from school and small proportion (1.1%) from church. Others sources from which students gained nutrition information includes internet, magazines, television, books, family and peers.
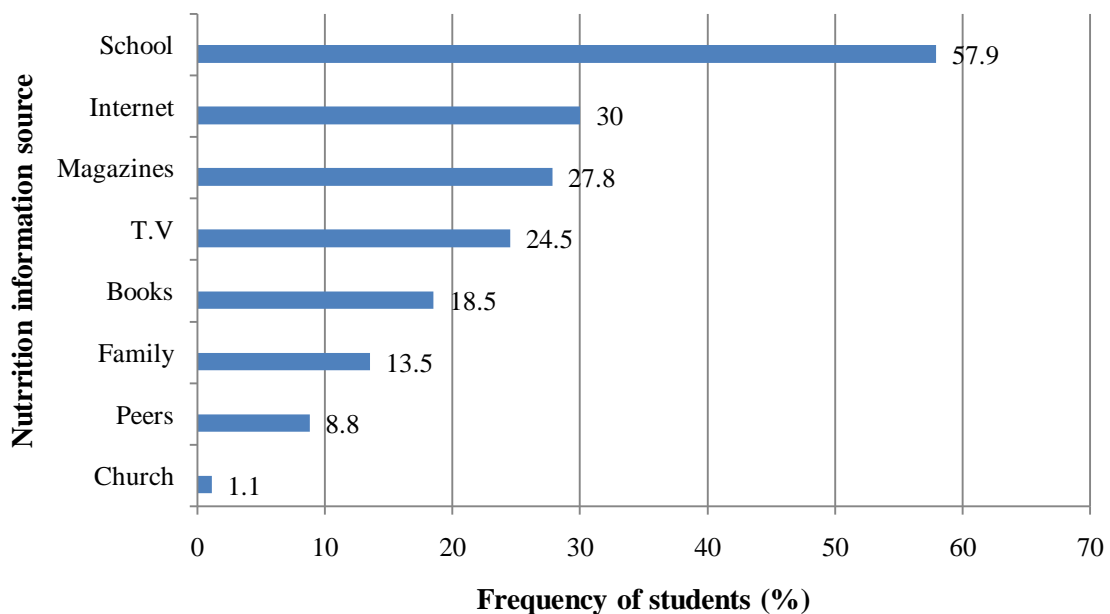
Figure 7: Source of nutrition information

4.3 NUTRITION ATTITUDE

The study findings show that majority (59.8%) of the students have a positive attitude towards nutrition practices. Out of total score of 60 the minimum score was 35 and the maximum score was 58. Out of 47 correct response average score the overall mean score was 47.1± 4.1. The mean attitude score for Humanities and Social Sciences (n=182) was 47±4.1 while the mean for Science students (n=181) was 47.3 ±4.1. Table 9 shows results of attitude by course using Pearsons Chi square there is no significant difference in attitude between HSS and Science disciplines (p > 0.05).

Table 9: General attitude of the students

	Attitude		
course	Positive	Negative	Statistical test
HSS (n=182)	29.2	20.9	Chi Square
Science (n= 181)	30.6	19.3	X^2 0.359[a], df 1
Total (N=363)	50.8%	40.2%	P value = 0.0549

4.4 DIETARY PRACTICES

The results given in this section represent dietary practices in terms of meal consumption patterns, types of snacks consumed, sources of meals consumed, frequency of consumption of various foods, alcohol consumption and practice of nutrition knowledge.

4.4.1 Meal Consumption Patterns

The mean number of meals consumed by students in a day was 2.5 (SD 0.7). As shown in Figure 8 a small proportion met the threshold of required meals (5-6) times in a day including snacks. The results further show in Figure 9 that majority of the students consumed supper

(76.3%), lunch (61.4%) and breakfast (59.2%) daily while daily snacking was very low (20.7%).
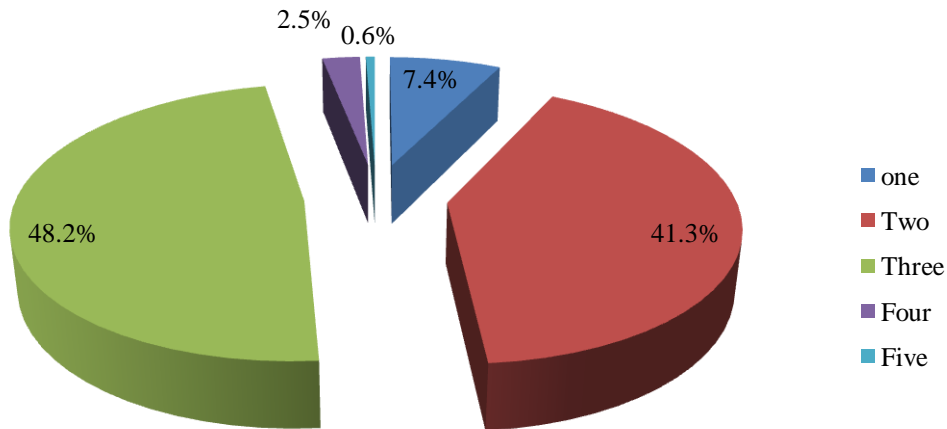
Figure 8: Number of meals consumed per day
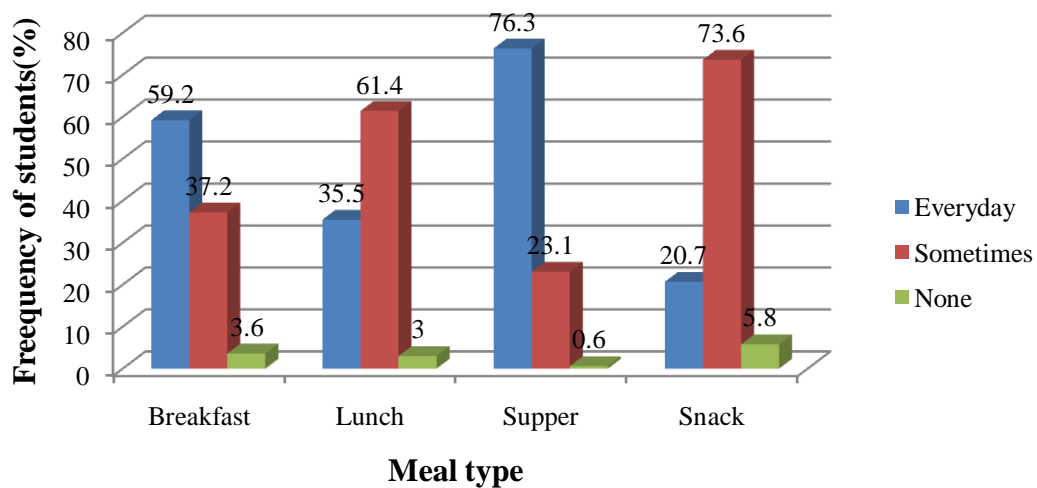
Figure 9: Meal consumption pattern

