SOCIO-ECONOMIC AND DEMOGRAPHIC DETERMINANTS OF DIETARY PRACTICES AMONG YOUNG ADULTS (19-24 YEARS) ATTENDING COMMERCIAL COLLEGES IN NAIROBI'S CENTRAL BUSINESS DISTRICT, KENYA

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DECLARATION

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

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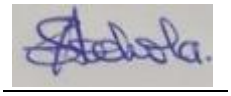
3. Signature  Date: 27/09/2023

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DEDICATION

This work is dedicated to my family, church and friends who gave their unrelenting support during this time of my study. It is also dedicated to the Ministry of Education and Ministry of Health who will help develop policies to facilitate healthy eating among college students.

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ABBREVIATIONS AND ACRONYMS

BMI -	Body Mass Index
CBD -	Central Business District
cm –	Centimetres
g -	Grams
JAMA -	Journal of American Medical Association
KCSE -	Kenya Certificate of Secondary Education
Kg -	Kilograms
KU-	Kenyatta University
NACOSTI -	National Commission for Science, Technology and Innovation
NCBD -	Nairobi Central Business District
NGOs -	Non-Governmental Organization
NHANES -	National Health and Nutrition Examination Survey
OCD -	Obsessive–Compulsive Disorder
SPSS -	Statistical Package for Social Sciences

DEFINITION OF TERMS

College – a tertiary institution of learning for vocational, technical or professional instruction where learners get knowledge and skills for their professions (Mattern et. al., 2014).

College students – students who are in their middle level of learning to get vocational, technical, or professional knowledge skills for their professions (Mattern et. al., 2014).

Commercial College – colleges that are in operation in search of profits as they give instruction in commercial knowledge and business (Mattern et. al., 2014).

Emerging adulthood - typically defined as 18–25 years of age which is a period marked by important transitions such as leaving home and increasing autonomy in decision-making (Arnet, 2014).

Young adults – young people past adolescent between the age group of 18 – 24 years of age mostly college attending persons (WHO, 2015).

OPERATIONAL DEFINITION OF TERMS

Central Business District – The facility of emphasis of an urban area. It is the office, commercial, social centre, as well as retail facility of the urban area and also usually is the main aspect for transportation systems.

Demographic d**eterminants** – These are characteristics such as sex, marital status, religion, age, ethnicity, and household size.

Nutritional status – This is the disorder of the body determined due to the diet plan as well as is dictated next to anthropometric dimensions like Physical body Mass Index, Waistline circumference, as well as Hip area.

Socio-economic determinants – These include characteristics such as income, occupation, and guardians' financial support.

ABSTRACT

Attending a college or university is an experience that is stressful to many young adults as they get introduced to an unfamiliar food environment full of economic constraints. As a result, they may develop poor dietary practices as a way of coping with this stressful environment. Evidence suggests that college students consume sub-optimal diets, hence, they tend to present with the triple burden of malnutrition. There is minimal data on the dietary practices of students attending commercial colleges in Kenya. The purpose of this study was to explore the socio economic and demographic factors related to dietary practices as well as health and nutrition status of commercial college students 19-24 years of age. A sample of 385 students was selected using proportionate stratified sampling coming from 10 purposively picked colleges in Nairobi's Central Business District (NCBD). Data was collected using a pre-tested researcher-administered semi-structured questionnaire that consisted of socio-demographic variables, a 24-hour dietary recall and a food frequency questionnaire. Key informant interview guides and observation checklists were also used to collect information on the food frequently consumed by the participants, food prices and types of food outlets available in the colleges. Food-related data analyses were conducted using the South African Medical Research Council (SA-MRC) Food Finder 111 (2016) package while the general data was analysed using the SPSS version 24 (2017) package. Statistical significance was set at $p < 0.05$. Overall, the mean energy, protein, fat, carbohydrate, added sugar, dietary fibre and sodium intake were respectively 5347kJ±, 138±132g, 138g±132g, 57g±50g, 172g±203g, 16g±15g, 12g±15g and 1244mg±1551mg. Females had higher BMI indices than males (22.67kg/m^2 versus 21.48kg/m^2, $p=0.010$). They also had significant waist-to-height ratios (WTHRs) when compared to males (0.49 versus 0.47 $p=0.005$). Males on the other hand had significant waist–to-hip ratios (WHRs) than females (0.85 versus 0.81, $p<0.001$). In this case, being male decreased the likelihood of the students having BMI $\geq$ 25kg/m^2 ($r= 0.203$, $p<0.001$); while having 2 children or more and attending college for 2 years or more increased the likelihood of the students having BMI $\geq$ 25kg/m^2 ($r=7.682$, $p=0.002$ and $r= 1.710$, $p=0.044$). The socio-economic determinants of dietary intake were; being a food decision maker, source of water and type of cooking fuel while socio-economic determinants of nutritional status were the source of income and monthly food expenditure. Furthermore, the demographic determinants of dietary intake were the tribe students belonged to, their year of study and the number of children and family size the students had while the socio-demographic determinants of nutritional status were age, sex, and religion. No dietary intake factors were significantly associated with the BMI $\geq$ 25kg/m^2. The food outlets were found to be selling mostly high fat and sugary foods and snacks. The commercial colleges did not have guidelines on the type and nutritional quality of food that should be sold. We therefore recommend that the colleges liaise with food outlets to encourage the sales of healthy food and consult nutrition experts to facilitate provision of information to the students regarding healthy food. The information from this research will therefore be useful to tertiary institutions and stakeholders such as the Ministry of Higher Education, Science and Technology, Ministry of Health, colleges in the Nairobi Central Business District and relevant Non-Governmental Organisations on the current dietary intake and nutritional status of students in Nairobi CBD.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The period of transitioning to being young adult from adolescence is associated with changes in lifestyle that have health consequences that are negative (Nelson et al., 2008) therefore this age group increases recognition as a suitable opportunity for creating wellness as well as disease prevention (Nelson et al., 2008). The diets of the young adults well as physical activities typically deteriorate resulting into undesired weight changes associated with limited access to well-balanced diet and also recreation centres when students start college (Nelson et al., 2008; Selkowitz, 2000; Stockton & Baker, 2013). Indeed, studies in Bogalusa, Louisiana have shown suboptimal dietary intake and unhealthy nutritional status among young adults aged 19–28 years (Demory-Luce, Morales, & Nicklas, 2004). Moreover, there is evidence that young adults start to engage in risky behaviours such as alcohol consumption, smoking, and substance use when they are in college (Kipping et al., 2012). These students therefore loose or put on weight derivable to factors that are socio-economic, demographic and also food items in the environment (Goodwin et al., 2011). Unhealthy dietary choices and malnutrition may lead to unfavourable physiological consequences in college students in the coming days (Tirosh, 2011). Several interventions therefore need to be put in place so as to prevent gain in weight gain and the declining in the quality of diet in these students during their years in college (Stockton & Baker; 2013 Selkowitz, 2000).

Wahl (1999) revealed that to acquire ideal status in nutrition, teenage males and females needs 2200 and 2800 calories daily respectively. This energy needs to be loaded with vital nutrients and because young people are still developing, these rules apply on them. A Bogalusa Longitudinal research that complied with a bi-racial associate of adolescents (15 years of age) right into younger the adult years, revealed that there is significant decline in the quality of diet

as this age group advances through this growth period (Nicklas, Demory-Luce, & Morales, 2004). Researches on countries that are Nordic in University of Uppsala Sweden by the Medicine Division (Samuelson, 2000) showed that food items practices among young adults are identified through poor dish trends, snacks and snacking, thereby bringing about 25-35% of their daily intake of energy. The same research reveals that smoking cigarettes and socio-economic health conditions were additionally linked to the young adults' poor dietary routines, along with female consuming essential nutrients and iron that were actually listed below the Nordic suggestions.

Ulla Díez (2010) recommends that socio-economic as well as demographic factors related with intake of diet affect how they choose food items and also meal patterns of the students. Additionally, study for review administered through Campbell et al., (2008) revealed a decreased physical activity with time amongst university student. A research performed through Borreli (2014) students 19-24 years of age in the Western Oregon University showed that 59% of students were exposed to malnutrition. A related study through Semproli et al., (2007) that was administered in Western part of Kenya among children of Luo indicated that they typically had undernourishment, along with teens being the most vulnerable to serious under-nutrition.

Study findings by Cancel-Tirado (2014) among college students in Kenya revealed that 59% had insecurities of food which is a concern to options of healthy food. When comparing, the percentage in U.S. College students with these similar concerns are only 14.9%. These high alarming levels of insecurities of food are attributable to a number of factors for instance the cost of higher education surpassing inflation in the past years, high cost of living, and medical expenses. In addition, more students attending college come from disadvantaged households, and with these changing demographic trends it makes it a more issue of significance than in the past.

The Central Business District of Nairobi is a busy region in Kenya, along with many colleges that are commercial being situated at the central part in the city. Majority of the colleges have a

populace of students varying from one hundred to 150 (Development Directory Site; Education of Africa; Nairobi Colleges, 2019). These colleges offer courses that are business and also non-business in addition to international languages at Higher Diploma, Diploma, Degree and Certificate levels which take 1 to 3 years. There is scarce data concerning demographic and socio-economic determinants, practices of diet and status of nutrition among these students attending the Nairobi Colleges in Kenya hence, a need for studies to be carried out within this scope of research.

1.2 Problem statement

American College Health Association states overweight among college students in America has gone up from 27.4% in 2006 to 29.2% in 2011. This is due to sedentary lifestyle, food insecurity and unhealthy eating where food insecurity is a major factor contributing to the high prevalence and change. Universities, colleges and health officials need to come up with strategies to address the overweight epidemic and consequently its detrimental health effects. Kenya experiences food and nutrition insecurity being contributed by factors such as economic environment that is unstable, the rise in food and fuel prices, budgetary allocation being insufficient, weather conditions being adverse, and also a weak sector coordination. More so malnutrition that exists in various forms like micronutrient deficiencies, acute and chronic under nutrition as well as obesity and being overweight (Kenya National Nutritional Action Plan, 2011-2017). This affects majority of people in the Kenya's population since large number of the households rely on diets found to be without nutritional variety as well as nearly a third of Kenyans being constantly meals insecure. In connection to this as much as four thousand individuals are going to demand food help at a specific provided point where a lot of families call for day-to-day caloric and nutritional intake. There have been current food prices rates hikes that pose additional restricted food accessibility in Kenya (Kenya National Nutritional Action Plan, 2011-2017).

Data shows that young adulthood is actually a time period that is dangerous for the development of obesity, underweight as well as additionally unhealthful dietary practices and a decrease in exercising (Nelson et cetera, 2008; Nelson et cetera, 2007). The dietary practices of these young people are actually discovered to fall short of recommended vital nutrients, featuring iron, potassium, calcium, folic acid, as well as fibre while they are in excessive of salt and calories (Barley et cetera, 2010; Ervin et cetera, 2004). There is also a revelation that these young adults are threatened by obesity, heart attacks and diabetic issues. Inadequate iron and also folic acid intake in female additionally increase the risk of having children with neural defects, among other health issues (McDowell et al., 2008). Dars et al., (2014) recommend that reduced haemoglobin levels and nutritional status relate with menstrual cycle irregularities and the connected complications in various age groups in female.

There is actually scarce data when it comes to meal patterns and practices of food among young adults in Sub-Saharan Africa. The few existing qualitative studies using focus group discussions have revealed that factors that are interpersonal like social and economic situations; intrapersonal like temptation and lack of discipline; and environmental like time constraints and access to un-healthful food are barriers that are major to good nutrition in the students (Greaney et al., 2009). This research was therefore directed to determine the dietary practices and nutritional status of young adults attending Kenyan colleges in the Nairobi CBD as well as study the determinants that shape both these students' dietary practices and nutritional status.

1.3 Purpose of the study

To determine the demographic and socio-economic determinants of practices of diet and status of nutrition of students 19-24 years old attending the commercial colleges in the Central Business District of Nairobi, Kenya.

1.4 Objectives

1. To determine the socio-demographic and socio-economic characteristics of students 19-24 years of age attending colleges in NCBD.
2. To determine the dietary practices of students 19-24 years of age attending colleges in NCBD.
3. To determine the nutritional status of students 19-24 years of age attending colleges in NCBD.
4. To identify the socio-demographic determinants of dietary practices and nutritional status of students 19-24 years of age attending colleges in NCBD.
5. To show the relationship between dietary intake and nutritional status of students 19-24 years of age attending colleges in NCBD

1. 5 Hypotheses

Ho_1: There is no significant relationship between socio-economic characteristics and dietary practices of students 19-24 years of age attending colleges in NCBD

Ho_2: There is no significant relationship between socio-demographic characteristics and dietary practices of students 19-24 years of age attending colleges in NCBD

Ho_3: There is no significant relationship between socio-economic characteristics and the nutritional status of students 19-24 years of age attending colleges in NCBD

Ho_4: There is no significant relationship between dietary intake and nutritional status of students 19-24 years of age attending colleges in NCBD

1.6 Significance of the study

The data acquired about patterns of food consumption will certainly be of help to relevant stakeholders like Ministry of Health, Non-Governmental Bodies, along with the College managers to aid develop healthy food environment in colleges. Identifying the factors that determine the dietary intake of 19-24 years of age in college students in Nairobi may additionally

help in the development of an intervention programme to help set up satisfactory healthy lifestyles and also as a result bring about meeting the Sustainable Growth Objectives (SDGs) and Kenya vision 2030. The research will definitely additionally create a valuable body of knowledge in health and nutrition research amongst young people.

1.7 Delimitations of the study

This research was delimited to assessment demographic as well as socio-economic determinants of practices of diet and status of nutrition. It did not focus on other factors such as cultural, political, technological, legal, knowledge, and attitude. It was conducted within NCBD in the County of Nairobi therefore generalizing the findings cannot be done except in similar contexts.

1.8 Limitations of the study

Since this research was cross-sectional (i.e. the data obtained was a time point), therefore it did not illustrate the variations in the seasons of diet and the status of nutrition for the students.

1.9 Conceptual framework

The study used the theoretical framework on the dietary intake determinants among students in college (Figure 1.1) which tailored and modified from Jones and Bartlett framework (2009). It illustrates that intake of diet among students in colleges results from a number of factors that are underlying.

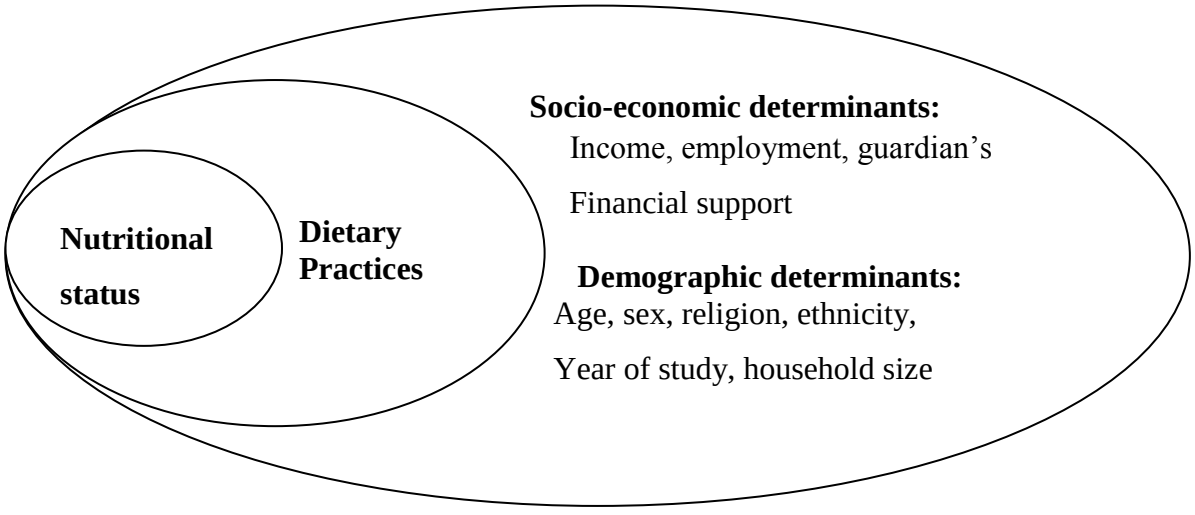


Figure 1.1: A conceptual framework on the determinants of dietary practices and nutritional status of students attending commercial colleges

Source: Adapted and modified from Jones and Bartlett (2009).