4.4.2 Snacks Consumed

Figure 10 shows the type of snacks consumed. As results show, snacks high in fats and sugar were the most consumed by students. Biscuits (41.0%) were the most preferred followed by french fries (chips) and crisps (37.5%). Healthy snacks such as fruits and nuts were among the least consumed with a proportion of 6.9% and 8.3% respectively.
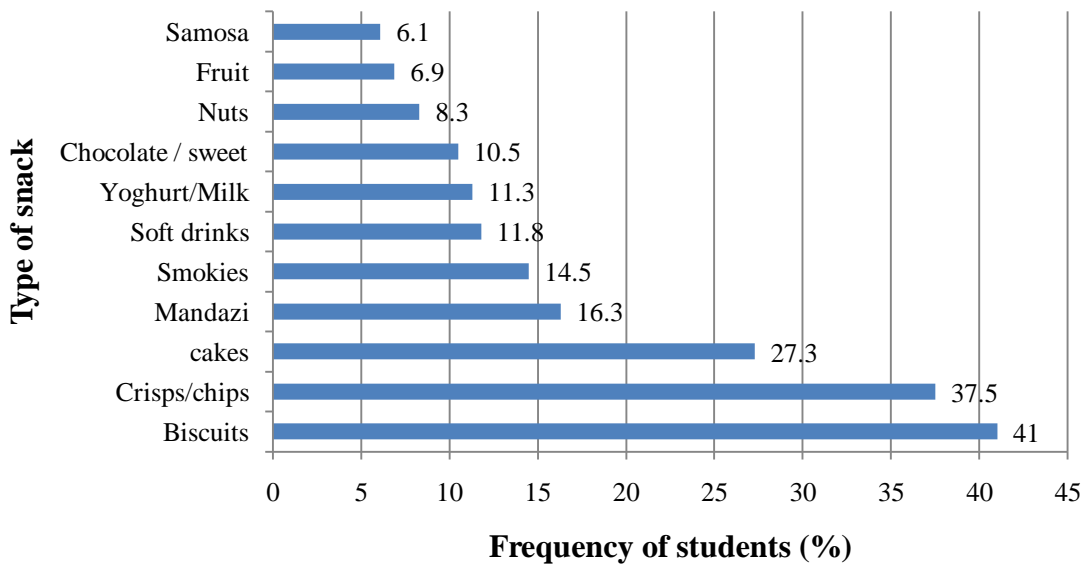
Figure 10: Type of snacks consumed

4.4.3 Source of Food Consumed

The results in Figure 11 show choice of eating places by students. Fast food restaurants were the most preferred eating sites (34.2%) followed by the college cafeteria 25.1% while 22.3% cooked for themselves and 8.8% carried packed foods from home. A few students preferred combining college cafeteria with cooking for themselves (8.3%) and packed food from home (0.8%).
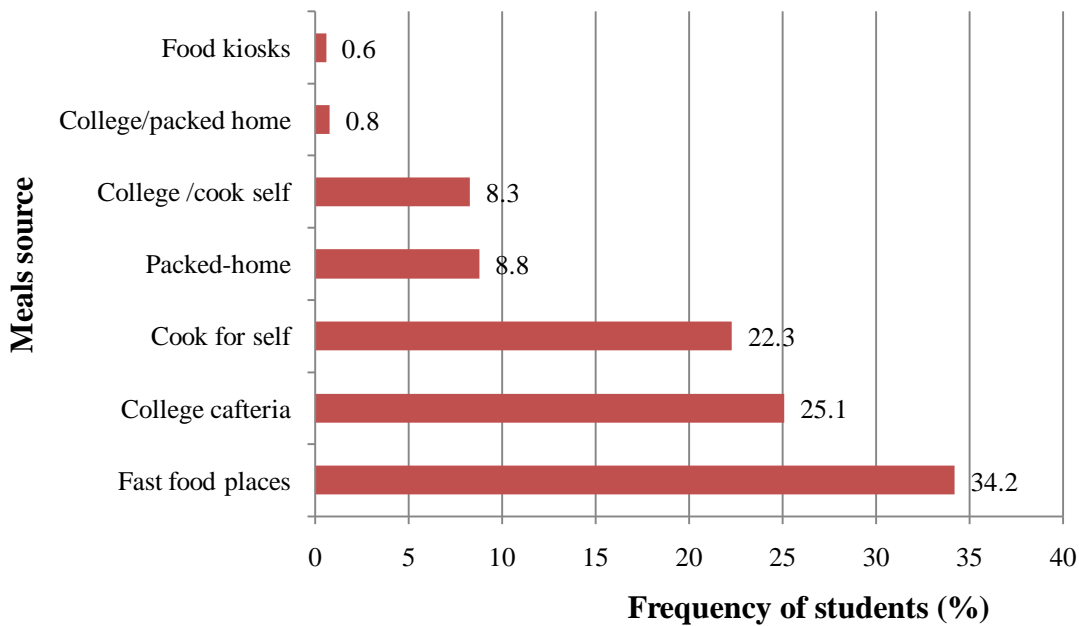
Figure 11: Source of meals consumed

4.4.4 Alcohol Consumption Pattern

The study results show that majority of the respondents did not take alcoholic beverages (64.2%) while a proportion of 35.8% consume alcohol. For the proportion that consumed alcohol, majority of the students (58.5%) consumed alcoholic beverage once in a month and a small proportion (1.5%) everyday as shown in Figure 12. Using Fisher Exact test there was no significant difference between the HSS and Science disciplines in alcohol consumption (p = 0.227).
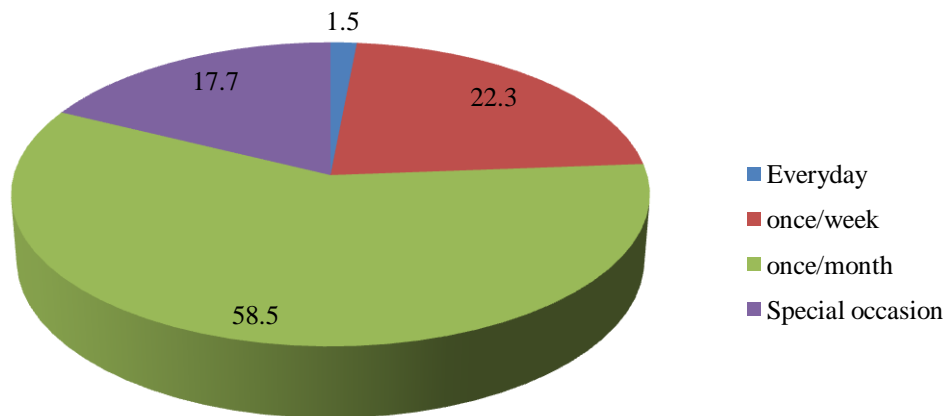
Figure 12: Frequency of alcohol consumption

4.4.5 Nutrition Consideration in Food Choice

Majority (56.2%) of the students agreed that they considered nutrition when choosing and planning meals, while 43.8% did not consider nutrition. Table 10 shows results of students' nutrition consideration in food choices. Using Pearson's Chi Square test there was no significant difference between HSS and science disciplines ($p > 0.05$).

Table 10: Nutrition consideration by course

course	Nutrition consideration		
	Yes	**No**	**Statistical test**
HSS (n=182)	26.2	24.0	Chi Square
Science (n= 181)	30.0	19.8	X^2 2.373[a], df 1
Total (N=363)	56.2%	43.8%	P value = 0.123

4.4.6 Frequency of Food Consumption

Food frequency results in Table 11 show students consume a variety of foods. The main staple food most frequently consumed was rice followed by *ugali*. Results of cereal foods showed frequent consumption of refined cereal products and less of whole grain products. Fried and processed roots/tubers were the most frequently consumed. Results further showed milk and milk products were frequently consumed but majority of students never consumed fish and sea foods (52.3%). Majority of the students frequently consumed fruits and vegetables but not daily, a proportion of 48.2% and 44.1% consuming them daily respectively. Majority of students frequently consumed sugar/honey (56.7%) daily, while tea/milo/cocoa (68%) was the most frequently consumed beverage daily.

Table 11: Frequency of consumption of various foods by respondents

Type of food	Everyday	1- 2 times a week	3-6 times a week	Never consumed
Cereals				
White rice	9.6	51.0	36.4	3.0
Brown rice	0.3	8.8	3.0	87.9
Ugali (grade 1 flour)	6.9	58.1	22.3	12.7
Chapati (white)	4.7	62.8	12.9	19.6
Chapati (brown)	2.8	24.5	4.7	68.0
Breakfast cereals	13.5	24.8	6.1	55.6
White bread	27.8	27.3	17.6	27.3
Whole bread	10.2	25.1	12.7	52.1
Cakes	6.9	54.3	13.5	25.3
Biscuits	9.9	43.8	14.9	31.4
Roots and Tubers				
Cassava/yams	-	18.5	-	81.5
Arrowroot/sweetpotatoes	1.1	39.1	8.3	51.5
Potato chips	6.9	51.7	20.1	21.5
Potato crisps	5.2	46.8	12.7	35.3
Mashed/baked potatoes	1.7	28.9	8.0	61.4
Milk and milk products				
Fresh milk	28.9	33.9	15.7	21.5
Yoghurt	5.0	51.0	15.7	28.4
Ice cream	1.7	38.6	8.5	51.2
Meat, poultry& product				
Eggs	5.2	57.3	17.4	20.4
Fish and sea food	1.7	38.8	7.2	52.3
Meats, pork,goat,lamb	12.9	47.7	20.1	19.3
Sausages	6.1	47.7	11.8	34.4
Burgers	0.3	25.1	6.9	67.8
Legumes and nuts e,g Beans, groundnuts, legumes, lentils, peas	12.9	49.0	27.3	10.7
Fruits e.g mangoes,avocado,pawpaw	48.2	25.6	24.0	2.2
Vegetables e.g Kales.spinach,Cabbage	44.1	25.9	27.5	2.5
Sweets				
Sugar / honey	56.7	15.4	10.5	17.4
Candies (sweets0	18.7	31.4	13.5	36.4
Chocolates	7.7	44.9	12.7	34.7
Beverage				
Fruit squash	8.0	28.1	11.8	52.1
Fresh juice	10.2	48.5	15.7	25.6
Tea/milo/cocoa	68.0	12.7	11.0	8.3
Sodas	10.2	44.9	12.4	32.5

Note: Column headers grouped under "Frequencies (%)" and "(N = 363)".

4.5 NUTRITIONAL STATUS OF THE STUDENTS

Height and weight measurements were carried out to determine the BMI. The results show the students mean height was 160.1cm (SD 5.9). The lowest and highest height was 139.9cm and 176.5cm respectively. The mean weight was 58.5 kg (SD 9.7) while the lowest and highest was 36.6 and 97.2 kg respectively. The mean BMI was 22.9 with a low of 15.4 and high of 37.3. Table 12 shows students BMI results and BMI distribution by discipline. Overall 71.6% of the female students were of normal weight, 5.5% were underweight, 18.5% overweight and 4.4% obese. Using Chi Square test there was a significant difference in nutrition status between the courses (p<0.05). The results further show in Table 13 that Social Science students were significantly more overweight and obese than Science students (P<0.05).

Table 12: Distribution of students BMI by course

Course undertaken	BMI Category					
	Underweight %	Normal%	Overweight %	Obese %	Total %	Statistical test
HSS (n= 182)	2.8	32.5	11.6	3.3	50.1	Chi square X^2 10.526[a], df 3
Science (n=181)	2.8	39.1	6.9	1.1	49.9	P=0.015
Total (N=363)	5.5	71.6	18.5	4.4	100	

Table 13: Prevalence of overweight and/or obesity by course

Course undertaken	Non overweight or obese	Overweight %	Statistical test
HSS (n= 182)	35.3	14.9	Chi square X^2 9.585[a], df 1
Science (n=181)	41.9	8.0	P=0.002
Total (N=363)	77.1 %	22.9%	