In Figure 1.1 shows that components of intake of diet as well as nutritional status consist of: i) factors that are socio-economic like income, work, and financial support of guardians, as well as ii) socio-demographic variables like age, sexual, faith, race, education and learning amount and household dimension.

For instance, people who have more financial support or those who are employed have more income thus are able to afford better meals. A study in Korea through Korean National Health as well as Nutrition Examination Questionnaire (2009) revealed that unemployment significantly relates to a greater overweight risk in the Korean population.

The American Academy of Paediatric medicines research study has actually presented that ethnicity (race), socioeconomic status and sex are very likely to become the contributors crucial to childhood health, as well as adult predictors to wellness status (McCarthy, Christoffel, Dungy, Gillman, Rivara, & Takayama, 2000). The variables above establish the practices of diet of these students which as a result recognizes their overall status of nutrition. This research concentrated on characteristics that are socio-economic and demographic.

1.10 Assumption of the study

The study assumes that the respondents will give honest and truthful answers which upon the gathered data by researchers were reliable and valid for correlation purposes. The research was additionally believed to be relevant in a timely way to the respondents that is believed to result into an outcome that provides a knowledge basis to the question at hand.

CHAPTER TWO

LITERATURE REVIEW

2.1 Demographic factors that influence college students' dietary intake

Studies done previously show that there is a relationship between demographic characteristics and dietary behaviour of students in colleges (Driskell et al., 2005). Studies by Racette et al., (2005), Mooney and Walbourn, (2001) showed that there are differences in gender as it comes to choosing of food. Park et al., (2009) in their study among students in Urban Areas of Korea discovered that most of young women had concerns regarding their weight and body image therefore had a strict eating which was actually a lot more common than their male equivalents. These students who were on diet had a total energy intake with low mean (1840 KCal) and 16.3%, 57.2%, and 24.0% intakes of energy from protein, fat, and carbohydrate, respectively together with other nutrients that are essential. The frequency to overindulge as well as night eating rose in this particular group as a result of frustration regarding physical body weight, dieting as well as image. Another research administered by Sergent and Toping (2001) amongst the students in the North Carolina University with ages between 19 to 25 years shows that African-American males (15%) and African-American females (16%) had BMIs $\geq 30 kg/m^2$. There is limitation in literature when it comes to intake of diet of students in colleges in the Sub-Saharan Africa, particularly in Kenya.

Odgen (2014) in his research among men in the United States revealed that, twenty seven point four percent of folks along with a university degree had overweight in comparison to 32.1% of the ones that possessed less than education from senior high school, nevertheless this variation was not of any statistical significance. 23.4% of the women holding a degree in college had obesity and this prevalence was significantly less than that of 42.1% of women with high school education was less. There seemed an effect of threshold in both genders, where obesity prevalence had tendency of being low among persons with degrees from college in comparison to those whose education was lower than a college degree. Poor literacy of health may be

actually adding aspect to persistent health conditions, such as being overweight as well as its own related diseases. Weight problems as well as its own associated diseases are major issue globally where grownups who are more than 1.4 billion globally being classified as being overweight (body system mass mark [BMI] ≥ 25), while more than 200 million males and close to 300 million females are actually overweight (BMI ≥ 30; WHO, 2012). Weight problems places financial burden in the US at an approximated $75 billion every year (Kennen et al., 2005). The Native Hawaiian, other Pacific Islanders (NHOPI) and Indigenous Hawaiian nation's frequencies of excessive weight are just one of the best worldwide. Analysts that examined multi-ethnic samples in Australia as well as the United States discovered that men have more likelihood of possessing higher BMIs than ladies (Kifle & Desta, 2012). In multi-ethnic samples, this relationship represented an inverted U-shaped curve which means that the BMI initially increases with age, flattens at adulthood, then tends to decrease later in life (Desta & Kifle 2012).

2.2 Socio-economic factors influencing college students' dietary intake

Deliens et al., (2014), revealed that prices of food and the individual budget influenced food choices of students in a Belgian University. These students often tend to invest additional amount of money on undesirable and fast food because they thought that it is less costly than eating a meal that is well-balanced. Seventy-point five percent reported that they have previously borrowed funds to get food; along with 53.3% reporting that they had actually borrowed food. Moreover, 9.2% of these students reported that they at times sold their belongings to get money to buy food, while 1.6% actually admitted that they had stolen food. This data shows the desperate measures that college students take to meet their food requirements. These measures then tend to affect their dietary practices, since majority of these struggling students are trying to develop coping mechanisms. In his study Patton-Lopez (2014) revealed that students who had insecurity of food worked approximately eighteen hours per week and some up to forty two hours but the need of money they had come across make up for the effects of having an income

that was actually much better to promote the cost of eating healthy. The findings do not support employment as the main solution to the major concern of health which affects more than 50% of the population in college. The inability access healthy foods makes students consume foods that are unhealthy, leading to lack of essential minerals and vitamins sustain an individual's health.

The association for being obesity and socio-economic status varies by race, sex ethnic and group. In girls, especially the non-Hispanic white coloured ladies, as income reduces weight problems occurrence enhances while one of Non-Hispanic and also Mexican-American black males being overweight reduces along with reduced income. Patton-Lopez (2014) states that there are high prevalence levels of obesity among income earning women than those below the poverty line. In males, prevalence of being overweight is actually generally similar in any way to amount of revenue and tends to become a little greater at higher amounts of income (Patton-Lopez 2014).

Jolliffe (2011) revealed that the policies, the media, and some writing in academic have a tendency give a negative picture on correlation of significance between income and obesity. Contrary he studied the U.S.'s National Health and Nutrition Examination Survey (NHANES) and found that there no difference that was statistically significant in obesity or overweight prevalence among poor and non-poor people. A substantial good connection in between being overweight and income was actually nonetheless located in study carried out in low and also countries that are middle-income (Finlay, Neuman, Subramanian & Johnson, 2011; Ozaltin, Subramanian, Johnson & Perkins, & 2011). The analysis additionally suggested that middle as well as reduced-income countries might help identify whether there is any significance between earnings as well as being overweight.

2.3 Dietary intake among students in tertiary institutions

Young adults have been found to fall short of the recommended dietary practices outlined under the Americans Dietary Guidelines (2010) and also the National Cancer Institute (2010). The young adults' intake of uneven diet regimen raises their risk to non-communicable diseases

(NCDs) (Flegal et al., 2010; Higgins; Dietz, 1998; et al., 1988). Consumption of various essential nutrients, featuring iron (for females), folic acid, potassium, calcium, as well as fibre in this particular age bracket of 18-24 years is actually less than acceptable, while calorie intake goes beyond the acceptable amount (Barley et al., 2010; Racette, 2005; Ervin et al., 2004;). Barley et al., (2010) along with Ervin et al., (2004) additionally revealed a lowered fibre intake along with vitamin C within the particular bracket due to less intake of fruits as well as also vegetables. Indeed, Hilga et al., (2017) have recently shown that students attending 40 universities across Germany have changed their eating behaviours since matriculation. Foods that were affected by this change were; fruits, vegetables, meat, fish, and regular meals. The main factor implicated in this change was high prices of healthy foods at food outlets and retail shops.

Furthermore, according to Dodd et al., (2010) of 410 students attending a United Kingdom University college sixty six percent consumed below the fruit servings that are recommended and vegetables per day; while 56% had binge drinking at least once a week. A research by Neumark-Sztainer et al., (2010) among 4746 Minnesota urban youths revealed that only 29.5% of the females and also 42.5% of the males fulfilled their everyday nutrient intakes that are recommended. The National Health and Nutrition Examination Survey (NHANES) (2008) conducted in North America done showed that using lunch counter was very high in young people, consuming fast food as much as 52%. Another research administered by Sergent and Topping (2001) among the North Carolina University students, aged 19 and 25 years showed that only 64% of them had BMI at acceptable levels as linked with their sub-optimal dietary intakes. Healthy practices and also nutritional behaviours are actually a significant issue for public health typically with groups that are susceptible like teens as well as college students (Al-Rethaiaa et al., 2010). There is additionally mental stress and anxiety associated with this emerging adulthood showing an increase of psychological disorders risk too (Misra & McKean, 2000; Sacker & Cable, 2010; Twenge et al., 2010).

Cardinal (2014) in his study in Oregon State University revealed that female students' fibre intake was lower, while male fat intake was more in their diet. Overall, the females eating habits were better which include more frequency eating in the dining halls of colleges, skip few meals, and label reading of foods. Students were found to skip meals fairly frequently, which accounts some lack of fruits and vegetables. Fewer meals were consumed, due to the fact that average students didn't always eat even a fruits serving or even vegetables in a day, which way lower than the guidelines by United States Dietetic Association (USDA). Both male and also female consumption of fats coming from excess fat was much more than 30 percent, going over the USDA suggestion every week. Students that reside away from college develop some unhealthy meal routines that reveal a fast modification of the social diet regimen in a direction that is undesired and also customization of way of life towards actions that are globalized (El-Qudah, 2008; Nasreddine et al., 2005; Popkin and the like, 2005). There is an increase of fast food eating among students (Bodur et al., 2010; Tayyem et cetera, 2008; Musaiger and the like, 2011). attributable to factors such as; not being home for several hours, stress of researching, being with friends, restriction in meals choices in the colleges, accessibility of fast foods together with the influence by the media (Pei-Lin, 2004).

A study by Dennis Eggett, Mickey Trockel, and Michael Barnes, (2000), found a positive relationship in eating breakfast and grade-point averages for the first-year college students. Limited finances, changes in lifestyle, peer pressure, and food access contribute to unacceptable eating patterns. The students tend to have limited diet variety often turning to high-fat snacks as result of underestimating sizes to serve which means that they will eat way more than what they think. There is a pattern of skipping meals often in weight management and intake of food is often disordered or not in existence. There are also daily schedules of class and work, as well as each semester which also structures eating patterns of the students. Most of the literature on intake of diet among tertiary institution students presented above was mostly from studies

undertaken in developed countries. There is however a dearth of literature on similar situations in the Sub-Saharan Africa, particularly in Kenya.

2.4 Nutrition status of students in tertiary institutions

The overweight as well as obesity prevalence are higher among young people internationally (WHO, 2004) where the health's professional as well as college students are not spared of these. To become particular, an evidence that is strong reveals a higher occurrence of overweight and also weight problems among university students in South Africa, USA (United States), Japan, Pakistan (Huang et al., 2003; Sakamaki et al., 2000, 2005; Steyn et al., 2000; Zafar et al., 2007). Indeed, 20.5 % as well as 6.2 % of the Pakistan students of medicine (Zafar et al., 2007); 5.8 % in addition to 1.2 % of the Japan students' college (Sakamaki et al., 2005). There is also 35 % of United States students in college as well as 25% of extremely first year college student in South Africa (Steyn et al., 2000) having actually been identified to become overweight as well as also obese. This prevalence connects with several chronic health relevant disorders that are going to ultimately put pressure on health care units around the globe (WHO, 2004). In yet another study carried out by Sergent and Topping (2001) among North Carolina University students aged 19 to 25 years, merely sixty four percent had satisfactory BMI levels. According to Talianova et al., (2010) these overweight occurrence is actually much higher in college students when matched up to their college-attending equivalents. Of the 1020 trainees aged 15 to 20 years who were attending higher schools or even colleges in East Bohemia, the highest possible prevalence of physical body fatty tissue percent (30.3%) was found in the 20-year-old team, and merely this 20-year-old team recorded values of class III excessive weight among young adults (0.2 %). These varieties were actually found not to be related to gender.

Several studies show significance in the relationship between high BMI among college students, skipping of breakfast, catching cold, stress and chronic disease (Smith, 2003; Keski-Rahkonen et al., 2003; Kumar et al., 2004; Berkey et al., 2003). Another research through Tayyem et al.,

(2008), discovered that males (30%) as well as females (19%) of students were actually over weight whereas the overweight were actually 6.6% among male and 5.3% of students who are female. There was actually no significant relationship identified between female and male students with regard to being overweight or even obese. Breakfast was skipped daily by both males 28% and females 30%, whereas 80% of male students took on their dinner every day; only 44% of female students took dinner daily. Students reporting consumption of fast foods on daily basis were less than 5%.

Akinyemi and Ibraheem (2016) in their study among Queens College students Nigeria showed that majority of them were lacking most nutrients and they also had inadequate energy intake in their diet. There was malnutrition among students in boarding school which has damaging effects that are long term on the students as well as the country at large. This ends up being worrying in the event where students are very seriously famished lacking some essential nutritional requirements in spite of exorbitant boarding costs billed on their parents. These findings for are similar to another study among urban and rural Nigerian adolescents where there were nutritional deficiencies amongst all of them (Ijarotimi, 2004; Okwu et al., 2007). Most of the literature concerning the status of nutrition tertiary institutions students presented above was majorly found from studies undertaken in developed countries. There is however a dearth of literature focusing on similar situations in the Sub-Saharan Africa, particularly in Kenya.

2.5 The food environment of colleges

Students registered in colleges possess direct exposure to environment of food that is featured by food items rich in energy, fat, as well as added sugar, and also reduced in nutrient density (Habmaire, Levitsky, & Mrdjenovic, 2004). The choice about what to consume for students is really made in a surrounding without nutrition labelling readily available, i.e. casual meals setting (Nelson et al., 2008). Research by conducted by Racette (2005) shows that as much as fifty% and above of students consuming higher excess fat, pan fry or perhaps processed food.

The NHANES study (2008), performed in The United States suggested that fast food establishment use is the best amongst young adults, along with as high as 52% of 20 to 29 years reporting to eat at the fast-food outlets. The environment has an impact on the physical activity and eating habits college students which has been identified in America, with obese college students being estimated to be approximately 36% (American College Health Association, 2006).

In majority of colleges, the first-year students tend to eat most if certainly not all of their primary foods on-campus. All in all full in eating on-campus restricts healthy eating and prevention of being overweight therefore chronicling the weight gain one of first-year university students. A recent study by Williams (2014) on intakes of energy in US students found that energy from stores was 63%, while that from fast food outlets was only 12%. Another study by Grier (2013) examining the sources of empty calories (total energy from solid fat and added sugar) across schools, food stores that are retail, and restaurants of fast-food in the US show that from stores provided 33% of students' empty calories. Several pilot studies in the UK, suggest the major calories sources for students may be from the food stores on their way to and also from the school or those located near the schools.

Several food outlets tend to surround the schools. In England, there is longitudinal evidence suggesting that a number of food stores (convenience stores and grocers) and outlets of takeaway food schools have increased in the recent years near schools (Smith, 2013). Green et al., 2020 studied fast food outlets in Nairobi CBD and found that informal vendors dominated them. There was existence of wide diversity of foods, with healthy foods being highly available like staples and vegetables. They also sold unhealthy foods like beverages that are sugar-sweetened, fried and processed foods. Almost 50% of all adverts were for beverages that are sugar-sweetened (48.3%), together with high exposure to alcohol in comparison with other items (28.5%). Five latent classes were identified demonstrating healthier foods clustering in outlets that are

informal, and also formal outlets for unhealthy foods. The literature on the food environment of colleges is very limited in Sub-Saharan Africa, and there is none in Kenya.

2.6 Summary of literature review

From these studies above dietary practices highlighted among students in colleges have likelihood to have influence by a number of factors that are integrated. They include; nutrition and knowledge of food, attitudes, environment of food, socio-demography, as well as the economy. The socio-economic and demographic determinants literature on the intake of diet among tertiary institution students as well as their status of nutrition was mainly found in studies undertaken in countries that are developed. There is however inadequate literature on similar situations in the Sub-Saharan Africa, and in Kenya. This study therefore aimed to bridge this research gap by exploring the practices of diet and the status of nutrition among students attending the NCBD colleges. It further aimed to determine the demographic and socio-economic determinants of practices of diet and the status of nutrition in this group of students.

CHAPTER THREE

METHODOLOGY

3.1 Research design

This was actually a cross-sectional analytical research that used qualitative as well as quantitative techniques in collecting data, analysing and discussion. The collection of data was done at only single point in time. Descriptive design was used because it is suitable for testing the associations among variables such as dietary intake, socio-economic characteristics, demographic characteristics and nutrition status (Mugenda & Mugenda, 2003).

3.2 Study variables

3.2.1 Dependent variables

The dependent variables were:

1. Nutrient intake established using a 24 hour-recall.
2. Nutritional status determined by BMI, Waist circumference, and Hip circumference.

3.2.2 Independent variables

The independent variables were:

1. Socio-economic characteristics established using: the occupation, income, and support of guardians.
2. Demographic characteristics established using: sex, marital status, religion, age, ethnicity, household size, access to pipe and treated water and toilets.
3. Food outlets at colleges and in the surrounding food environment where the college students at NCBD eat from.