4.6 ASSOCIATION OF NUTRITION KNOWLEDGE WITH NUTRITION STATUS

Using Spearman rank order correlation, results showed the association of nutrition knowledge and nutrition status was negative and not significant at ($r = -0.032$, $p = 0.549$) as shown in Figure 13. Those students with high nutrition knowledge were not necessarily having good nutrition status.
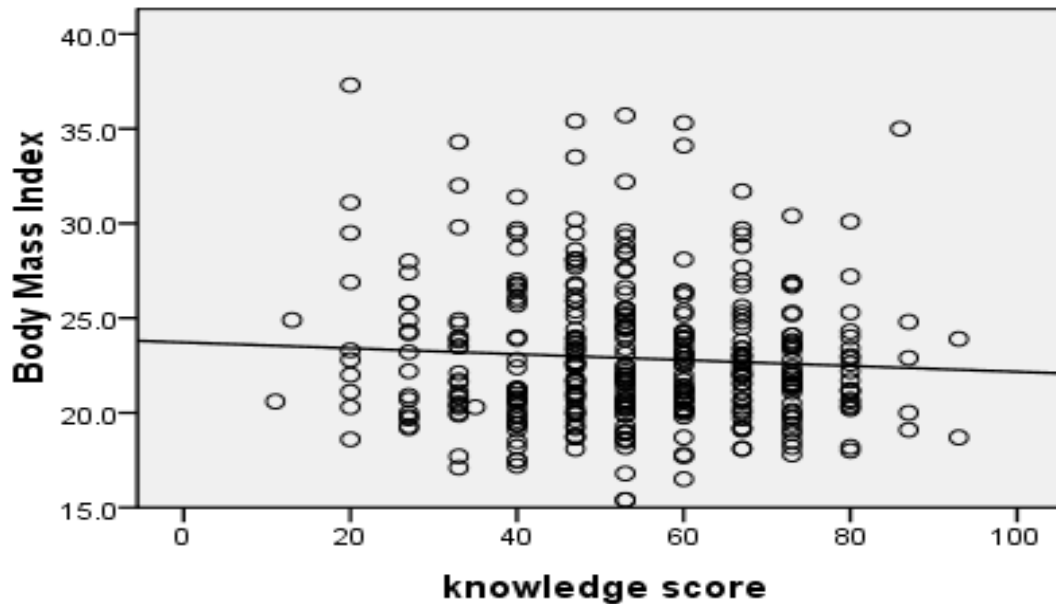
Figure 13: Correlation of nutrition knowledge and status

4.7 ASSOCIATION BETWEEN NUTRITION KNOWLEDGE AND DIETARY PRACTICES

Results of Spearman rank order correlation between knowledge and number of meals taken was positive relationship but not significant ($r = 0.36$, $p = 0.495$). As shown in Table 14 using Fisher Exact test a significant association of knowledge and frequency of consumption of various foods was observed ($p<0.05$). These foods included arrowroot/sweet potatoes ($p=0.036$), Potato crisps ($p= 0.028$), Sausages ($p=0.025$) and Tea/milo/cocoa ($p=0.039$).

Table 14: Association between knowledge and frequency of foods consumption

N= 363 (%)					
Type of food	Everyday	1-2 times/week	3-6 times/week	Never consumed	Statistical test
Arrowroot/sweet potatoes	1.1	39.1	8.3	51.5	Fisher Exact P=0.040
Potato crisps	5.2	46.8	12.7	35.3	Fisher Exact P= 0.028
Sausages	6.1	47.7	11.8	34.4	Fisher Exact P= 0.025
Tea/milo/cocoa	12.9	49.0	27.3	10.7	Fisher Exact P= 0.039

4.8 ASSOCIATION OF ATTITUDE AND NUTRITION STATUS

The results of Spearman's rank order correlation between attitude and nutrition status show a positive relationship but not significant (r = 0.03, P= 0.566). Students with positive attitude did not necessary have good nutrition status.

4.9 ATTITUDE AND DIETARY PRACTICES

Results of Spearman's rank order correlation between attitude and number of meals consumed was negative and not significant (r= -0.018 P= 0.734) therefore no relationship between attitude and the number of meals consumed. Using one way ANOVAs significant differences in attitude was observed in frequency consumption of a number of foods. Results in cereals showed significant difference in attitude for brown rice (P= 0.013). Results of the mashed/baked potatoes shows a significant difference (P= 0.003) and post hoc (LSD) test showed attitude difference between those who never consumed and [1-2 times a week (P=

0.016) and 3-6 times a week (P= 0.001)]. In meats there was a significant difference in attitude for sausages (P=0.036) and post hoc test (LSD) showed a difference in attitude between those who consumed everyday and [1-2 times (P= 0.009), 3-6 times (P= 0.005) and those that never consumed (P= 0.009)]. Results further showed significant difference in vegetable consumption (P=0.019) and post hoc (LSD) tests showed difference in attitude between those that consumed everyday and 1-2 times a week (P= 0.007).

CHAPTER FIVE: DISCUSSION

5.1 INTRODUCTION

This chapter presents the discussion of the study findings of Nutrition knowledge, attitude, and its association with dietary practices and nutrition status of the students' participants from the three university colleges.

5.2 NUTRITION KNOWLEDGE

This study established that female students have average level of nutrition knowledge as opposed to high level expected by virtue of being highly educated. This is consistent with other studies that have shown students are slightly aware of nutrition issues (Barzegari *et al*, 2011; Sakamaki *et al*, 2005). In this study however, a significant difference was observed in level of knowledge between the Humanities and Social Science and Science students. Science students were more knowledgeable in nutrition than Social Science students and this confirms previous studies that showed nutrition knowledge is related to field of study and found that fields with nutrition as a subject had higher knowledge score (Azizi *et al*, 2010). Therefore the difference could be attributed to the possibility that the Science students in this study are more likely to have had exposure of nutrition information in course of their studies unlike the Humanities and Social Science students.

Results of the nutrition knowledge in the area of macro-nutrients and micro-nutrients shows majority of the students are more knowledgeable in the area of macronutrients compared to knowledge in micronutrients. This can be attributed to previously great emphasis of macronutrients deficiencies particularly in the developing countries as a result of constant food insecurity challenges. Micro nutrient awareness having emerged recently could be still a

new area of interest to most students. Diet and disease knowledge is key in prevention of risk factors associated with disease outcomes, enhances healthy food choices and optimal dietary practices to help lessen the burden of early onset on chronic diseases. Diet plays an important role throughout lifecycle in promoting good health and preventing lifestyle diseases which have been significantly linked to poor dietary habits. The low knowledge in this area by students could be attributed less attention given by the students due to their age in the view that since they are in life phase when lifestyle diseases are less common and a possibility that they also physically active since lifestyle diseases are common until later stages of life (Whitney and Rolfes, 1999).

Students have a wide source of nutrition information. However, school continues to be an avenue through which majority of students gain nutrition knowledge. This study confirms that students' main source as school. Other sources preferred by students include internet, magazines and television shows the power of media influence to young adults and the need for them to assume a greater role in nutrition education. This could be attributed to a growing demand for information technology that enables shared information easy to access away from formal classroom set ups. However, school environment continue to be an important place of broadening knowledge that may impact society health because students are viewed as positive change agents. These results agree with a previous study that showed school environment as the last and important avenue through which majority of students can be impacted with nutritional knowledge and spirals up improvement in society's health (Berzegari *et al*, 2011).

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5.3 NUTRITION ATTITUDE

Some previous study has shown that students have average score in nutrition attitude (Sakamaki *et al*, 2005). In this study majority of students have above average score showing a positive attitude towards nutrition with a higher intensity. The results in this study do not agree with this study. This could be attributed to increased nutrition awareness and upsurge of nutrition information through modern communication and technology sources such as internet and magazines which students are increasingly able to access. The results of this study show that students have access to internet, magazines and television which may have played a positive role in their attitude by nutrition information accessed. The other attribute could be influence from society social expectation on the females due to their gender roles as caretakers and therefore they are more concerned with food issues (Lin *et al*, 2011).