3.3 Study location

The location of the study was Central Business District (CBD) in Nairobi which is actually a busy region that possesses several commercial colleges located in the heart of the city. These

students come from all parts of the country hence making a good representation. Most of these colleges possess a population size that range from 100 to 150 students, with a handful that possess greater than 200 pupils (Innovation Directory of Learning Africa; Nairobi Colleges, 2014). These colleges train business and also non-business programs like Tourism, Accountancy, Business management, Hotel and catering and also Languages at Certification, Higher Diploma, Diploma, and Degree levels that take a time frame of 1 to 3 years (Ministry of Higher Education Science and Technology Handbook, 2012).

3.4 Study population

The research focused on students in commercial colleges within NCBD aged 19-24 years living outside the premises of college and was specific to course. There is approximately 12,000 students in NCBD (Advance Directory of Education Africa; Nairobi Colleges, 2014). The age group between 19 to 24 years comprises students both male and female pursuing their post-secondary school level of education and provides an appropriate population for the study.

3.4.1 Inclusion criteria

i. Male as well as women trainees from 19-24 years old
ii. Attending a commercial college within the NCBD
iii. Has been in college for a minimum of one semester

3.4.2 Exclusion criteria

i. Students who were lactating or pregnant
ii. Those who had chronic illnesses such as diabetes, asthma
iii. Students who were unwilling to participate

3.5 Sampling techniques

The technique used was purposive sampling to select the 97 commercial colleges in Nairobi CBD which had a student population of 100 or more because this helped in proper representation of participants for the study and it enhanced the precision of the results. 10 commercial colleges

were selected from the 97 colleges using simple random sampling technique which was a 10% representation of NCBD commercial colleges with more than 100 students (Austin, 2010). The 100 colleges were each given a number on pieces of paper which were used to randomly select 10 numbers representing the ten colleges using simple random sampling. Proportionate stratified sampling was also used to pick the students from each one of the 10 colleges in 10% of total student population plus 10% non-response giving a sample size of 424 students (Figure 3.1).

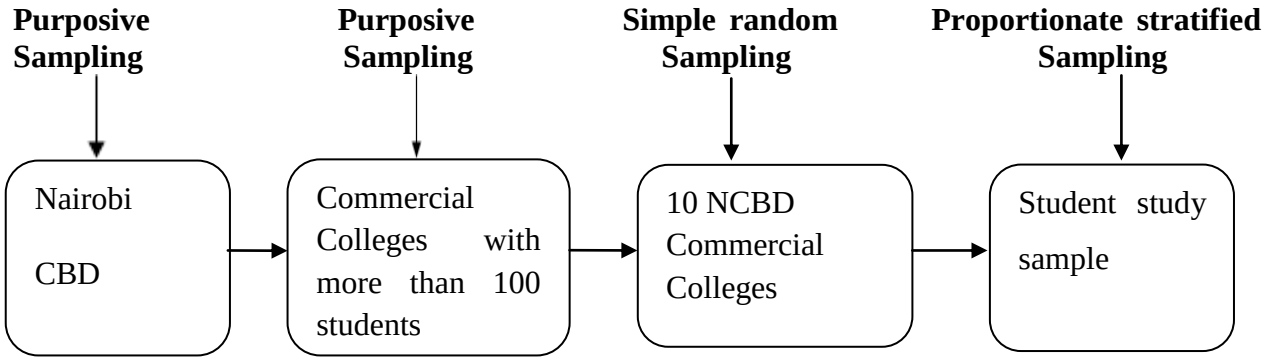


Figure 3.1: A flow diagram showing Sampling Techniques

Random sampling helps to give each of the elements of population an equal chance of having to being selected which results to the size of sample being taken to represent the whole population in general (Fisher et. al., 1998).

3.6 Sample size determination

The size of sample was determined by the use of the formula by Cochran (1963):

$n=Z^2pq/d^2$ where;

Z is the standard normal deviate 1.96

p is the target population proportion that is estimated to be having the characteristics that are being measured. The researcher had no information on the nutritional status of students in NCBD and therefore 50% prevalence was assumed as recommended by Cochran (1963). q is a population that does not have characteristics that are being measured (1-p) and d is the level of precision being measured which is 0.05 in this study.

$1.96x1.96x0.5x\ (1-0.5)/0.05^2$

$1.96^2 \times 0.5^2 / 0.0025 = 384.16$ making 384 students

10% (39) of the calculated size of sample was added to be for non-response giving a sample of 424 students. This was allocated proportionately to the ten colleges picked based on the size of their population.

Table 3.1: Sample size for colleges

College	Total population	Sample (10%)
Kenya Institute of Management	531	53
Zetech College	524	52
Beams College	380	38
Aviation College	413	41
Kenya Institute of Professional Studies	419	42
Nairobi Institute of Business Studies	673	67
Dima College	348	35
Kenya College of Commerce and Hospitality	357	36
East Africa Commercial College	321	32
Nairobi Institute of Development Studies	277	28
TOTAL		**424**

3.7 Research instruments

The instruments used in data collection during the research are as follows:

3.7.1 Semi-structured questionnaire

Researcher-administered semi-structured questionnaire (Appendix B) was used in data collection on socio-economic and demographic features of the students and also elicit information on health issues (KDHS, 2014).

3.7.2 The 24-Hour recall dietary questionnaire

A 24-hour dietary recall questionnaire was used in probing respondents to report on all beverages and foods consumed in the previous 24 hours (Appendix B). This was to facilitate in estimating of models of food, portion sizes, and household measures that are calibrated were used (South African National Health and Nutrition Examination Survey; SANHANES, 2011).

3.7.3 Food Frequency Questionnaire

A questionnaire for food frequency was used to collect data on how frequently each food is consumed from a given list of foods focusing on nutrients like carbohydrates, fats, proteins, minerals, vitamins (Appendix B) (KDHS, 2014).

3.7.4 Anthropometric instruments

Waist and hip circumferences gathered anthropometric data by the use a non-elastic tape measure. A stadiometer was used to measure height while weight was determined using a weighing scale that was calibrated (KDHS, 2014).

3.7.5 Observation checklist

A checklist for observation (Appendix B) was used to gather information on the environment of food; food outlets types often used by students, food types sold within the outlets and foods mostly preferred by students as well as the pricing. In scenarios where colleges had food outlets like dining halls and cafeterias, an observation was be used on them.

3.7.6 Key Informant Interview guide

This was used to gather information from people operating food outlets within the colleges focusing on: food types the outlets sold and the foods most preferred by students together with their prices (NHANES, 2011).

3.8 Pre-testing

A pre-test was performed on a 10% of the size of sample, which ensured questionnaire reliability and identified the needs for any revisions. The colleges upon which the pre-testing of the instrument was conducted did not play a role in the main research. This allowed for the language, length, and content of the questionnaire to be analysed to be appropriate so as to achieve the research objectives.

3.8.1 Reliability

The test re-test method was used which ensured the questionnaires was reliable and a 0.87 (0.80-0.99; 95% CI) correlation coefficient being was obtained which was above 0.7, therefore it was considered adequate (Austin, 2014). In addition, research assistants were trained to ensure that procedures were standardized and there was quality in collection data.

3.8.2 Validity

Standard questionnaires including 24-hour recall and a food frequency questionnaire were used which enhanced validity. A Pre-testing also facilitated in modifying by correction of mistakes and eliminated ambiguity of questions to ensuring a clarity therefore elicit the information required for a better validity.

3.9 Recruitment and training of research assistants

The researcher recruited and conducted a full day training for research assistants who had a minimum qualification of Kenya Certificate of Secondary Education (KCSE). During this period, study objectives, skills for interviewing, research ethics and research instruments were familiarized with them. They were trained on calibrating the anthropometric equipment so as to increase the results validity. Additionally, they were trained on taking and recording anthropometric measurements two times or more on each respondent, to ask questions and recording the data in the questionnaires.

3.10 Data collection procedures and techniques

Prior to data collection, an informed consent was sought from the participants by the researcher assisted by research assistants. This was followed by collecting information from the participants on their diet consumption. The collection of anthropometric data was the done for weight and height, hip and waist circumference. Data was completed with one participant before moving to the next one. The data collection techniques used included interviews, observations and also the anthropometric measurements.

3.10.1 Interviews

One-time interviews that were face to face were conducted with students to facilitate collecting of information by the use of a questionnaire that was researcher-administered. Additionally, Key Informant Interviews were carried out among operators of food outlet within the colleges.

3.10.2 Anthropometric measurements

Data on anthropometrics was hip circumference and waist collected by the use a tape measure rounded to the nearest 0.1cm on the waist and the fullest region of the hips. The height was established using a stadiometer to the nearest 0.1cm with the participants standing at $90^0$with heels being against the wall. Weighing scale measured the weight to the nearest 0.1kg and the participants were wearing some light clothing. Waist-to-height and Waist-to-hip ratios were calculated by use of height, hip and waist measurements. Height and height were also used in calculating BMI. Measurements were taken twice and the average calculated.

3.10.3 Observations

Observations and data recording was from environment of food in terms prices of food, food outlets types frequently used by the students, food types the outlets sold, and the common foods mostly eaten by the students

3.11 Quality control of data

The data was entry was done twice into a Statistical Package for Social Sciences (SPSS) for accuracy. Questionnaires were checked and cleaned daily and kept in a locked place for safety.

3.12 Data analysis and presentation

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 24 Software (2016). The study used was a FoodFinder 111software database (2016) for South African Medical Research Council (MRC) in analysing the dietary data gathered by use of a 24-hour recall. The outcomes of amounts of nutrients consumed per day from the FoodFinder 111

software were then put in comparison with the RDAs to establish if there was any adequacy of intakes of diet (Table 3.1).

Table 3.2: Recommended Nutrient cut-off points for 19 - 24-year olds based on National Health and Medical research Council (2015)

Classification	**Food nutrient**	
	Principal cut-off points	
Nutrient	**Males**	**Female**
Fibre	38g	25g
Energy	2800kj	2000kj
Protein	56g	46g
Total fat	95g	70g
Carbohydrates	300g	220g
Added sugar	36g	24g
Calcium	1g	1g
Iron	8g	18g
Sodium	6g	6g
Vitamin A	0.9mg	0.7mg
Vitamin D	10.0μg	10.0μg
Vitamin C	60mg	60mg
Zinc	15µg	12µg
Phosphorus	1.2g	1.2g

Anthropometric data was analysed using WHO reference removed aspects for waist and also hip circumference and also BMI (Tables 3.2-3.6).

Table 3.3: Recommended WHpR cut-off points based on the WHO criteria

Principal cut-off points				
The gender	Excellent	Good	Higher	At risk
Male	<0.84	<0.84-0.88	0.89-0.94	≥0.94
Female	<0.74	<0.740.78	<0.79-0.84	≥0.85

Table 3.4: Recommended BMI cut-off points based on the WHO criteria

The Classification	**BMI(kg/m^2)**
	Principal cut-off points
Being Underweight	<18.50
Being Normal range	18.50 - 24.99
Being Overweight	25.00-29.99
Being Obese	≥30.00

Table 3.5: Recommended waist hip ratio cut-off points based on the WHO criteria

Classification	Normal	Increased risk	Higher risk
Male	≤0.340	0.535	≥0.57
Females	≤0.458	0.492	≥0.51

Table 3.6: Recommended waist height ratio cut-off points based on the WHO criteria

Classification	Normal	Increased risk	Higher risk
Male	0.424	0.535	0.57
Females	0.458	0.492	0.51

The statistics descriptive such as percentages, frequencies, standard deviations, and mean was used to describe and put together the students' socio-economic, demographic characteristics and the status of nutrition. Chi-square testing was conducted to test relationships between categorical variables (nominal) such as income, intake of diet, environment of food and sex. Binary Logistic regression analysis was performed to establish the contribution of every variable to the dietary intake and to the status of nutrition. A statistical significance was set at $p < 0.05$ and when the CIs did not overlap. Key informant interviews for qualitative data were analysed by the use content analysis based on pre-determined themes. Data was also presented in cross-tabulations, frequency tables, and scatter graphs.

3.13 Logistical and ethical considerations

To be able to conduct the research permission was sought from Kenyatta University graduate school, Kenyatta University Ethical Review Committee gave ethical clearance while the National Commission for Science, Technology and Innovation (NACOSTI) gave the research permit from reference number NACOSTI/P/16/07615/9156. The management of participating colleges also gave permission while a written/signed informed consent was obtained from the respondents prior to participation in the study (Appendix A). Respondents were also given information sheets

with health and good dietary and physical activity options and were also informed that participation was voluntary. Participation was voluntary and anyone who declined from participating in the study was not included in the research. All the information collected from the respondents was kept confidential. The participants were advised on healthy eating, good dietary practices and other nutrition-related matters after data collection was completed.

CHAPTER FOUR

FINDINGS OF THE STUDY

4.1 Overview

The purpose the research was to determine the socio-economic and demographic determinants of practices of diet and status of nutrition of students 19-24 years of age in commercial colleges in NCBD, Kenya. The study focused on Kenyan and non-Kenyan students in NCBD commercial colleges aged 19-24 years living outside the premises of college and it was specific to course. The calculated sample size was 385 students. Ten percent of the calculated sample (N=39) was added to take care of the non- response. As such, the total sample of the current study was 424 students. Of the 424 college the students who consented to take part in the study, 390 had valid data and were used to analyse data. The rate of response was 93%. According to Mugenda (2003), a 50% rate of response is adequate to analyse and report; whereas 60% is good and 70% or more excellent. Using this assertion, the response rate of 93% was therefore considered as adequate for this research.

4.2 Demographic and socio-economic characteristics of students

4.2.1 Demographic characteristics of students

Overall, significantly more females than males participated in the study (72.6% and 27.4%, p=0.002) (Table 4.1). Majority of the students (68.4%) were within age groups 19-21years, while 29.2% were within the age group of 22-24years. Majority of the students (94.4%) were not married with only 5.1% and 0.5% married and divorced respectively. While the total sample had diversity of cultures, majority of the students (46.4%) were Kikuyu. In terms of religion, majority of the students (95.6%) were Christians. Majority of the students (49.5% and 34.1%) were also from households with 4-5 and 1-3 members, respectively. Regarding the students' year of study, majority (79.7%) were in their first year. Only 25 of the students reported that they had children, with 80% of these having at least 1 child. Finally, 93.6% of the students were studying towards their diploma (Table 4.1).

Table 4.1: Socio-demographic characteristics of the students

Characteristics	N=390	
	n	%
Sex		
Males	107	27.0
Females	**283**	**63.0**
Total	390	100
Age		
19-21	266	68.4
22-24	134	21.6
Marital status		
Single	**368**	**94.4**
Married	20	5.1
Divorced	2	0.5
Total	390	100
Ethnicity		
Kikuyu	**181**	**46.4**
Kamba	54	13.8
Luo	41	10.5
Maasai	12	3.1
Meru	13	3.3
Embu	11	2.8
Kalenjin	17	4.4
Luhya	33	8.5
Kisii	8	2.1
Somali	7	1.8
Gabra	3	0.8
Dogodia	2	0.5
Taita	3	0.8
Giriama	1	0.3
Non-Kenyan	4	1.0
Total	390	100
Religion		
Christian	**373**	**95.6**
Muslim	14	3.6
Others	3	0.08
Total	390	100
Household size		
No response	2	0.5
1-3	133	34.1
4-5	**193**	**49.5**
6 and more	62	15.9
Total	390	100
Year of study		
One semester	62	7.9
One year	11	2.8
One and half years	**311**	**75.7**
Two years	7	1.8
Three years	50	12.8
Total	390	100
Number of children		
One	11	2.8
Two	**20**	**78**
Three	4	16
Total	35	100
Level of study		
Certificate	19	4.9
Diploma	**365**	**93.6**
Degree	4	1.0
Other	2	0.5
Total	390	100

4.2.2 Socio-economic characteristics of the students

Overall, male students spent a mean of 11485 ± 8281.97 Kenyan Shillings, while female students spent a mean of 11197 ± 7533.33 Kenyan Shillings per month. It was also established that male students spent a mean of at least 2579 ± 2047.26 Kenyan Shillings on food during school hours while female students spent a mean of at least 2734 ± 2163.71 Kenyan Shillings on food during school hours (Table 4.2). No significant gender differences were observed concerning both the overall amounts of money and the money spent on food during school hours (both p values were >0.05) (Table 4.2).

Table 4.2: Average financial expenditure on food

	N-390	
Gender	Average money expenditure per month (KS SD)	Average money expenditure on food during school hours (KS SD)
Male (n=107)	11485.05 (8281.97)	2579.49 (2047.26)
Female (n=283)	11197.17 (7533.33)	2734.26 (2163.71)
Total	11276.15 (7736.15)	2691.81 (2130.91)
p values	0.743	0.523

*Kenyan Shillings

Less than half (41.8%) of the students had worked in the month preceding the interviews (Table 4.3). However, majority of these students (83.3%) depended on their parents or relatives financially. Moreover, 81.0% of these students obtained finances for food from their parents or relatives. Finally, 66.4% reported that their parents or guardians were decision makers for food that needed to be purchased (Table 4.3).

Table 4.3: Employment status and sources of finance

Done work in the previous 3 months	**N=390**	
	n	**%**
Yes	163	41.8
No	**227**	**58.2**
Total	390	100
Sources of finance for food		
Employed	17	4.4
Self employed	52	13.3
Parents/relatives	**316**	**81.0**
Others	5	1.3
Total	390	100
General sources of finance		
Employed	19	4.9
Self employed	41	10.5
Parents/relatives	**321**	**83.3**
Others	9	2.3
Total	390	100
Decision maker of food to be purchased		
Self	100	25.6
Parent/guardian	**259**	**66.4**
Anyone	321	82.3
Total	680	174.3

*Multiple response

Majority of the students (62.1%) lived in rented houses (Table 4.4). About forty six percent and 51.3% of the students lived in mud and grass thatched and stone and iron sheeted roof houses, respectively. A little more than half (52.6%) of the students reported that they had access to pipe and treated water in their households, while 22.8% had access to communal pipe and treated water. Majority of students (66.7%) had flush toilets in their households, while 23.3% had access to communal flush toilets. Majority of students had assets like radio, cell phone and refrigerators (91.3%, 93.6% and 68.5%, respectively). Finally, 93.3% and 72.8% used electricity as lighting fuel and natural gas for cooking, respectively (Table 4.4).

Table 4.4: Socio-economic characteristics of students

Characteristic	N = 390	
	n	%
Mode of accommodation		
Own house	48	12.3
Rented	40	2.6
Hostel	**242**	**62.1**
Parent/guardian house	66	16.9
Others	24	6.2
Total	390	100
Type of house		
Mud grass thatched	2	0.5
Stone iron sheet	179	45.9
Stone tile roof	**200**	**51.3**
Others	9	2.3
Total	390	100
Source of water		
Piped to house	**205**	**52.6**
Pipe to plot	89	22.8
Public tap	23	5.9
Bore hole	17	4.4
Dug well	2	0.5
Spring water	4	0.1
Rain water	6	0.2
Total	390	100
Type of toilet used by family		
Flush toilet in house	**260**	66.7
Flush toilet shared	91	23.3
Pit latrine	38	9.7
Total	390	100
Assets owned		
Radio	**356**	**91.3**
Cell phone	**365**	**93.6**
Landline phone	50	12.8
Refrigerator	267	68.5
Solar panel	52	13.3
Total	390	100
Type of cooking fuel		
LPG/Natural gas	**284**	**72.8**
Bio gas	22	6.5
Kerosene	37	9.4
Charcoal	41	10.0
Wood	5	1.3
Other	1	0.03
Total	390	100

4.3 Dietary practices of students 18-24 years of age attending colleges in NCBD

4.3.1 Preferred method of cooking

When the students were asked about their preferred cooking methods, 61.0%, 27.4% and 24.9% reported that they preferred frying, frying and stewing and frying and boiling when preparing their food, respectively (Table 4.5).

Table 4.5: Preferred methods of cooking by students

	N= 390	
Method	**n**	**%**
Frying	**240**	**61**
Boiling	55	14
Stewing	95	24
Steaming	7	1.7
Baking	12	3.1
Frying & Stewing	**107**	**27.4**
Frying & Boiling	97	24.9
Total	613	156.1

*Multiple response

4.3.2 Frequency of food item consumption among students

There was almost an equal spread (33.1 %, 21.5% and 31.5%) of students who drank coffee daily, weekly and occasionally, respectively (Table 4.6). An almost similar pattern was observed with students who drank sweetened drinks (22.3% drank them daily, 39.7% drank them weekly and 26.4% drank them occasionally). However, majority of the students (80.0%) drank tea daily. Majority of the students (87.9% and 79.7%) added sugar in their food or used salt and salty foods daily. While majority (66.4%) of the students reported drinking milk daily, 33.1%, 26.9% and 29.5% preferred to drink full cream milk daily, weekly and occasionally respectively; while the majority (45.4% and 22.1%) preferred either to drink low fat milk occasionally or not drinking milk at all, respectively.

Majority of the students (63.1%) ate bread daily, with most of them (43.1% and 26.4%) using bread spreads and butter daily and occasionally respectively. Twenty point eight and 39.5% of them also used peanut butter daily and occasionally respectively. While the majority of the students (47.4%) consumed porridge occasionally, 37.7% and 32.6% consumed cereals weekly and occasionally respectively, with 50.8% consuming "Ugali" (cooked solid corn flour) daily and 40.3% consuming rice weekly.

While a third of the students (33.1% and 33.1%) consumed chicken weekly and monthly respectively, 22.3% and 43.8% consumed red meat daily and weekly respectively, 27.7%, 32.6% and 27.7% consumed fish weekly, monthly and occasionally respectively. Majority of the students (47.2% and 45.6%) respectively consumed eggs and legumes weekly. Most students 44.1%, 32.1% and 38.7% consumed fast foods, pastries and processed foods weekly respectively.

While most students (38.1%) consumed sweets, fudge or toffees daily, 36.1% consumed chocolate occasionally. While 22.6% and 34.9% of the students reported drinking fruit juice daily and weekly, 33.8% and 39.5% of them also reported consuming whole fruits daily and weekly. While 40.3% and 39.5% of the students reported consuming dark green vegetables daily and weekly, 62.3% and 26.9% also reported consuming light-coloured vegetables daily and weekly. Finally, while 51.2% of students reported not be consuming alcohol, while 30.3% reported that they only consume it occasionally (Table 4.6).

Table 4.6: Frequency of consumption of food items

Food item	None n (%)	N =390 Daily n (%)	Weekly n (%)	Monthly n (%)	Occasionally n (%)
Coffee	19(4.9)	129(33.1)	84(21.5)	35(9.0)	123(31.5)
Tea	3(0.8)	**312(80.0)**	27(6.9)	7(1.8)	41(10.5)
Sweetened drinks	4(1.0)	78(22.3)	155(39.7)	41(10.5)	103(26.4)
Sugar	2(0.5)	**343(87.9)**	16(4.1)	3(0.8)	26(6.7)
Salt and salted products	1(0.3)	311(79.7)	43(11.0)	8(2.1)	27(6.9)
Milk	4(1.0)	**259(66.4)**	77(19.7)	12(3.1)	38(9.7)
Full cream	8(2.1)	129(33.1)	105(26.9)	3(8.5)	115(29.5)
Low fat	86(22.1)	44(11.3)	49(12.6)	34(8.7)	117(45.4)
Bread	1(0.3)	**246(63.1)**	89(22.8)	13(13.3)	41(10.5)
Other bread spreads and butter	21(5.4)	**168(43.1)**	70(17.9)	28(7.2)	103(26.4)
Peanut butter	48(12.3)	80(20.8)	42(10.8)	66(16.9)	154(39.5)
Porridge	17(4.4)	47(12.1)	79(20.3)	61(15.6)	185(47.4)
Cereals	4(1.0)	66(16.9)	147(37.7)	46(11.8)	127(32.6)
Ugali and rice	0(0.0)	**198(50.8)**	157(40.3)	14(3.6)	21(5.4)
Chicken	1(0.3)	20(5.1)	129(33.1)	129(33.1)	97(24.9)
Red meat	1(0.3)	87(22.3)	**171(43.8)**	71(18.2)	60(15.4)
Fish	5(1.3)	42(10.8)	108(27.7)	127(32.6)	108(27.7)
Eggs	5(1.3)	81(20.8)	184(47.2)	2(13.3)	69(17.4)
Legumes	6(1.5)	69(17.7)	**178(45.6)**	66(16.9)	71(18.2)
Fast Foods	2(0.5)	80(20.5)	172(44.1)	56(14.4)	80(20.5)
Pastries	9(2.3)	81(21.0)	125(32.1)	63(16.2)	11(28.5)
Processed foods	4(1.0)	79(20.3)	**151(38.7)**	53(13.6)	103(26.4)
Sweets/ Fudge/Toffees	1(0.3)	**150(38.1)**	102(26.3)	30(7.7)	105(27.10)
Chocolate	12(3.1)	71(18.2)	115(29.5)	51(13.1)	141(36.1)
Juice	0(0.0)	88(22.6)	**136(34.9)**	55(14.1)	111(28.5)
Fruits	4(1.0)	132(33.8)	134(39.5)	34(8.7)	66(16.9)
Dark green vegetables	7(1.8)	**157(40.3)**	154(39.5)	16(4.1)	56(14.4)
Light coloured vegetables	2(0.5)	243(62.3)	105(26.9)	7(1.8)	33(8.5)
Alcohol	**199(51.2)**	11(2.8)	40(10.3)	22(5.6)	118(30.3)
Total	497	3801	3104	1153	2450

*Multiple response

4.3.3 Nutrient intake among the college students

Overall, the mean energy, protein, fat, carbohydrate, added sugar, dietary fibre and sodium intake were 5347kJ, 138g, 57g, 172g, 16g, 12g and 1244mg, respectively. These outcomes were different from the median energy, protein, fat, carbohydrate, added sugar, dietary fibre and sodium intake that were 4994kJ, 163g, 46g, 146g, 12g, 10g and 768mg, respectively was due to the fact of having the data was not distributed normally (i.e. data was inclined towards the right).

4.3.3.1 NCBD College students' nutrient intake by socio-demographic characteristics

More females than males consumed total dietary energy and sodium levels that were within the recommended daily allowances. Majority of male and female students (87.9% and 90.8%, 77.6% and 83.7%) consumed total dietary energy and sodium levels that were within the recommended dietary allowances. Similarly, more females than males consumed lower than recommended dietary proteins and fibre levels. However, lower than recommended levels of dietary protein and fibre on the other hand were consumed by (55.1% and 58.7%, 97.2% and 96.8%) of male and female students respectively. No other nutrient intake significant differences were observed with the other socio-demographic factors. (Table 4.7).

Table 4.7: NCBD College students' nutrient intake by socio-demographic characteristics

				N=390				
RDI	Dietary Energy 2200-2800 kcal/day		Dietary Protein 46- 56g/day		Dietary Fibre 30-38g/day		Sodium 1500-2300g/day	
Actual intake	<2200kcal	2200kcal-2800kcal	<46g	46g -56g	<30g	30g-38g	<1500mg	1500mg - 2300mg
				n(%)				
				Gender				
Male	13(12.1)	94(87.9)	59(55.1)	48(44.9)	104(97.2)	3(2.8)	24(22.4)	83(77.6)
Female	26(9.2)	**257(90.8)**	166(58.7)	117(41.3)	**274(96.8)**	9(3.2)	46(16.3)	**237(83.7)**
Total	39	351	225	165	378	12	70	320
				Age				
18-21	**252(91.6)**	23(8.4)	117(42.6)	158(57.4)	**264(96.4)**	10(3.6)	228(82.9)	47(17.1)
22-25	99(86.1)	16(13.9)	48(41.7)	67(58.3)	114(98.3)	2(1.7)	92(80.0)	23(20.0)
Total	351	39	165	225	378	12	320	70
				Status				
Single	**333(90.5)**	35(9.5)	150(40.8)	218(59.2)	356(96.7)	12(3.3)	**302(82.1)**	66(17.9)
Married	16(80.0)	4(20.0)	14(70.0)	6(30.0)	**20(100.0)**	0 (0.0)	16(80.0)	4(20.0)
Divorced	**2(100.0)**	0(0.0)	1(50.0)	1(50.0)	2(100.0)	0 (0.0)	2(100.0)	0 (0.0)
Total	351	39	165	225	**378**	12	320	70
				Ethnicity				
Kikuyu	**178(98.3)**	3(1.7)	82(45.3)	99(54.7)	**178(98.3)**	3(1.7)	155(85.6)	26(14.4)
Somali	**7(100.0)**	0 (0.0)	4(57.1)	3(42.9)	**7(100.0)**	0 (0.0)	4(57.1)	3(42.9)
Gabra	**3(100.0)**	0 (0.0)	1(33.3)	2(66.7)	**3(100.0)**	0 (0.0)	1(33.3)	2(66.7)
Dogodia	**2(100.0)**	0 (0.0)	1(50.0)	1(50.0)	**2(100.0)**	0 (0.0)	2(66.7)	1(33.3)
Taita	**3(100.0)**	0 (0.0)	1(33.3)	2(66.7)	**3(100.0)**	0 (0.0)	**2(100.0)**	0 (0.0)
Giriama	**1(100.0)**	0 (0.0)	0(0.0)	1(100.0)	**1(100.0)**	0 (0.0)	**1(100.0)**	0 (0.0)
Non-Kenyan	**4(100.0)**	0 (0.0)	1(25.0)	3(75.0)	**4(100.0)**	0 (0.0)	**4(100.0)**	0 (0.0)
Kamba	50(92.6)	4(7.4)	22(40.7)	32(59.3)	50(92.6)	4(7.4)	45(83.3)	9(16.7)
Luo	39(95.1)	2(4.9)	18(43.9)	23(56.1)	39(95.1)	2(4.9)	30(73.2)	11(26.8)
Maasai	11(91.7)	1(8.3)	5(41.7)	7(58.3)	11(91.7)	1(8.3)	8(66.7)	4(33.3)
Meru	**13(100.0)**	0 (0.0)	5(38.5)	8(61.5)	**13(100.0)**	0 (0.0)	**13(100.0)**	0 (0.0)
Embu	**11(100.0)**	0 (0.0)	6(54.5)	5(45.5)	**11(100.0)**	0 (0.0)	9(81.8)	2(18.2)
Kalenjin	16(94.1)	1(5.9)	6(35.3)	11(64.7)	16(94.1**)**	1(5.9)	12(70.6)	5(29.4)
Luhya	32(97.0)	1(3.0)	11(33.3)	22(66.7)	**32(97.0)**	1(3.0)	27(81.8)	6(18.2)
Kisii	**8(100.0)**	0 (0.0	2(25.0)	6(75.0)	8(100.0)	0 (0.0	7(87.5)	1(12.5)
Total	181	9	75	114	180	9	151	38
				Religion				
Christian	**337(90.3)**	36(9.7)	158(42.4)	**215(57.6)**	**361(96.8)**	12(3.2)	**308(82.6)**	65(17.4)
Muslim	11(78.6)	3(21.4)	6(42.9)	8(57.1)	14(100.0)	0 (0.0)	9(64.3)	53(5.7)
Other	3(100.0)	0	1(33.30	2(66.7)	3(100.0)	0 (0.0)	3(100.0)	0 (0.0)
Total	351(90.0)	39(10.0)	165(42.3)	225(57.7)	378(96.9)	12(3.1)	320(82.1)	70(17.9)
				House hold Size				
1	**2(100.0)**	0 (0.0)	0 (0.0)	**2(100.0)**	**2(100.0)**	0 (0.0)	**2(100.0)**	0 (0.0)
2-3	118(88.7)	15(11.3)	60(45.1)	57(44.9)	130(97.7)	3(2.3)	108(81.2)	25(18.8)
4-5	171(89.5)	20(10.5)	60(45.1)	33(24.5)	185(96.9)	6(3.1)	159(83.2)	32(16.8)
6-8	58(93.5)	4(6.5)	81(42.4)	97(67.6)	59(95.2)	3(4.8)	50(80.6)	12(19.4)
8 and more	2(100.0)	0 (0.0)	1(50.0)	1(50.0)	2(100.0)	0 (0.0)	1(50.0)	1(50.0)
Total	351	39	202	188	378	12	320	70

4.3.3.2 NCBD College students' nutrient intake by socio-economic characteristics

With regard to monthly financial expenditure on food, 89.9%, 98% and 82.1% students who spent 4000-6000 Kenyan Shillings consumed less dietary energy (≤2200kcal) and sodium (< 1500 mg), but more dietary fibre (> 38g) (Table 4.8).