5.4 DIETARY PRACTICES

Regular eating practices and healthy food choices ensure female students meet their nutritional requirements for growth and health maintenance particularly their needs for reproduction roles. The average number of meals consumed daily by the students (2.5 ± 0.7) is far below the required five to six times in a day including snacks (WHO, 2002). Results of breakfast intake in this study agree with results of a previous study at Lebanon University that reported majority of students consumed regular meals and majority of females (53.3%) took breakfast daily. In this study majority of students' skipped lunch and snack meals everyday but majority took breakfast and supper. This could be attributed to other factors such as affordability of meals as a higher proportion of students eat from fast-food restaurants and college cafeterias. Therefore cost of foods could have limited purchase of adequate meals subjecting students' to irregular meal patterns resulting to preference for breakfast and supper while skipping lunch or snacks meals.

The students' choice of snacks reflects those high in sugar, refined products and high in fats compared to healthy snacks. This shift shows nutrition transition associated with poor dietary practices linked to rising risks of overweight and obesity in developing countries (WHO, 2002). Students' attraction to these foods could be due to their palatability, convenience, ease of availability and affordability in many food places where students consume their meals. This agrees with a previous study in Lebanon that showed high consumption of fried foods by university students (Yahia *et al*, 2008). As people are increasingly eating away from home fast food restaurants are becoming an important source of meals for urban dwellers. Students preference for fast food eateries could be attributed to students' preference for easy convenient eating places due to time demand on their academic workload. Fast food eating facilities present great avenues to offer high quality meals to students including affordable healthy snacks.

Alcohol consumption by students can negatively interfere with their academic output but their health as well since alcohol is known to alter metabolism of nutrients and to interfere with action of nutrients in the body. Alcohol though rich in energy (7 kilocalories per gram) it is empty in nutrients. Majority of the students may have avoided alcohol due to its negative association of interfering with academics while proportion that consumed could be attributed to factors like peer pressure influence.

Nutrition knowledge becomes important when it influences healthy choices and practices. However, knowledge does not necessary translate to practice due to other factors such as socio economic, cultural and food availability. Students contradicted themselves in nutrition practices in food choices linked with healthy living yet majority consider nutrition in food

choices. This could also be attributed to students' preference for cheap and convenient foods that are easily available regardless of their low benefit to wellness.

Rice and *Ugali* grade 1 are common foods in Kenyan most cultures and urban areas therefore this could attributed to students choice as main staples frequently consumed. Refined grain products have a longer shelf life than whole grain products and mostly preferred. However whole products supply fiber and micronutrients necessary for body functions such bowel movements and they are also regarded as low glycemic index foods which help to control overweight and obesity.   Majority of students frequently consumed proteins sources. However, fish and sea products were the least consumed and this could be attributed to cultural beliefs, factors of availability and affordability. There is also low daily intake of fruits and vegetables by students despite their vital contribution in supply of vitamins and minerals that are crucial for body functions. This study agrees with a previous study in Lebanon University that reported low daily intake of fruits and vegetables by female students (25.8% and31.5%). This could be attributed to their seasonality and cost.

5.5 NUTRITIONAL STATUS

According to 2008-09 KDHS, national BMI for group 20-29 years is 22.6 while proportion with normal status is 67.0, overweight (17.8%) and obesity is 4.4%. The results in this study are consistent with the results of the survey. The rate of overweight and obesity in developing countries is increasingly emerging in urban areas due to changing lifestyle such as uptake of diets high in sugar, fats and inactivity factors linked with risk factors associated with rising chronic diseases globally (WHO, 2002).   In this study, overweight and /or obese is significantly more in Social Science students than Science based students and this could be attributed to significant difference in nutrition knowledge between the disciplines. Higher

nutritional knowledge in Science could have influenced their food choices, snacking habits and some dietary practices which may have impacted their nutrition status positively in view of physical stature than HSS students.

5.6 ASSOCIATION OF NUTRITION KNOWLEDGE WITH DIETARY PRACTICES

The aim of promoting nutrition knowledge is to influence society's health through behavior change by fostering positive food habits and practices among individuals. Even though studies have indicated that level of education can influence dietary practices, higher knowledge levels do not always lead to practices especially when individuals do not know how to apply acquired knowledge. The correlation between knowledge and numbers of meals consumed by students is not strong and significant in this study. The threshold of three meals and snacks enables appropriate provision of nutrients needs when a variety of foods are consumed yet this students' insufficiency could be an indicator of poor eating habits. This observed practice gap could be attributed to inadequate knowledge on the importance of meals distribution and portion size throughout the day. Students optimal practices may be limited by others factors too such as socio economic, peer pressure and environmental factors such as accessibility. Students' finances are likely to limit adequate purchase of foods and therefore predisposing them to skipping some meals. There is therefore need to provide subsidized meals to all students. Peer pressure within students is also likely to diminish healthy practices guided by nutrition information due to students' desire in satisfying strong sense of belonging among the peer and are likely to prioritize other material needs that define high social class and   acceptable lifestyle at the expense of food.

Knowledge on benefits of foods or lack of it is likely also to influence the frequency consumption of various foods. In this study frequency of consumption of arrowroot/sweet

potatoes is less compared to potato crisps and sausages even though there is a significant knowledge association in all. This could be attributed to low knowledge on food value linked to traditional orphaned foods. The low frequency consumption of sausages and potato crisps could be attributed to growing awareness that these foods are increasingly contributing to unhealthy benefits such as overweight and food additives associated with lifestyle diseases when frequently consumed. Hence this study partly confirms the hypothesis that there is no association of students' nutritional knowledge and dietary practices as it relates to the number of meals consumed but rejects the hypothesis as it relates to frequency consumption of various foods by students since statistical significance was observed ($p < 0.05$).

5.7 ASSOCIATION OF NUTRITION KNOWLEDGE WITH NUTRITION STATUS

Nutrition education strategies help to raise levels of knowledge aiming at preventing unhealthy food related lifestyles as well as promoting society's health. Nutrition knowledge indirectly contributes to nutrition status when good dietary practices are translated into practice and sustained in life. Knowledge targets to influence dietary practices by promoting actions that lead to healthy food intake and in discouraging negative practices likely to negatively influence nutrition status. The results of association of nutrition knowledge and nutrition status in this study show a negative relationship that was not significant. This could be attributed to the fact that knowledge influences lifestyle behaviour which takes a process to completely change into practices that directly influence nutrition status. Students being in their active stage of life may not realize the need for nutrition knowledge to guide their eating habits and to maintain health such as normal weight so as to prevent lifestyle diseases of latter stages of life. Healthy food choices contribute towards healthy management of body weight and in prevention of nutrient deficits that are likely to lead to poor health. The fact that knowledge does not always transit to practices is confirmed in this study and this could

be attributed to factors influencing food consumption that are not adequately addressed. This study therefore confirms the hypothesis that there is no association of students' nutritional knowledge and nutritional status ($p < 0.05$).