Table 4.8: NCBD College students' nutrient intake by socio-economic characteristics

				N=390				
RDI	**Dietary Energy**		**Dietary Protein**		**Dietary Fibre**		**Sodium**	
	2200-2800kcal/day		46- 56g/day		30-38g/day		1500-2300g/day	
Actual intake	<2200kcal	2200kcal-2800kcal	<56g	56g - 46g	<38g	38g - 56g	<1500mg	1500mg - 2300mg
				n(%)				
				General Monthly financial expenditure (KShs.)				
<4000	40(90.9)	4(9.1)	17(38.6)	27(61.4)	41(93.2)	3(6.8)	36(81.8)	8(18.2)
4000-6000	**266(89.9)**	30(10.1)	130(43.9)	166(56.1)	**290(98.0)**	6(2.0)	243(82.1)	53(17.9)
> 6000	45(90.0)	5(10.0)	18(36.0)	32(64.0)	47(94.0)	3(6.0)	41(82.0)	9(18.0)
Total	351	39	165	225	378	12	320	70
				Monthly expenditure on food (KShs.)				
<2000	**193(87.7)**	27(12.3)	95(43.2)	125(56.8)	**210(95.5)**	10(4.5)	183(83.2)	37(16.8)
> 2000	**158(92.9)**	12(7.1)	70(41.2)	100(58.8)	**168(98.8)**	2(1.2)	137(80.6)	33(19.4)
Total	351	39	165	225	378	12	320	70

4.3.4. The micronutrient intake among college students

The researcher investigated the level to which the respondents met, unmet or over met the recommended daily intake (RDIs) requirements for selected nutrients based on the WHO cut-off values. The RDIs for the nutrients studied are shown in Table 4.9.

Majority of the students (76.9%, 99.5%, 58.7%, 91.0%, 95.1%, 95.9%, 94.6% and 99.0%, respectively) did not meet the dietary requirements for iron, calcium, zinc, Folate, vitamin C, vitamin E, vitamin K and vitamin E. Vitamin B6 and B12 were the only micronutrients that were consumed in excess by the majority of students (51.3 and 73.3) respectively.

Table 4.9: Micronutrient intake among college students

Micronutrient	N=390 Unmet n (%)	Met n (%)	Over met n (%)	Total N (%)
Iron (mg)	**300 (76.90**)	8 (2.10)	82 (21.0)	390 (100.0)
Calcium (mg)	**388 (99.5)**	0 (0.0)	2 (0.5)	390 (100.0)
Zinc (mg)	**229 (58.7**)	109 (27.9)	52 (13.3)	390 (100.0)
Vitamin C (mg)	355 (91.0)	0 (0.0)	35 (9.0)	390 (100.0)
Folate (mcg)	371 (95.1)	1(0.3)	18(4.6)	390 (100.0)
Vitamin B6 (mg)	190 (48.7)	0(0.0)	**200(51.3)**	390 (100.0)
Vitamin B12 (mcg)	104(26.7)	0(0.0)	**286(73.3)**	390 (100.0)
Vitamin D (mcg)	**374(95.9)**	11(2.8)	5(1.3)	390 (100.0)
Vitamin E (mg)	**369 (94.6)**	2(0.5)	19(4.9)	390 (100.0)
Vitamin K (mcg)	**386 (99.0)**	0(0.0)	4(1.0)	390 (100.0)

4.4. Association between nutrient intake, demographic and socio-economic characteristics

A chi-square test was done to test relationship between nutrient intake and demographic characteristics. Total energy intake was not associated with any of the socio-demographic characteristics tested; age (χ^2 1.134; P=0.576), gender (χ^2 1.453; P=0.541) marital status (χ^2 2.134; p=0.192), and religion (χ^2 1.3640; p=270) and house hold size (χ^2 1.373; p=0.809). Similarly, dietary fat intake was not associated with any of the socio-demographic characteristics tested; age (χ^2 1.404; p=0.750), gender (χ^2 1.047; p=0.835), marital status (χ^2 1.404; p=0.923,), ethnicity (χ^2 1.363; p=0.694), religion ($\chi^2$1.938; p=0.601) and house hold size ($\chi^2$1.383; p=0.450). Furthermore, carbohydrate intake was not associated with any of the socio-demographic

characteristics tested; age (χ^2 1.059; p=0.460), gender (χ^2 1.848; p=0.723), marital status (χ^2 1.486; p=0.994), ethnicity (χ^2 1.083; p=0.895), religion (χ^2 1.839; p=0.977) and rouse hold size ($\chi^2$1.383; p=0.540). Added sugar intake was also not associated with any of the socio-demographic characteristics tested; age (χ^2 1.048; p=0.630), gender (χ^2 1.758; p=0.374), marital status (χ^2 1.059; p=0.792,), ethnicity ($\chi^2$1.389; p=0.092), religion ($\chi^2$1.939; p=0.940) and house hold size (χ^2 1.938; p=0. 0.260). Dietary fibre intake was also not associated with any of the socio-demographic characteristics tested; age (χ^2 2.093; p=0.339), gender (χ^2 2.094; p=0.200), marital status (χ^2 1.373; p=0.889,), ethnicity (χ^2 1.032; p=1.000), religion (χ^2 1.930; p=0.984) and house hold size (χ^2 1.493; p=0.898) (Table 4.10).

Dietary protein intake similarly had significant association with marital status (χ^2 9.084; p=0.031); but not associated with age (χ^2 1.695; p=0.650), gender (χ^2 1.453; p=0.461), ethnicity (χ^2 1.373; p=0.907), religion (χ^2 1.383; p=0.736) and household size ($\chi^2$1.383; p=0.621. Sodium intake was also significantly associated with gender (χ^2 13.576; p=0.020), but not associated with age (χ^2 1.493; p=0.523), marital status (χ^2 1.836; p=0.660,), ethnicity (χ^2 3.052; p=0.063), religion (χ^2 1.837; p=0.782) and household size (χ^2 1.383; p=0.705) (Table 4.10).

Gender, age, religion, marital status, ethnicity and household size did not associate with the intake of any of the micro-nutrients tested (all the p-values were greater than 0.05). (Data not shown in a table format). As a result of some observed associations, the blanketed hypothesis (Ho_3) that there isn't significance in the relationship between all demographic characteristics and the nutrient intake of students was rejected.

Table 4.10: The relationship between dietary intake and socio-demographic characteristics of college students

	N=390						
	Energy (kJ) (χ^2 p--value)	**Protein(g) (χ^2 p--value)**	**Fat (g) (χ^2 p--value)**	**Carbohydrate(g) (χ^2 p-value)**	**Added sugar(g) (χ^2 p--value)**	**Dietary fibre (g) (χ^2 p--value)**	**Sodium (mg) (χ^2 p-value)**
Age	1.134	1.695	1.404	1.059	1.048	2.093	1.493
	0.576	0.650	0.750	0.460	0.630	0.339	0.523
Gender	1.453	1.453	1.0474	1.848	1.758	2.094	13.576
	0.541	0.461	0.835	0.723	0.374	0.200	**0.020***
Marital	2.134	9.084	1.404	1.486	1.059	1.3734	1.836
Status	0.192	**0.031***	0.923	0.994	0.792	0.889	0.660
Ethnicity	1.737	1.373	1.363	1.083	1.389	1.032	3.052
	0.808	0.907	0.694	0.895	0.092	1.000	0.063
Religion	1.364	1.383	1.938	1.839	1.939	1.930	1.837
	0.270	0.736	0.601	0.977	0.940	0.984	0.782
House	1.373	1.383	1.383	1.383	1.938	1.493	1.383
hold size	0.809	0.621	0.450	0.540	0.260	0.898	0.705

*Significant at $p< 0.05$

Chi-square test was also carried out to test relationship between nutrient intake and characteristics that are socio-economic. Total energy intake was not associated with any of the socio-demographic characteristics tested; monthly financial expenditure (χ^2 1.847; p=0.977), decision maker on food purchase (χ^2 1.478; 0.188) sources of finance to purchase food (χ^2 21.746; 0.079), and monthly financial expenditure on food (χ^2 1.637; p=0.187). Fat intake was also not associated with any of the socio-demographic characteristics tested; monthly financial expenditure (χ^2 1.370; p=0.72), decision maker on food purchase (χ^2 1.484; p=0.774), sources of finance for food (χ^2 1.857; p=0.574), and monthly financial expenditure on food (χ^2 1.848;

p=0.171). Similarly, carbohydrate intake was not associated with any of the socio-demographic characteristics tested; monthly financial expenditure (χ^2 1.473; p=0.91), decision maker on food purchase (χ^2 1.859; p=0.889), sources of finance for food (χ^2 1.959; p=0.990), and monthly financial expenditure on food (χ2 1.849; p=0.857). Dietary fibre intake was not associated with any of the socio-demographic characteristics tested; monthly financial expenditure (χ^2 1.473; p=0.91), decision maker on food purchase (χ^2 1.859; p=0.889), sources of finance for food (χ^2 1.959; p=0.990), and monthly financial expenditure on food (χ^2 1.849; p=0.857) (Table 4.11).

However, a significant relationship was noted between intake of protein and decision maker of food purchase, whereby the students who reported that their parents were the main decision makers on food purchase had higher dietary protein intake (χ^2=11.768; p=0.029) (Table 4.11).

In contrast monthly expenditure (χ^2 11.946; p=0.503), sources of finance for food (χ2 1.858; p=0.153), and monthly expenditure on food (χ^2 11.378; p=0.7571.946) were not associated with protein intake. With regard to added sugar there were no significant association observed for socio-demographic characteristics tested; monthly financial expenditure (χ^2 1.987; p=0.230), decision maker on food purchase (χ^2 1.857; p=0.814), and sources of finance for food (χ^2 1.859; p=0.608) except where students who spent 2000-2999 Kenyan Shillings had higher added sugar intake (χ^2 =17.084; p=0.002). Sodium intake was also not associated with any of the socio-demographic characteristics tested; Monthly expenditure (χ^2 1.958; p=0.999), Decision maker on food purchase (χ^2 1.948; p=0.222), Sources of finance for food (χ^2 1.857; p=0.260), and Monthly expenditure on food (χ^2 1748; p=0.151) (Table 4.11).

Similarly, because of some of the observed associations, the blanketed hypothesis (Ho_2) that there isn't any significance in the relationship for socio-economic characteristics and the nutrient intake of students was rejected.

Table 4.11: The relationship between dietary intake and socio-economic characteristics

N=390							
	Energy (kJ) (χ^2 p--value)	**Protein (g) (χ^2 p--value)**	**Fat (g) (χ^2 p--value)**	**Carbohydrate (g) (χ^2 p--value)**	**Added sugar (g) (χ^2 p--value)**	**Dietary fibre (g) (χ^2 p--value)**	**Sodium (mg) (χ^2 p--value)**
Monthly expenditure	1.847 0.977	1.946 0.503	1.370 0.72	1.473 0.91	1.987 0.23	1.859 0.102	1.958 0.999
Decision maker on food purchase	1.478 0.188	**11.768** **0.029***	1.484 0.774	1.859 0.889	1.857 0.814	1.484 0.504	1.948 0.222
Sources of finance for food	1.746 0.079	1.858 0.153	1.857 0.574	1.959 0.990	1.859 0.608	1.857 0.993	1.857 0.260
Monthly expenditure on Food	1.637 0.187	1.378 0.757	1.848 0.171	1.849 0.857	**17.084** **0.002***	1.184 0.151	1748 0.151

*Significant at $p< 0.05$

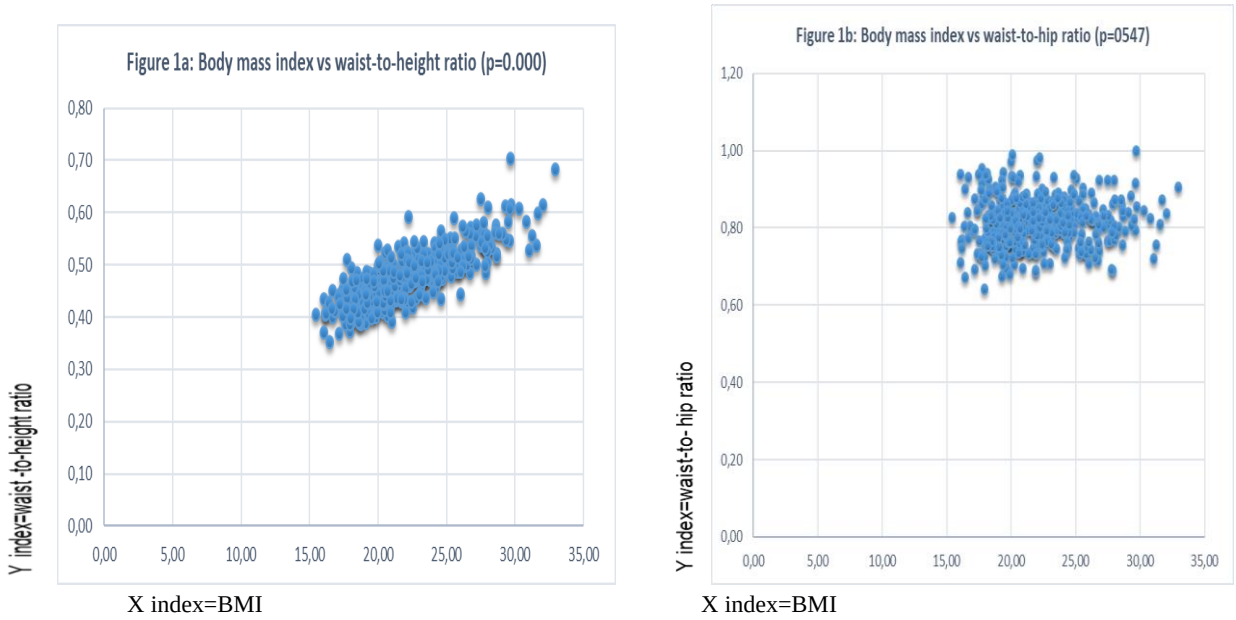
4.5 Nutritional status of the students

The study also determined the nutritional status (BMI, waist-to-hip ratio, waist-to height ratio, and waist circumference) of the students. The mean BMI was 21.48 ± 22.67. Majority of students (70.8%) lay within a range that is normal for body weight, 18.2% were overweight, and 2.6% were obese, while 8.5% were underweight.

The mean waist-to height ratio (WHtR) was (0.48±0.07). Majority of students' (70.8%) ratios fell within the recommended range (≤0.424) for males and (≤0.46) for females, an indication of less risk of NCDs. Eighteen-point two percent had ratios that fell on the upper side of the recommended range (0.535) for males and (0.492) for females while 8.5% were at high risk range (0.57) for males and (0.51) for females (an indication of high risk of NCDs). The overall mean WHpR for the students was (0.82±0.08). Majority of students (53.5%) lay within a range of normal WHR (0.85 to 0.89 for males and 0.75 to 0.79 for females), 35.9% had ratios that fell on the upper side of the recommended range (0.90-0.95 for males and 0.80-0.85 for females) while 10.6% were at risk (≥0.95 for males and ≥0.86 for females). The mean waist circumference

was 78.87±9.43. Majority of students (54.7%) were also within the normal range of hip waist ratio (0.85-0.89) for males and (0.75-0.79) for females), 37.3% were more than the recommended (0.90-0.95) for males and (0.80-0.85) for females, 8.0 % at risk for males and (≥0.95) for females (≥0.86)

The BMI increased significantly with an increase in WHtR ratio (χ^2 =9.546; p=0.000) (Figure 4.1a), whereas there was no association in significance that was observed for BMI and WHpR ratio (χ^2 =1.963; p=0.547) (Figure 4.1a).



*p<0.05

Figures 4.1: The body mass index versus (a) the waist-to-height ratio and (b) the waist-to-hip ratio of the college students

4.5.1 Association between nutritional status and socio-demographic characteristics

Overall, significant relationships between the nutritional status and gender were observed. For instance, the p-values were p=0.010, p=0.010, p=0.010, p=0.010 and p=0.005 for height, weight, BMI, WHpR and WHtR, respectively with an expectation for p-value for waist circumference that never showed any significance in the difference (p=0.735). In this regard, males were taller (171.66cm±12.95cm vs 161.53cm±7.36cm), heavier (63.85kg±12.86kg vs 59.02kg±9.81kg), had a higher WHpR (0.85±0.062 vs 0.81 ±0.09), but lower WHtR (0.47±0.08 vs 0.49 ±0.07) and a lower mean BMI (21.48kgm^2±4.42kgm^2 vs 22.67 kgm^2±3.88kgm^2) than females.

Table 4.12: Nutrition status by gender

			N=390			
Sex	**Height Mean ±SD**	**Weight Mean ±SD**	**Waist Circumference Mean ±SD**	**BMI Mean ±SD**	**Waist-hip-ratio Mean ±SD**	**Waist-height-ratio Mean ±SD**
Male (N=107)	171.66±12.95	63.85±12.86	79.13±6.73	21.48±4.42	0.85±0.062	0.47±0.08
Female (N=283)	161.53±7.36	59.02±9.81	78.77±10.28	22.67±3.88	0.81(0.09	0.49±0.07
Total (N=390)	164.31±10.27	60.34±10.93	78.87±9.43	22.34±4.06	0.82±0.08	0.48±0.07
p value	**0.010***	**0.010***	**0.735**	**0.010***	**0.010***	**0.005***

*Significant at p< 0.05

More females than males lay within the normal weight range (67.8%, vs 78.5% respectively) and underweight (11.2% vs 7.4%). On the other hand, more females were overweight compared to males (22.3% vs 7.5%), while almost similar prevalence values were observed in terms of obesity males (2.8%) and females (2.5%) (Table 4.13).

There were a no significant differences in the students' BMI and age ($\chi 2$ =17.57; p=0.823), marital status ($\chi 2$ =11.833; =0.066) ethnicity ($\chi 2$ =39.215; p=0.594), and religion ($\chi 2$ =9.006; p=0.173). In contrast, a relationship of significance was noted between the students' BMI and gender ($\chi 2$ =11.924; p=0.008) (Table 4.13).

Table 4.13: Association between body mass index and socio-demographic characteristics

		N=390 BMI						
		<18.50kg/ m^2 n(%)	**18.5-24.99 kg/m^2 n(%)**	**25-29.99 kg/m^2 n(%)**	**≥30 n(%)**	**Total**	χ^2	**p**
Gender	Male	12(11.2)	84(78.5)	8(7.5)	3(2.8)	107	11.924	**0.008***
	Female	21(7.4)	192(67.8)	63(22.3)	7(2.5)	283		
Age (Yrs)	19-21	24(0.9)	195(71.0)	50(18.2)	5(1.9)	283	17.57	0.823
	22-25	9(10.3)	60(70.0)	14(16.1)	4(4.6)	87		
Marital Status	Single	32(8.7)	265(72.0)	62(16.8)	9(2.4)	368	11.833	0.066
	Married	1(5.0)	9(45.0)	9(45.0)	1(5.0)	20		
	Divorced	0 (0.0)	2(100.0)	0(0.0)	0(0.0)	2		
Ethnicity	Kikuyu	17(9.4)	126(69.6)	32(17.7)	6(3.3)	181	39.215	0.594
	Kamba	4(7.4)	3 6(66.7)	12(22.2)	2(3.7)	54		
	Luo	3(7.3)	29(70.7)	9(22.0)	0(0.0)	41		
	Maasai	3(25.0)	7(58.3)	2(16.7)	0(0.0)	12		
	Meru	0(0.0)	12(92.3)	0(0.0)	1(7.7)	13		
	Embu	0(0.0)	6(54.5)	5(45.5)	0(0.0)	11		
	Kalenjin	1(5.9)	14(82.4)	2(11.8)		17		
	Luhya	0(0.0)	23(69.7)	9(27.3)	1(3.0)	33		
	Non-Kenyans	5(17.9)	23(82.1)	0(0.0)	0(0.0)	28		
Religion	Christian	29(7.8)	263(70.5)	71(19.0)	10(2.7)	373	9.006	0.173
	Muslim	3(21.4)	11(78.6)	0(0.0)	0(0.0)	14		
	Others	1(33.3)	2(66.7)	0(0.0)	0(0.0)	3		
Total		33(8.5)	276(70.8)	71(18.2)	10(2.6)	390		

*Significant at $p< 0.05$

In terms of the relationship between WHpR and the socio-demographic variables, the only significant association observed was with gender (χ^2=38.195; $p< 0.001$) (Table 4.14).

Table 4.14: Association between waist-to-hip ratio and socio-demographic characteristics

N=390

	Excellent	Good	Average	At Risk	Total	X^2	P-Value
Gender							
Male	55(51.4)	24(22.4)	25(23.4)	3(2.8)	107(100.0)	38.195	**<0.001***
Female	61(21.6)	69(24.4)	115(40.6)	38(13.5)	283(100.0)		
Total	116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		
Age (Yrs)							
19	11(16.7)	22(37.0)	19(33.3)	8(13.0)	67(100.0)	6.914	0.722
20	43(36.4)	23(19.5)	40(33.9)	12(10.2)	118(100.0)		
21	24(24.7)	24(24.7)	40(41.2)	9(9.3)	97(100.0)		
22	31(35.6)	17(19.5)	30(34.5)	9(10.3)	87(100.0)		
23	6(27.3)	5(22.7)	8(36.4)	3(13.6)	22(100.0)		
24	1(20.0)	2(40.0)	2(40.0)	0(0.0)	5(100.0)		
25	0(0.0)	0(0.0)	1(100.0)	0(0.0)	1(100.0)		
Total	116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		
Marital Status							
Single	111(30.2)	85(23.1)	135(36.7)	37(10.1)	368(100.0)	6.279	0.616
Married	4(20.0)	7(35.0)	5(25.0)	4(20.0)	20(100.0)		
Divorced	1(50.0)	1(50.0)	0(0.0)	0(0.0)	2(100.0)		
Total	116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		
Ethnicity							
Kikuyu	53(29.3)	46(25.4)	60(33.1)	22(12.2)	181(100.0)	41.339	0.928
Kamba	20(37.0)	11(20.4)	19(35.2)	4(7.4)	54(100.0)		
Luo	11(26.8)	14(34.1)	13(31.7)	3(7.3)	41(100.0)		
Maasai	21(6.7)	1(8.3)	7(58.3)	2(16.7)	12(100.0)		
Meru	2(15.4)	43(0.8)	5(38.5)	2(15.4)	1(100.0)		
Embu	3(27.3)	3(27.3)	2(18.2)	3(27.3)	11(100.0)		
Kalenjin	3(17.6)	1(5.9)	11(64.7)	2(11.8)	17(100.0)		
Luhya	11(33.3)	8(24.2)	12(36.4)	2(6.1)	33(100.0)		
Kisii	2(25.0)	4(50.0)	2(25.0)	0(0.0)	8(100.0)		
Somali	1(14.3)	0(0.0)	5(71.4)	1(14.3)	7(100.0)		
Gabra	2(66.7)	0(0.0)	1(33.3)	0(0.0)	3(100.0)		
Dogodia	1(50.0)	0(0.0)	1(50.0)	0(0.0)	2(100.0)		
Taita	2(66.7)	0(0.0)	1(33.3)	0(0.0)	3(100.0)		
Giriama	1(100.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)		
Non- Kenyan	2(50.0)	1(25.0)	1(25.0)	0(0.0)	4(100.0)		
Total	116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		
Religion							
Christian	109(29.2)	92(24.7)	132(35.4)	40(10.8)	373(100.0)	8.498	0.386
Muslim	5(35.7)	0(0.0)	85(7.1)	1(7.1)	14(100.0)		
Other	2(66.7)	1(33.3)	0(0.0)	0(0.0)	3(100.0)		
Total	116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		

*Significant at $p < 0.05$

In phrases of the association between WHtR as well as the socio-demographic variables, the only substantial association monitored was actually with sex ($\chi 2$= 16.480; p= 0.001) (Table 4.15).

The hypothesis Ho5 that there is in fact no notable alliance in between demographic characteristics and the status nutrition of students 19-24 years old in colleges in NCBD was actually therefore rejected.

Table 4.15: Association between waist-to-height ratio and socio-demographic characteristics

N=390
n(%)

Gender

		Male	Female	Total	χ^2	P-value
Waist height ratio category	0-49	86(80.4)	165(58.3)	251(64.4)	16.480	**<0.001***
	0.5-2	21(19.6)	118(41.7)	139(35.6)		
Total		107(100)	283(100)	390(100.0)		

Age in years

		19.00	20.00		22.00	23.00	24.00	Total	χ^2	P-value
Waist height ratio category	0-0.49	42(15.1)	71(28.30)	65(25.9)	60(23.9)	11(4.4)	3(1.2)	251(100.0)	8.528	0.384
	0.5-2	19(11.5)	47(33.8)	32(23.0)	27(19.4)	11(7.9)	2(1.4)	139(100.0)		
Total		61(15.4)	118(30.3)	97(24.9)	87(22.3)	22(5.6)	5(1.3)	390(100.0)		

Marital Status

		Single	Married	Divorced	Total	χ^2	P-value
Waist height ratio category	0-0.49	24(96.42)	8(3.2)	1(0.4)	0.059	5.669	0.059
	0.5-2	126(90.7)	12(8.6)	1(0.7)	139(100.0)		
Total		368(94.4)	20(5.1)	2(0.5)	390(100.0)		

Ethnicity

		Kikuyu	Somali	Others	Kamba	Luo	Maasai	Meru	Embu	Kalenjin	Luhya	Kisii	Total	χ^2	P- value
Waist height ratio category	0-0.49	117(46.6)	4(1.6)	10(2.3)	34(13.5)	28(11.2)	8(2.2)	7(2.8)	5(2.0)	10(4.0)	20(8.0)	8(3.2)	251 (100.0)	9.58	0.792
	0.5-2	64(46.0)	3(2.2)	3(2.2	20(14.4)	13 (9.4)	4(2.9)	6(4.3)	6(4.3)	7(5.0)	13(9.4)	0(00	139(100.0)		
Total		181(46.4)	7(1.8)	15(2.6)	54(13.8)	41(10.8)	12(3.1)	13(3.3)	11(2.8)	17(4.4)	33(8.5)	8(2.1)	390(100.0)		

Religion

		Christian	Muslim	Other	Total	χ^2	P- value
Waist height ratio category	0-0.49	239(95.2)	10(4.0)	2(0.8)	251(100.0)	0 .325	0.850
	0.5-2	134(96.4)	4(2.9)	1(0.7)	139(100.0)		
Total		373(95.60	14(3.6)	3(0.8)	390(100.0)		

*Significant at $p < 0.05$

4.5.2 Association between nutritional status and socio-economic characteristics

In terms of the association in the students' socio-economic factors and BMI, the only significant association observed was with the students' source of finance (χ^2 =25.125; p=0.003) (Table 4.16). No association of significance was observed for BMI and average general expenditure per month (χ^2 =5.627; p=0.934), average food expenditure per month (χ^2 =13.486; p=0.565) and decision maker on food purchasing (χ^2 =5.187; p=0.520). In this case, the majority of self-employed students and those that depended on their parents for finance were within the normal range of weight (68.3% and 72.9%). There was almost an equal spread of employed (52.6% and 47.4%) and an equal spread for other students (44.4% and 44.4%) who were within the range of normal weight and overweight.

Table 4.16: Association between Body mass index and socio-economic characteristics

N=390								
		BMI						
		<18.50kg/ m^2	**18.5-24.99 kg/m2**	**25-29.99 kg/m^2**	**≥30**	Total	χ^2	p
Sources of finance	Employed	0(0.0)	10(52.6)	9(47.4)	0(0.0)	19	25.125	**0.003***
	Self Employed	4(9.8)	28(68.3)	6(14.6)	3(7.3)	41		
	Parents/ Relatives	29(9.0)	234(72.9)	52(16.2)	6(1.9)	321		
	Others	0(0.0)	4(44.4)	4(44.4)	1(11.1)	9		
Average general expenditure per month	<4000	1(2.4)	33(78.6)	8(19.0)	0(0.0)	42	5.627	0.934
	4000-6000	6(12.2)	35(71.4)	8(16.4)	0(0.0)	49		
	>6000	26(8.8)	207(69.7)	55(18.5)	9(3.0)	297		
Average food expenditure per month	≤2000	11(7.1)	113(73.4)	27(17.5)	3(2)	154	13.486	0.565
	>2000	22(9.3)	163(69.1)	44(18.6)	7(3.0)	236		
Decision maker on food purchasing	Self	5(4.3)	82(71.3)	25(21.7)	3(2.6)	115	5.187	0.520
	Parent/ Guardian	2(15.4)	9(69.2)	2(15.4)	0(0.0)	13		
	Others	26(9.9)	185(70.6)	44(16.8)	7(2.7)	262		
Total		33(8.5)	276(70.8)	71(18.2)	10(2.6)	390		

*Significant at p< 0.05

No significant association observed for WHpR and socio-economic characteristics tested. All the p values were >0.05 (Table 4.17). In this case, the relationship between the WHpR and

the sources of finance (χ^2 =19.168; p=0.085), average total financial expenditure per month (χ^2 =24.196; p=0.085), and average financial expenditure on food per month (χ^2 =21.581; p=0.364), and decision maker on food purchase (χ2 =14.046; p=0.081).

Table 4.17: Association between Waist-to-hip ratio and socio-economic characteristics

N=390								
Waist-to-hip ratio and socio-economic characteristics								
		Excellent	**Good**	**Average**	**At Risk**	**Total**	**χ^2**	**P-Value**
Sources of Finance * Waist to Hip Ratio								
	Employed	9 (47.4)	2 (10.5)	8 (42.1)	0 (0.0)	19 (100.0)	19.168	0.085
	Self Employed	18 (43.9)	4 (9.8)	14 (34.1)	5 (12.2)	41 (100.0)		
	Parents/ Relatives	87 (27.1)	85 (26.5)	116 (36.1)	33 (10.3)	321(100.0)		
	Others	2 (22.2)	2 (22.2)	2 (22.2)	3 (33.3)	9 (100.0)		
Total		116 (29.7)	93(23.8)	140 (35.9)	41(10.6)	390(100.0)		
Average Total General Expenditure per Month * Waist to Hip Ratio								
Average total general Expenditure per Month	1000-2000	0 (0.0)	1 (25.0)	2(75.0)	(0.0)	3(100.0)	24.196	0.085
	2000-4000	13 (33.3)	10(25.6)	12(30.8)	4(10.3)	39(100.0)		
	4000-5000	6 (26.1)	4 (17.4)	10(43.5)	3(13.0)	23(100.0)		
	5000-6000	12 (44.4)	4 (14.8)	9 (33.3)	2 (7.4)	27(100.0)		
	6000 and Above	85 (28.6)	74(24.9)	106(35.7)	32(10.8)	297(100.0)		
Total		116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		
Average Total Food Expenditure per Month * Waist to Hip Ratio								
Average Total Food Expenditure per Month	500-1000	25(32.5)	13(16.9)	32(41.6)	7(9.1)	77(100.0)	21.581	0.364
	1000-2000	21(27.3)	26 (33.8)	21(27.3)	9(11.7)	77(100.0)		
	2000-2500	25(33.3)	17(22.7)	21(28.0)	12(16.0)	75(100.0)		
	2500-3000	4(20.0)	6(30.0)	10 (50.0)	0(0.0)	20(100.0)		
	3000-5000	41(29.3)	31(22.1)	55 (39.3)	13(9.3)	140(100.0)		
	Over 5000	0(0.0)	0(0.0)	1 (100.0	0(0.0)	1(100.0)		
Total		116(29.7)	93(23.8)	140 (35.9)	41 (10.6)	390(100.0)		
Decision Maker On Food Purchase * Waist to Hip Ratio								
Decision Maker On Food Purchase	Self	45(39.1)	25(21.7)	34(29.6)	11(9.6)	115(100.0)	14.046	0.081
	Parent/ Guardian	6(46.2)	2(15.4)	2(15.4)	3(23.1)	13(100.0)		
	Others	65(24.8)	66(25.2)	104(39.7)	27(10.3)	262(100.0)		
Total		116(29.7)	93(23.8)	140(35.9)	41(10.6)	390(100.0)		

*Significant at p< 0.05

The only significant association observed for socio-economic characteristics and WHtR were with the source of finance for food (χ^2=14.830; p=0.002). The relationship between the WHtR and sources of finance for general expenditure ($\chi^2$11.903; p=0.080) and decision maker on food purchase (χ2=1.229; p=0.746) were not significant (Table 4.18).

Overall, 35.6% of the participants had higher than normal WHTRs (>0.05). Of the students who had higher than normal WHTRs, 58.8%, 26.9%, 34.8% and 100% reported that they were employed, were self-employed, were financed by their parents or relatives and had other sources of finance, respectively (Table 4.18).