5.8 ASSOCIATION OF NUTRITION ATTITUDE WITH DIETARY PRACTICES AND NUTRITION STATUS NEXUS

As expected university students demonstrated positive attitude towards nutrition since they are highly educated. However the relationship between nutrition attitude and the number of meals consumed was not significant in this study. Students' positive attitude towards nutrition did not translate into practice for the correct number of meals consumed. Positive attitude reinforces behavior change when knowledge is practical. This gap in practice could be attributed to other factors influencing the food consumed such as food affordability, social factors and food availability. Students' economic status plays a key role in enabling students purchase foods that are affordable to them regardless of the attitude they hold concerning foods. Students are likely to prefer cheap and convenient foods. Social factors like cultural influence on perceptions and may lead people to prefer what is familiar to them regardless of knowledge and attitude they hold towards food. However a significant difference in attitude was observed in frequency of consumption of various foods and this could be attributed to other factors like cultural influence on food, knowledge on food benefits, peer influences on food choice and food available to students at various eating places. For example low consumption of whole grain rice could be attributed to low knowledge on its benefit and preparation techniques. On other hand, lack of demand by students could be attributed to students' perception on its palatability and therefore preference for white rice becomes steady (Cox and Anderson, 2004). Therefore this study partly confirms the hypothesis that there is no association of nutrition attitude and students dietary practices as it relates to number of

meals consumed but rejects the hypothesis as it relates to frequency of consumption on variety of foods by students.

In this study, association of attitude and nutrition status was positive but not significant. This could be attributed to the fact that attitude does not directly influence nutrition status but help to promote healthy eating habits by influencing food choices. The fact that nutrition status is a sum total of interlinked factors attitude indirectly contributes to nutrition status but attributes such as quality and quantity of food directly influences nutrition status over a period of time. Food choices therefore are presumed to promote healthy lifestyle and consequently healthy status when positive nutrition attitude is based on long term healthy benefits of good dietary practices. This study therefore confirms the hypothesis that there is no association between nutrition attitude and nutrition status of female undergraduate students.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The study has shown that university female students within Nairobi Metropolis have average level of nutritional knowledge and students in Science discipline are more aware of nutrition issues than students in Humanities and Social sciences.

The university students have a positive attitude towards nutrition and there is no significant difference between the disciplines of Science and humanities and Social Science. School and access to mass media plays a key role in enhancing positive attitude towards nutrition practices which can help promote society health and a food conscious society.

Most of the students have normal nutrition status and the prevalence for overweight and/or obese is slightly more in Humanities and Social Science students than in Science students.

Dietary practices of the students are not optimal. Students' meal patterns are inadequate and food choices characterized by highly refined cereal products, high sugar and fat products compared to healthier food choices. Students contradicted themselves in practices despite exhibiting average nutritional knowledge and positive attitude towards nutrition.

The study shows no relationship of students' knowledge and attitude with their nutrition status. However there is significant association of knowledge and frequency consumption of variety of foods. There is also significant difference in attitude and frequency consumption of some foods.

6.2 RECOMMENDATIONS

Based on the results of this research there is need to enhance nutrition education among the students. Universities curriculum may provide common undergraduate nutrition courses for all students particularly disciplines where nutrition and health is not directly or indirectly taught. There is also need for enhancing enabling environment where students can access and exploit sources beyond the conventional classroom set up such as internet to enable them benefit from wide range of authenticated nutritional information.

Eating premises within Universities should be guided by nutrition principles to ensure provision of convenient, nutritious, varied, acceptable and affordable meals for students to discourage reliance on unhealthy convenient fast foods that expose students to future health risks that are preventable.

Peer based support strategy should be encouraged and even formalized within universities as young adults do not seem to realize the long term benefits of healthy dietary practices compared to long term effects of unhealthy food choices. Peer support provides potential for strong linkages and motivation within students' networks. Science students who exhibited higher knowledge than Social science students may help disseminate and influence positive nutrition habits within peer networks.

Further studies can be conducted on students' strategic nutrients intake and factors influencing their dietary practices be investigated since they exhibited average nutritional knowledge and strong positive attitude towards nutrition but non optimal dietary practices.

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ANNEXURES

Annexure 1: Consent form for the students

Hello, my name is **Lucy kinyua** a Masters student in Applied Human Nutrition at the University of Nairobi. It is my pleasure to notify you that you have been identified to participate in this study on **"Influence of Nutritional Knowledge and Attitude on Dietary practices of the female undergraduate students aged 19-25 years in Nairobi Central District, Kenya".**

The study aims at investigating the association of nutritional knowledge, attitude with dietary practices and nutritional status of the female undergraduate students. The results of the study will inform design of the nutrition education intervention strategies targeting student's particularly female students' due to their importance in reproductive and productive roles in the society. Your responses will be treated as confidential and for research purposes only. You are therefore requested to append your signature a as a sign of acceptance to participate in the study.

Sign _____ Date _____

THANK YOU

Annexure 2: Students questionnaire

STUDENTS QUESTIONNAIRE

Questionnaire No. [   ]

A. **General Information**
   (State the answer in the space provided)

   Date _____ (day/Month/Year)   University Name _____

   Campus _____   Year of Study 1___   2___   3___   4___   5___

   Course undertaken_____   Age _____

   Is it: 1. Art based   2. Science based (**Please circle one**)

B. **ANTHROPOMENTRY**

MEASUREMENTS	1st	2nd	Average
Height (cm)			
Weight (Kg)			
BMI			

C. **NUTRITION KNOWLEDGE (tick one answer)**

1. Which one is **not** a function of carbohydrates in our bodies?
   a) Spare protein
   b) To provide energy
   c) Provide fibre
   d) Conversion to fats

2. Which of the following foods are **energy rich** foods?
   a) Bread, tea, sausage
   b) Rice, beans, Ugali
   c) Chapati, sphagetti, potatoes
   d) porridge, peas, bread

3. Which type of foods listed below provides **high protein**?
   a) Peas, avocado, liver
   b) Chicken, green grams, sausage
   c) Liver, eggs, milk, fish
   d) Nuts, cabbage, beans, pawpaw

4. Which one of the following gives **most calories/energy** when a portion is consumed?
   a) 1 teaspoonful Sugar
   b) 1teaspoonful Fat
   c) 1 teaspoonful Honey

5. Recommended good fats are mainly found in?
   a) Dairy products
   b) Vegetable oils
   c) Both (a) and (b)
   d) Not sure

6. Which fat type does the nutrition experts say should be reduced in consumption?
   a) Polyunsaturated
   b) Saturated fats
   c) Monounsaturated
   d) Cis fats

7. The hardened/solid fats contain more of the following fats?
   a) Monosaturated
   b) Polyunsaturated
   c) Saturated
   d) Not sure

8. A healthy woman should consume an average of how much water per day?
   a) 2.0 litres
   b) 1.0 litres
   c) 1.5 liters
   d) Not sure

9. Which of the following vitamins **require fat** to be absorbed by the body?
   a) Vitamin A, B_6, E
   b) Vitamin D, C, K
   c) Vitamin A, B_{12}, K
   d) vitamin A, D, E, K

10. The following vitamins **act as antioxidants**?
    a) Vitamin B, C
    b) Vitamin A, C, E
    c) Vitamin C, B, A
    d) Not sure

11. To prevent anaemia one should consume the following mineral and vitamin?
    a) Calcium and Vit B_2
    b) Iron and Vit C
    c) Boron and Vit C
    d) Iron and B_1

12. What disease or health problem do you think are related to a low intake of fiber?

    ………………………………………………………………..

13. Which mineral and vitamin is good for bone development.
    a) Calcium and Vit E
    b) Selenium and Vit. D
    c) Calcium and Vit. D
    d) Iron and Vit B

14. Which of the following diseases/ conditions **is not** related to excess intake of **sugar and fats?**
   a) Obesity, Cancer
   b) Diabetes, High blood pressure
   c) Osteoporosis ,gout
   d) Atherosclerosis, Hyperlipidemia

15. When should the fruits be consumed?
   a) Before a meal
   b) Anytime
   c) After a meal

16. What is the source(s) of nutrition information you have gained so far?

D. NUTRITION ATTITUDE

Please indicate how much you agree or disagree with each of the following statements.
(Please Tick one answer)

	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
1	Female students should consume three main meals and one snacks in a day to maintain good healthy state.				
2	A fat woman is healthier than a slim woman				
3	Brown Sugar is a healthy alternative to white sugar.				
4	Fermented products are more beneficial than unfermented products.				
5	Traditional vegetables are tasteless and difficult to cook.				
6	Women of reproductive age should take folate supplement 1-3 months prior to conception to avoid neural tube defects to the baby.				
7	Oil/Fat intake is necessary for the body to absorb Vitamin A in foods				
8	It is not easy to achieve a balanced diet as students in Nairobi.				

	Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
9	Maintaining good nutrition status as a student will have good outcome in motherhood.				
10	Fast foods are convenient healthy foods good for female students.				
11	Whole meal products are healthier alternative to refined products.				
12	As we grow older we should eat less of protein, carbohydrates and fats while eat more of fruits and vegetables				
13	Slicing green vegetables before washing does not wash away useful nutrients.				
14	Boiling and steaming are better cooking methods than roasting and deep frying.				
15	It is healthier to take a glass of milk than a glass of soft drink.				

E. DIETARY PRACTICES

1. Where do you take your meals while in college?

2. How many **main meals** do you take in a day? _____

3. How often do you consume the following meals in a week? (**circle one for each meal**)

Breakfast	Lunch	Supper	Snacks
1.Everyday	1.Everyday	1.Everyday	1.Everyday
2.Sometimes	2.Sometimes	2.Sometimes	2.Sometimes
3. None	3. None	3. None	3. None

4. Which snacks do you consume if any snacks?

5. Do you take alcoholic beverages? (**circle one**)   1. Yes   2. No

   If **Yes** how often? 1. Everyday   2. Once/ week   3. Once/month   4.Other specify

6. Do you think you apply the concept of balanced diet when choosing and preparing your foods?   1. Yes   2. No

7. Please indicate the number of times in a week that you take the following foods

Foods Type	Frequency per week			
	Everyday	1-2 times week	3-6 times a week	Never consumed
1.**Cereals based foods**				
White rice				
Brown rice				
Ugali (grade 1 flour)				
Chapati (white)				
Chapati (brown)				
Breakfast cereals				
White bread				
Whole bread				
Cakes				
Biscuits				
2.Roots and Tubers				
Cassava/yams				
Arrowroot/sweetpotatoes				
Potato chips				
Potato crisps				
Mashed/baked potatoes				
3.Milk and milk products				
Fresh milk				
yoghurt				
Ice cream				
4.Meat, poultry& product				
Eggs				
Fish and sea food				
Meats, pork,goat,lamb, chicken				
sausages				
Burgers				
5.Legumes and nuts e,g Beans, groundnuts, legumes, lentils, peas				
6.Fruits e.g mangoes,avocado,pawpaw				
7.Vegetables e.g Kales.spinach,Cabbage				

	Everyday	1-2 times week	3-6 times a week	Never consumed
8. Sweets				
Sugar / honey				
Candies (sweets)				
Chocolates				
9.Beverage				
Fruit squash				
Fresh juice				
Tea/milo/cocoa				
Sodas				

Thank you for your response

Annexure 3: Research assistants training schedule

 RESEARCH ASSISTANTS TRAINING SCHEDULE

Time	Topic	Learning aids	Learning methods
8.30 am-10.30am	Nature of study and its objectives	Handouts	Lecture
	BREAK		
11.00am-1.00pm	Data collection Review of questionnaire	Sample questionnaire Measuring instruments	Demonstration Role play
	LUNCH		
2.00pm- 5.00pm	Code of conduct during data collection period. Work schedule	Work Schedule	Lecture

Annexure 4: Nutrition knowledge marking scheme

Questions	Maximum marks for correct response

1   Which one is **not** a function of carbohydrates in our bodies?   1
       d) Conversion to fats

2   Which of the following foods are **energy rich** foods?   1
       c) Chapati, sphagetti, potatoes

3   Which type of foods listed below provides **high protein**?   1
       c) Liver, eggs, milk, fish

4   Which one of the following gives **most calories/energy** when a portion is   1
consumed?   b) 1teaspoonful Fat

5   Recommended good fats are mainly found in?   1
       b) Vegetable oils

6   Which fat type does the nutrition experts say should be reduced in consumption?   1
       b) Saturated fats

7   The hardened/solid fats contain more of the following fats?   1
       a) Trans fats

8   A healthy adult woman should consume an average of how much water per day?   1
       a) 2.0 litres

9   Which of the following vitamins **require fat** to be absorbed by the body?   1
       d) vitamin A, D, E, K

10   The following vitamins **act as antioxidants**?   1
       b)Vitamin A, C, E

11   To prevent anemia one should consume the following mineral and vitamin?   1
       a) Iron and Vit C

12   What disease or health problem do you think are related to a low intake of fiber?   1
       Constipation, piles, colon cancers, diverticulars