Therefore, the blanketed hypothesis (Ho4) that no significant association for socio-economic characteristics and the nutritional status of students 19-24 years old in NCBD colleges was therefore rejected (Table 4.16).

Table 4.18: Association between Waist-to-height ratio and socioeconomic characteristics

N=390								
Waist-to-height ratio and socioeconomic characteristics								
		Sources of finance for food						
		Employed	Self employed	Parents/ relatives	Others	Total	χ^2	P-Value
Waist height ratio category	0-0.49999	7(41.2)	38(73.1)	206(65.2)	0(0.0)	251(64.4)	14.830	**0.002***
	0.5-2	10(58.8)	14(26.9)	110(34.8)	5(100)	139(35.6)		
	Total	17(100)	52(100)	316(100)	5(100)	390(100.0)		
		Sources of finance for general expenditure						
		Employed	Self employed	Parents/ relatives	Others	Total	χ^2	P-Value
Waist height ratio category	0-0.49999	8(3.2)	28(11.2)	213(84.9)	2(0.8)	251(100.0)	11.903	0.080
	0.5-2	11(7.9)	13(9.4)	108(77.7)	7(5.0)	139(100.0)		
	Total	19(4.9)	41(10.5)	321(82.3)	9(2.3)	390(100.0)		
		Decision maker on food purchase						
		Self	Parent/ Guardian	Friends	Other	Total	χ^2	P-Value
Waist height ratio category	0-0.49999	19(0.4)	62(24.7)	170(67.7)	18(7.2)	251(100.0)	1.229	0.746
	0.5-2	0(0.0)	38(27.3)	89(64.0)	12(8.6)	139(100.0)		
Total		1(0.3)	100(25.6)	259(66.4)	30(7.7)	390(100.0)		

*Significant at p< 0.05

4.6 Socio-demographic and socio-economic determinants of the nutritional status of young adults in colleges in NCBD

The only factors that appeared in the logistic regression analysis of the socio-demographic factors and overweight (BMI ≥ 25kg/m^2) body size status of the college students were the gender, number of children, year of study, the duration of study and the sources of finance for food (Table 4.19). In this case, while being male decreased the likelihood of the students having BMI ≥ 25kg/m^2 (OR = 0.203, p<0.001); having 2 children or more and being at the college 2 years or more increased the likelihood of the students having BMI ≥ 25kg/m^2 (OR =7.682, p=0.002 and OR = 1.710, p=0.044).

Table 4.19: Logistic regression on socio-demographic and socio-economic determinants of being overweight (BMI ≥ 25kg/m^2)

	N=390				
	β	**Odds Ratio**	**p**	**95% C.I.**	
				Lower	**Upper**
Sex *(female versus male)*	0.253	0.203	**<0.001***	0.086	0.477
Do you have children?					
None	-	-	-	-	-
1	0.044	1.000	0.099	0.000	-
≥2	-0.164	7.682	**0.002***	2.122	27.805
Year of study *(first versus second or higher)*	0.071	0.542	0.055	0.290	1.013
How long have you been doing course *(one year versus two or more years)*	0.175	1.710	**0.044***	1.013	2.887
Sources of finance for food					
Employed					
Self employed	-0.027	0.264	0.439	0.009	7.695
Parents / relatives	0.082	0.614	0.775	0.022	17.472

*Significant at p<0.05

4.7 Association between dietary intake and BMI of young adults in colleges in NCBD

On comparing dietary intake with the BMI status of the students, the only significant association observed was with carbohydrates (χ^2 =9.385; p=0.026). In this case, the obese students consumed more carbohydrates than their counterparts who were underweight, normal weight and overweight (Median = 163.1g, Min-Max [49.7g-360.7g] versus Median = 128.1g, Min-Max [34.41g-320.60g]; Median = 151.0g, Min-Max [5.84g-210.6g] and Median = 138.9g, Min-Max [10.0g-301.2g], respectively). There were no other significant associations observed between the nutritional status and nutrient intakes; total energy (χ2 =4.104; P=0.396), total protein (χ2 =2.046; P=0.538), total fat (χ2 =1.693; P=0.761), added sugar (χ2 =12.851; P=0.827), total dietary fibre (χ2 =1.245; P=0.917), and sodium (χ2 =1.056; p=0.678) intakes. As a consequence of the observed significant relationship between carbohydrates consumption and BMI , the blanketed hypothesis (Ho_1) that no significant association between dietary intake and nutrition status of students was rejected (Table 4.20).

Table 4.20 Association between dietary intake and BMI of young adults in colleges in NCBD

N=390								
BMI		**Energy (kJ)**	**Total protein (g)**	**Total fat (g)**	**Carbohydrate (g)**	**Added sugar (g)**	**Total dietary fibre (g)**	**Sodium (mg)**
Underweight (<18.5kgm^2)	Mean ± Std. Dev	4787,37±1535,44	126,96±124,03	44,76±26,19	139,96±55,96	12,90±9,74	9,87±5,08	1116,24±1317,72
N=51	Median	4493,00	164,40	40,60	128,10	12,00	9,10	848,00
	Std. Error of Mean	215,00	173,50	3,67	7,84	1,36	0,71	184,52
	Min-Max	(1491,10-8973,00)	(23,30-385,40)	(2,70-113,70)	(34,41-320,60)	(0,00-53,30)	(1,20-25,90)	(20,00-6418,00)
Normal weight (18.5 kgm^2-24.9kgm^2)	Mean ± Std. Dev	5812,46±4269,82	134,86±131,30	59,96±56,93	178,90±213,65	15,86±15,26	12,74±18,46	1357,04±1696,79
N=253	Median	5199,10	161,80	46,30	150,98	12,00	9,80	812,00
	Std. Error of Mean	268,44	82,38	3,58	13,43	0,96	1,16	106,68
	Min-Max	(1533,10-57520,10)	(11,20-700,10)	(6,40-465,70)	(5,84-210,60)	(0,00-160,50)	(0,50-272,40)	(12,00-11765,00)
Overweight (25 kgm^2-29.9 kgm^2)	Mean ± Std. Dev	5640,79±3414,02	156,60±132,31	54,75±36,98	142,90±66,40	15,87±13,64	9,91±6,36	1097,18±1223,46
	Median	4932,50	194,80	50,00	138,88	12,00	9,40	670,00
N=73	Std. Error of Mean	399,58	154,76	4,33	7,77	1,60	0,74	143,19
	Min-Max	(1275,30-26667,00)	(22,60-512,70)	(13,90-262,60)	(10,00-301,20)	(0,00-63,60)	(0,00-28,70)	(19,00-3954,00)
Obese (≥30kgm^2)	Mean ± Std. Dev	5246,51±2099,73	157,75±192,39	48,65±39,01	311,12±549,75	24,24±16,43	11,04±10,34	374,38±351,35
N=13	Median	5181,20	161,00	42,10	163,06	16,80	7,50	191,00
	Std. Error of Mean	582,36	532,34	10,82	152,47	4,56	2,87	97,45
	Min-Max	(2744,30-10215,10)	(26,00-658,00)	(8,80-160,50)	(49,86-360,70)	(0,00-55,80)	(2,90-42,30)	(37,00-988,00)
	χ^2	4.104	2.046	1.693	9.385	2.851	1.245	1.056
	P-value	0.396	0.538	0.761	**0.026***	0.827	0.917	0.678

*Significant at p<0.05

4.8 Logistic regression to identify dietary intake factors associated with being overweight (BMI ≥ 25kg/m^2)

None of the nutrients were significantly associated with being overweight. (Table 4.21)

Table 4.21 Logistic regression of dietary intake factors associated with being overweight (BMI ≥ 25kg/m^2)

	N=390			
Dietary intake *(meeting recommended allowances versus not meeting allowances)*	**Odds Ratio**	Sig. **P**	95% C.I.	
			Lower	Upper
Total dietary fibre (g)	0.998	0.826	0.977	1.018
Energy (kJ)	1.000	0.076	1.000	1.000
Total protein (g)	1.000	0.458	1.000	1.000
Total fat (g)	0.995	0.246	0.988	1.003
Carbohydrate, avail. (g)	1.001	0.405	0.999	1.002
Added sugar (g)	0.981	0.086	0.961	1.003
Sodium	0.761	0.093	0.851	1.010

*Significant at p<0.05

4.9 The college food environment

4.9.1 Food outlets characteristics

Overall, there were 50 food outlets that were included in the current study. Ten percent, 20.0%, 40.0% of these food outlets were away from the college by 300 metres (m), 200m and ≤ 100m, respectively. While 24.0% of these food outlets were within the college yard. Majority of students (60.0%) reported that they visited these food outlets because they were closer to the college, while 24.0% reported that they were influenced by their peers to visit these food outlets. The majority (60% and 66%) of students also reported that they visited the food outlets with an average price of Kenya shillings 50 and those that had cheaper food prices, respectively. The average food prices in these outlets ranged from 50 to 100 Kenyan Shillings. Of these food outlets, 70.0% had nutrition-related government regulations, whereas 30.0% had their own nutrition-related regulations (Table 4.22).

Majority of these food outlets followed the government guidelines within the Hotels and Restaurants Act (2012) which states that outlets should be inspected for the purpose of examination of any article of food or drink and if food or drink is diseased or otherwise unfit for human consumption, it is disposed of in order to avoid danger to health

Table 4.22 Food outlets in the vicinity of colleges

	N = 50
Distance from college	n (%)
300m	5(10.0)
200m	10(20.0)
100m	**20(40.0)**
50m	3(6.0)
Within the college yard	12(24.0)
Total	50(100)
Why visit	
Peer influence	12(24.0)
Quality	4(8.0)
Cheap	4(8.0)
Near	**30(60.0)**
Total	50(100)
Average price (Kenyan Shillings)	
100	5(10.0)
70	5(30.0)
50	**30(60.0)**
Total	50(100)
Why choose foods	
Quality	5(10.0)
Variety	12(24.0)
Cheap	**33(66.0)**
Near	5(10.0)
Total	50(100)
Any regulations by who	
Government	**35(70.0)**
Own	15(30.0)
Total	50(100)

4.9.2 Food items purchased at the food outlets

The study from 50 food outlets in the vicinity of commercial colleges found out that foods that were more preferred by students were mandazi, chapatti and samosas (16.0%, 14.0% and 12.0% respectively) (Table 23).

Table 4.23: Food items purchased at the food outlets by the students

N=50	
Foods frequently eaten	n(%)
Biscuit	5(10.0)
Smokies	3(6.0)
Sausage	3(6.0)
Tea	4(8.0)
Ndazi	8(16.0)
Chapatti	7(14.0)
Juice	4(8.0)
Hotdog	5(10.0)
Samosas	6(12.0)
Uji	3(6.0)
Cake	2(4.0)
Total	50(100)

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The study established that majority of the students were female (72.6% %), ages 19-21 years (68.4%), and first years (79.7%). Most of the participants' source of finance for food (83.3%) was their parents or relatives, most (81.0% %) spent Ksh 11,197.17 per month on food. Overall, the mean energy, protein, fat, carbohydrate, added sugar, dietary fibre and sodium intake were 5347kJ±2209g, 138±132, 138g±132g, 57g±5og, 172g±203g16g±15g, 12g±15gand 1244mg±1551mg, respectively. Majority of the students consumed macronutrients that were within the allowances recommended except for the dietary protein and fibre, where the majority (57.7% and 96.9%, respectively) of students consumed lower than recommended allowances.

Less than 50% (43.8%, 33.1%, 47.2%, 32.6% and 45.65% respectively) consumed foods rich in protein such as red meat, chicken, eggs, fish and legumes weekly, respectively. Whereas, more than 50% of them (i.e. 66.4% and 63.1%) consumed milk and bread daily respectively. Fewer of the students consumed fruits and dark green vegetables (39.5% and 40.3%, respectively); while the majority preferred to eat bright coloured vegetables daily (62.3%). Finally, salt and salted products were consumed daily by 79.7% of students, with less than half (48.8%) of the participants reporting that they consume alcohol daily 2.8%, weekly 10.3%, monthly 5.6% and occasionally 30.3%.

In terms of the nutrition status, majority of these students (70.8%) were found within a range of body size that is normal (BMI (18.5 kgm^2-24.9kgm^2), with only 8.5%, 18.2% and 2.6% being underweight, overweight and obese respectively. The mean WHtR was (0.48±0.07). Majority of the students (70.8%) were also within range of normal WHtR (0.42-0.48), with 18.2% being above the recommended (0.49-0.53), whereas 8.5% were

below the recommended (0.35-0.41) WHtR. The mean WHpR was (0.82±0.08). Majority of the students (53.5%) were within a range of normal WHpR (0.75-0.85), 35.9% were above the recommended (0.79-0.89), 10.6% were below the recommended (0.86-0.95) WHpR. The mean WC was 78.87± (9.43). Majority of the students (54.7%) were within the normal range (0.85-0.89) for men and (0.75-0.79) for women), 37.3% were above the recommended (0.75-0.85), 8.0 % were below the recommended (0.86-0.95) WC.

The socio-economic determinants of dietary intake were; food decision maker, source of water and type of cooking fuel while socio-economic determinants of nutritional status were source of income and monthly food expenditure. Further the demographic determinants of dietary intake were tribe/ethnicity, year of study number of children and family size while demographic determinants of Nutritional status were age, sex, and religion. Majority of the food outlets were close to the colleges (within 20m-100m). Student's preferred food outlets that had variety of food and served cheaper food items. Majority of the food outlets followed the government guidelines within the Hotels and Restaurants Act 2012 which states that outlets should be inspected for the purpose of examination any item of food or drink and if food or drink is contaminated or otherwise unfit for human consumption, it is disposed of in order to avoid danger to health. The findings obtained show that there was similarity in consuming the foods selected among students in the different colleges.

5.2 Socio-economic and Demographic characteristics of students 18-24 years of age attending colleges in NCBD

5.2.1 Socio-economic characteristics of students 18-24 years of age attending colleges in NCBD

The findings of the current research that suggested the majority of college students to be financed by their parents or relatives for food related with international study results which

suggesting that parental income is a predominant money source for college students, and paid more than half of a student's study costs (Mae, 2018). Moreover, like in America and China, the primary food decision makers for college students are parents or guardians (McKinne, 2013). Hence, students' food choices and preferences are shaped by their family environment and family values, since parents / guardians are always the sources of nutrition information. The outcome that majority of students own mobile phones and radios can be explained by a research that found out that generally, 99.8% of college students in Nairobi own mobile phones (especially smartphones) (Mobile Research at UCF, 2018).

The financial situation of the students participating in the current research was not optimal. Despite, the majority of students having access to cooking gas as well as running and treated pipe water inside their rented houses, these houses had only one toilet shared among several tenants. These findings agree with the College Board results on undergraduate student life released in 2018, where it was shown that on average, 44 percent of undergraduate students lived off campus in rental houses. The numbers varied slightly between public and private universities, with respectively 46 and 29 percent of students living off campus. In Kenya a report by Makena (2018) showed similar findings. These findings can also be attributed to the fact that, according to official Kenyan statistics, public universities and most private institutions in Kenya can only accommodate 25 per cent of their students within the campus premises. This therefore forces thousands of learners to seek alternative accommodation outside of the institutions (Makena, 2018). This has provided a huge opportunity to private developers who have been building hostels with shared toilets and tapped water near universities to exploit needy learners who cannot afford to find better and private shelter due to financial constraints. This outcome therefore calls for the government and other concerned stakeholders to step in and provide affordable education and accommodation for college students.

5.2.2 Demographic characteristics of students 18-24 years of age attending colleges in NCBD

According to findings in the current research, the study sample was in excess of females, 19-24year olds, Kikuyu and Christians. These findings are corroborated by some international studies (Marcus, 2017) and explained by local surveillance databases (National Centre for Education Statistics [NCES], 2018; Wanjiru, 2018; CIA World Fact Book, 2019). In fact, in Kenya, more females than males attend colleges and in a study by Marcus (2017) similar gender outcomes were observed among students attending colleges in North Carolina, USA. Moreover, the findings by the NCES (2018) suggested the majority of students attending colleges in Kenya to be between the ages of 18 and 24 years. With diversity of cultures of students attending colleges in Kenya, according to Wanjiru's (2018) the Kikuyu tribe still tops the charts in terms of the number of students who are at tertiary level of education especially those in colleges pursuing their careers in competitive courses. Finally, in terms of religion, majority (70%) of Kenyans are Christians, with the remainder of Kenyans (30%, 38%, 28%, 25% and 6%) being Protestant, Catholic, practice indigenous religions and are Muslims, respectively (CIA World Fact Book, 2019).