13   Which mineral and vitamin is good for bone development.   1
       a) Calcium and Vit. D

14   Which of the following diseases/ conditions **is not** related to excess intake of **sugar**   1
and fats?
       c) Osteoporosis, gout

15   When should the fruits be consumed?   1
       b) Anytime

Annexure 5: Nutrition attitude score guide

	Statement	Type of statement	Strongly Agree	Agree	Disagree	Strongly Disagree	Correct
1	Female students should consume three main meals and one snacks in a day to maintain good healthy state.	+	4	3	2	1	3
2	A fat woman is healthier than a slim woman	-	1	2	3	4	3
3	Brown Sugar is a healthy alternative to white sugar.	+	4	3	2	1	3
4	Fermented products are more beneficial than unfermented products.	+	4	3	2	1	3
5	Traditional vegetables are tasteless and difficult to cook.	-	1	2	3	4	3
6	Women of reproductive age should take folate supplement 1-3 months prior to conception to avoid neural tube defects to the baby.	+	4	3	2	1	3
7	Oil/Fat intake is necessary for the body to absorb Vitamin A in foods	+	4	3	2	1	4
8	It is not easy to achieve a balanced diet as students in Nairobi.	-	1	2	3	4	3
9	Maintaining good nutrition status as a student will have good outcome in motherhood.	+	4	3	2	1	3
10	Fast foods are convenient healthy foods good for female students.	-	1	2	3	4	3
11	Whole meal products are healthier	+	4	3	2	1	3

	alternative to refined products.			68			
12	As we grow older we should eat less of protein, carbohydrates and fats while eat more of fruits and vegetables	+	4	3	2	1	3
13	Slicing green vegetables before washing does not wash away useful nutrients.	-	1	2	3	4	4
14	Boiling and steaming are better cooking methods than roasting and deep frying.	+	4	3	2	1	3
15	It is healthier to take a glass of milk than a glass of soft drink.	+	4	3	2	1	3
						Total	47

Annexure 6: Letter seeking authorization from universities

Ms. Lucy W. Kinyua
P. O. Box 12880 - 00400
Nairobi.

———————————————

———————————————

———————————————

REF: AUTHORITY TO COLLECT RESEARCH DATA

I am a student pursuing a Master of Science degree in Applied Human Nutrition at the Department of Food Science, Nutrition and Technology Kabete Campus of the Falculty of Agriculture University of Nairobi.

I will be conducting a research on *"Influence of Nutrition Knowledge and Attitude on Dietary Practices and Nutritional Status of Female University Students aged 19-25 Years in Nairobi Central Business District, Kenya"* During sampling _____University was purposively chosen for data collection. The study targets female students using self administered questionnaires on selected female students between July and August 2012.

The purpose of this letter is to request your authority to administer questionnaires to students. Please find attached copies of the introductory letters from my supervisor and the head of Applied Nutrition Programme.

Yours Faithfully,

Lucy W. Kinyua

Annexure 7: Letter of authorization University of Nairobi

UNIVERSITY OF NAIROBI
OFFICE OF THE DEPUTY VICE - CHANCELLOR
(Research, Production & Extension)
Prof. Lucy W. Irungu B.Sc., M.Sc., Ph.D.

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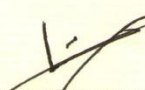
UON/RPE/1/12

June 26, 2012

Ms. Lucy W. Kinyua
C/O Dean, Faculty of Agriculture
CAVS

Dear Ms. Kinyua,

APPROVAL TO COLLECT DATA AT THE UNIVERSITY OF NAIROBI

I write to inform you that your request dated June 17, 2012, to collect data at the University of Nairobi towards your MSc. project titled: *"Influence of Nutrition Knowledge and Attitude on Dietary Practices and Nutritional Status of Female University Students aged 19-25 Years in Nairobi Central Business District, Kenya"* has been approved.

You are however required to deposit a copy of your research findings with the Vice-Chancellor, UoN on completion of your research.

LUCY W. IRUNGU
DEPUTY VICE-CHANCELLOR
(RESEARCH, PRODUCTION AND EXTENSTION)
&
PROFESSOR OF ENTOMOLOGY

c.c.   Vice-Chancellor
        DVC, (AA)
        DVC, (A&F)
        DVC, (SA)
        Principal, CAVS
        Dean, Faculty of Agriculture

ISO 9001:2008 CERTIFIED

Annexure 8: Letter of authorization Kenya Methodist Universities

UNIVERSITY OF NAIROBI

COLLEGE OF AGRICULTURE & VETERINARY SCIENCES

FACULTY OF AGRICULTURE

APPLIED HUMAN NUTRITION PROGRAMME

DEPARTMENT OF FOOD SCIENCE, NUTRITION & TECHNOLOGY

TEL: 3592734-9 Ext: 27206 E-mail: dftn@uonbi.ac.ke

5th June, 2012
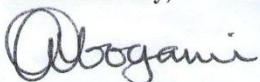
TO WHOM IT MAY CONCERN

RE: LUCY WANJA KINYUA - A56/69489/11

Ms. Wanja is our 1st year student pursuing an M.Sc. Degree in Applied Human Nutrition, in the Department of Food Science, Nutrition and Technology.

Ms. Wanja has completed her course work in May, 2012 and as part of the degree requirements, she has to conduct research and prepare a dissertation. For this purpose, Ms. Wanja would like to conduct a study on *"The Influence Knowledge and Attitude on Dietery Practices and Nutrition Status of Female University College Students Aged 19 – 25 Years in Nairobi's CBD".*

Kindly grant Ms. Wanja any assistance she may need towards this course.

Yours faithfully,

HEAD
APPLIED HUMAN NUTRITION

DR. ALICE M. MWANGI
HEAD
APPLIED NUTRITION PROGRAMME

AMM/fs

Annexure 9: Letter of authorization Kenya Polytechnic University College

UNIVERSITY OF NAIROBI
COLLEGE OF AGRICULTURE & VETERINARY SCIENCES
FACULTY OF AGRICULTURE
APPLIED HUMAN NUTRITION PROGRAMME
DEPARTMENT OF FOOD SCIENCE, NUTRITION & TECHNOLOGY
TEL: 3592734-9 Ext: 27206 E-mail: dftn@uonbi.ac.ke

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HEAD
APPLIED NUTRITION PROGRAMME

AMM/fs

Female Student in Kpuc
Degree programmes in S43

Note: We shall provide assistance when
valid research permit given

ACADEMIC REGISTRAR
KENYA POLYTECHNIC UNIVERSITY
COLLEGE

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