Majority of the students in the current research were from households with 4-5 and 1-3 family members, and were in their first year of study. Furthermore, a small fraction of students was found to be having children. Similarly, Noll (2017) found that among USA university students, nearly a third of all undergraduate female students are mothers, with the majority being single mothers.

5.3 Dietary practices of students 18-24 years of age attending colleges in NCBD

The findings obtained also show that the preferred food consumed daily by the students were refined carbohydrates (bread, in particular), sugar sweetened beverages (i.e. tea and coffee) and salty foods. A study by Galuska (2019) taken on to analysis Jordan University

student likewise found that of the method calorie intake from food (179.8 kcal/d, 480.6 kcal/d, 180.7 kcal/d) were obtained from warm drinks, reward extracts and also soft drink, specifically. In this study, the highest possible rate of beverage usage was actually for homemade scorching drinks (herbal tea and also coffee) (89.1%) complied with through result extracts (45.3%), and soft drinks (45.2%) and also there were identical end results by Bipasha et al., (2017) in Bangladesh. In this study, fast foods were consumed weekly. The overconsumptions of sugary, salty and fast foods in the current study are attributable to a fact that readily available foods have cheaper prices being easy to reach at the local food outlets and supermarkets.

Moreover, college students have busy schedules that span the whole day, hence they prefer to buy fast foods than doing their own cooking. A study by Elkhawaga (2015) on Egyptian students found that, in a typical week, only less than half (46%) of students ate three meals daily. Majority use snacks as their diet of choice daily. The current study and Elkhawaga (2015) study also agree with Brown's (2018) study of 121 Indiana College students, where it was shown that more than half (65.3%) of them either consuming food that is processed on daily basis or two times or more each day. Furthermore, (81.8%) of these Indiana College students reported that they either regularly drank soda with a small proportion of those participating that is 18.2% reporting that they drank soda rarely. In the current study, eating with the family most of the time was stated by 62.5% of students, with home-made sandwiches eaten by 35.8% students only during school time.

What was encouraging, in the current study is that fruits as well as light and bright coloured vegetables were consumed the most by the students. Candy and chocolate on the other hand were consumed less often or occasionally. Similar findings were observed by Schroeter (2014) when he studied college students in Florida and Arkansas. They found that while students were not more likely to be consuming vegetables, more likelihood was to consume

three or more servings of fruits each day. This concurs with a study by Adejumo (2017) where it was revealed that banana the most preferred fruit by students while cashew nuts was the least preferred food. In this study, the most preferred vegetables were pumpkin leaves while the least preferred was celosia. Only 37% of students in the current study consumed the recommended amount of fruit and vegetables daily. McKinne (2013) supported these findings by embarking on in East Tennessee Condition Educational Institution, where it was shown that large number of students (70%) ate less than 5 fruits and vegetables on daily basis. These findings are actually even more discussed in the information summarized in the Dietary Standards for Americans (2010) and also the National Cancer Institute (2010), who state that young people will commonly disappoint dietary practices that are actually highly recommended, particularly those related to the consumption of nutrient abundant meals.

Flegal et al., (2010) in their study found that unbalanced dietary practices in the young U.S.A. adults to increase their risk for chronic non-communicable diseases (NCDs). Related to this are also the findings from studies by Barley et al., (2010), Ervin et al., (2004) and also Racette (2005), where it has actually been actually presented that 18-24 years of age students' consumption of numerous vital nutrients, featuring iron, folate, calcium, as well as fibre, are lower than the recommended. Barley et al., (2010), also Ervin et al., (2004) likewise highlighted that reduced consumption of vitamin C and fibre among young adults may be actually attributed to the decreased usage of vegetables and also fruits. This becomes an issue of concern due to the fact that inadequate folic acid intake in females imposes their danger of bearing children who have defects of the neural tube (McDowell et al., 2008).

While the findings of the current study showed that the students had diverse diets, some of the unhealthy foods (starch-based foods like *cakes*, *chapati* and *samosas*) were more

consumed more than the others. Similar findings have been shown in South Africa, in a study undertaken by Van den Berg (2012) on Cape Town college students. In this study less healthy foods were consumed more than the others (i.e. sugary foods [including sweets] were consumed more than the fruits). The consumption of sugary foods was 73% versus 42% of fruits. A large number of these South African students had consumption of bread (55.9%), fat, margarine or oil (68.3%), sugar (59.0%) daily, along with far fewer having daily consumption of vegetables at 12.4%, fruit at 23.6%, and fruit extract at 21.2% as well as milk at 15.6%. It is actually for that reason that Barley et al., (2010) as well as Ervin et al., (2004) discovered that Indiana University students fall short key nutrients including folic acid, iron, potassium, calcium, and fibre while they over consumed sodium and also fats.

These kinds of less healthy dietary practices therefore expose college students to a whole lot of health risks including malnutrition, obesity and NCDs. After all, in this study, although no significant relationships between nutrient intake and the BMI of the participants, 71% of the participating students reported to have gained weight in their second college year. Moreover, in the current research the BMI of the students was shown to increase with their WHtR, an indication of cardiovascular disease risk. There is also concern that, students who carry more weight around their mid-section than on their hips may be at a higher risk to develop certain health conditions which can have a high financial implication to families of those affected, the health institutions and ultimately the country's GDP. There is also a concern that adolescents and youth who are obese and overweight have more likelihood of becoming obese and overweight adults.

5.4 Nutrition status of students 18-24 years of age attending colleges in NCBD

In terms of health and nutrition status, majority of these students (70.8%) lay actually within the level of normal weight of body (BMI, 18.5 kgm2-24.9 kgm2), along with simply

8.5%, 18.2% and 2.6% being skinny, overweight as well as obese respectively. Body mass index (BMI) is commonly used indicator of status of weight. BMI does not however consider the body fat distribution which results in variations in various populations and individuals. The prevalence of obesity and overweight in young adults are high at a global level (WHO, 2004). Health professional students including college students are not spared of these. Specifically, there is a strong evidence showing a high prevalence of obesity and overweight among students in States of America, (USA), Japan, South Africa Pakistan, United (Huang et al., 2003; Sakamaki et al., 2005; Steyn et al., 2000; Zafar et al., 2007). Indeed, 35 % of USA college students (Steyn et al., 2000); 25 % of first year university students in South Africa and 5.8 % of Japan college students (Sakamaki et al., 2005); 20.5 % of Pakistan medical students (Zafar et al., 2007) have actually been found to be actually overweight and also underweight.

An identical research by Poobalan (2016) carried out in young people in developing countries revealed that prevalence of weight problems ranges coming from 2.3 to 12 %, as well as overweight is actually 28.8 % along with weight increasing in the course of this transition period at a higher rate of 1 kg/year, than in developed countries. He likewise found that not less than 23 % of Saudi Arabian as well as Egyptian (16.7 %) who are 18-25 years had a raised risk of developing cardiovascular disease that are actually fatal within ten years. Respiratory functions within these students are largely impacted by overweight and excessive weight with reduction in forced as well as vital capacity. Topping and also Sergent (2001) study of 630 USA university students showed that merely 64% had acceptable BMI levels, indicating sub-optimal intake of nutrients.

The current research also showed that some of the participating students reported that they had gained weight from freshman to sophomore year. The findings are agreed with the study by Flegal (2012) which showed that 70% students at the Tennessee State University

reported that they gained 9.02 +7.92 lbs or 4.1 kg +3.6 kg from freshman to second year. Furthermore, Flegal (2012) did 4 different studies to assess gain of weight during the college first semester where he concluded that there was an increase the mean weight ranging from 1.2 kg to 3.3kg. This also concurs with a study by Poobalan (2016) among 40% students Hawaii who were classified as either overweight and they were college-aged adults (ages 18–24). The trend marks the start of high percentages of obesity and overweight among adults in stages of their later life suggesting the need for interventions geared towards obesity-related prevention behaviours among youth who are college-aged as a strategy to curb the long-term health problems when they become adults.

Majority of students (70.8%) lay within a range that is normal, 18.2% were more than the recommended, 8.5% were below the recommended WHtR. Majority of the students (53.5%) were found within normal range, 35.9% were more than the recommended and 10.6% were below the recommended WHpR. Majority of students (54.7%) being within range that is normal (0.85-0.89) for males and (0.75-0.79) for females), while 37.3% and 8.0 % had more than the recommended and below the recommended waist circumferences (WC) respectively. The WHtR and WHpR indicate fat distribution that is associated with metabolic diseases and the person's overall health. They also measure of central obesity and visceral fat accumulation, better indicators for obesity. According to Elsayed, Tighiouart, Weiner, Griffith, Salem, Levey and Sarnak (2008) a person who have highest WHtR are thought to have a higher risk issues of cardiac in comparison to persons with the low WHpR. Further, Odenigbo, Oguejiofor and Adogu (2011) noted that WHpR is an indicator for abdominal adiposity and is crucial because increase in abdominal body fat puts an individual at raised risks for having chronic illness.

Similarly, a study by Dapare et al., (2017) among 200 Ghana students found that the overweight and obesity prevalence were 28% (WHR), 10% (WHR), 6% (BMI), and 1%

(BMI). The prevalence of underweight was higher in male who had high physical activity than in female who had low physical activity with the average total regular energy intake of the student populace being 4177 ± 7569 Kcal/day. The research reveals the increasing cases of underweight, obese and also over weight incidences in adolescents, coming to be a dual trouble of under nutrition and also over nutrition. There were also nutritional deficiencies in boarding school students together with reduced physical activity as well as eating habits that are unhealthy among day school students. According to KDHS (2017) out of 4, 838 young people in Kenya between 20-29 years, 62% had normal BMI, 28.5 were overweight while 6.9% were obese which agrees with the study findings.

5.5 Demographic determinants of dietary practices and nutritional status of students 19-24 years of age attending colleges in NCBD

5.5.1 Demographic determinants of dietary practices of students 19-24 years of age attending colleges in NCBD

There was general tendency to exceed the daily energy (calories) requirements among students of various age brackets and a significant relationship between age and meeting daily energy requirements. In this regard, younger people tended to exceed the required daily energy requirements as opposed to their older counterparts. This agrees with studies in Bogalusa, Louisiana that have shown suboptimal dietary intake among young adults aged 19–28 years (Demory-Luce, Morales, & Nicklas, 2004). Similarly, the findings agree with Barley et al., (2010) who found that young adults tend to take excess calories. These findings also agree those of Ervin et al., (2004) among students at the Indiana University where he found that the young adults' dietary practices often fell short of recommended key nutrients, while they consumed more calories and sodium. On contrary, Borreli's (2014) study conducted in Western Oregon University among students 19-24 years of age on the other hand found that 59% of these students were prone to taking less than recommended amounts of sodium. Similarly a study by Semproli et al., (2007) that was

conducted in Western part of Kenya among Luo adolescents revealed that majority of the students were generally under consuming essential nutrients.

The study showed that student in the current research over met the recommended carbohydrates intake. Looking at the total counts, most of the respondents did not meet the required daily carbohydrate intake across all the age brackets. These findings agree with those of Habmaire, Levitsky and Mrdjenovic, (2004) in Cornel University New York who argued that college students are exposed to an environment of food characterized by food high in carbohydrates. Further, most of the respondents did not meet the required daily calcium intake across the various age brackets. This coincides Barley et al., (2010) as well as Ervin et al., (2004) research amongst Indiana University students who suggest that the nutrient intake including calcium, folic acid, iron (for women) and fibre in the age bracket of 18-24 years was not recommendable and calories surpass the encouraged levels.

As far as total protein requirements were concerned, there was a significant association for gender and protein consumption, with males consuming more protein than females. This agrees with studies by Racette et al., (2005) and Mooney and Walbourn, (2001), in University of Lethbridge Canada showed that gender differences exist when it comes to food choices. In this regard, more males tended not to meet the protein requirements as opposed to females. This also agrees with Park et al., study (2009) among Southern California students that found out that females had concerns for their image and body weight and consumed less protein compared to males' counterparts. Further, there was a significant relationship between gender and intake of sweets with females tending to consume more sweets daily and monthly than males. With sugar and bread, there was a significant relationship with females consuming more sugar daily and men consuming more bread daily.

The results acquired likewise revealed that there was actually a significant relationship between gender and iron intake. Here, it was actually found out that although many males complied with or even over met their encouraged regular iron intake, a lot of females often tended not to satisfy the recommended regular iron intake. A study on demographic factors likewise linked to the young adults' unsatisfactory dietary practices, along with female showing to consume vital nutrients as well as iron levels that were actually listed below the Nordic recommendations (McDowell et al., 2008). Additionally Barley et al., (2010) and also Ervin et al., (2004) likewise stressed that a decreased intake of fibre and also vitamin C in the age group is actually due to the minimized intake of fruits as well as vegetables. The findings obtained show that there was no substantial connection between any of the demographic factors and tendency to fulfil the recommended Vitamin K intake. All in all, many of the students never complied with the recommended vitamin K intake for all the demographic elements. Further, there was tendency to not to meet the recommended vitamin D requirements across these age brackets.

There was a considerable variation in energy intake in relation to gender. This agrees with Hakim et al., (2012) in his study that reveals that the mean consumption of energy among students who are female was much less in comparison to male counterparts (women: 1681.84 kcal, men: 1938.5 kcal). More than fifty percent of the students never met the Recommended Nutrient Intake (RNI) in Malysia healthy protein (men only), iron (women only), calcium and energy. Male students were also discovered to miss breakfast in comparison to female students. A large number of the students consumed fruits and vegetables 1-4 times per week. This is because male students (33.3%) as well as female students (29.1%) take convenience foods a number of times per week. This contrasts a findings by Tayyem et al., (2008) which uncovered that students who are female are even more worried concerning the status of their weight and body image than male students thus may take on a variety of restrictive measures to prevent body weight increase by limitation

their caloric intake. One more research amongst females by Tayyem et al., (2008) confirmed that females have vegetarian/low caloric trends of diet even more typically than male, who likewise used westernized diet plan in particular.

On the total fat intake, there was not significant relationship between any of the demographic factors and tendency to meet total fat requirements. All in all, for all the various demographic factors (age, gender, marital status, religion and ethnicity) there was tendency to over meet the recommended daily total fat intake. These findings agree with those of Habmaire, Levitsky and Mrdjenovic (2004) in Cornell University who argue that the food environment college students are subjected to become defined through meals high in body fats as well as reduced nutrient density where there is overindulging as well overeating and poor nutrition.

Regarding ethnicity, some the tribes (Somali, Kisii and Maasai), actually over met the daily recommended total protein requirements. Two of these tribes (the Somali and Maasai) are pastoralists and take a lot of meat and dairy products but Kisii are an exception. As such, it seems that they took a lot of proteins as compared to other related tribes. Overall, with reference to ethnicity, there was tendency not meet the required daily total protein intake.
Majority of the students (94.4%) were not married with only 5.1% and 0.5% married and divorced respectively. Conversely, one of the two divorced students over met the recommended intake while the other one did not do so. In this study, 50% of the divorced students over met the recommended intake while the other 50% did not do so. There was high tendency of divorced not to meet the recommended daily intake requirements. This revealed that there existed a relationship of significance between ethnicity and meeting the recommended Vitamin E requirements.

The implication of the findings above is that there was an association between demographic factors and behaviour of diet of the students. Gender characteristics, age, marital status and

ethnicity are significant determinant of dietary practices. Differences in complying with the patterns of diet showed a differences of biological importance in intakes of food. Students' health is affected by the diet consumed which may further affect the policy makers and caregivers in the long run. In line with this KDHS (2016) states that proper nutrition is a very key in countries developing nationally and for the individuals' well-being. More so, the Kenya Government 2011 Food and Nutrition Security Policy highlights that nutrition is very central to development of human in the nation (Government of Kenya, 2011).

5.5.2 Demographic determinants of nutritional status of students 18-24 years of age attending colleges in NCBD

The findings reveal that there was a relationship of significance for BMI and gender where BMI strongly influenced the women's image of the body than that of men. Body mass index (BMI) relates highly to total fatness of the body by densitometry, which has been widely used to indicate overweight risks that are related to morbidity and mortality. The study shows that gender determined the nutritional status of students where by more males were overweight than females as indicated by BMI. This concurs with a study among Malaysia students by Hakim (2012) that the gender of students tends to have a significant relationship with BMI. This agrees with a study by Salameh et al., (2014) that found that percentage of overweight and obesity in males was higher in comparison to females, whereas females had the tendency to be underweight. Similarly, this agrees with Kifle and Desta (2012) among Hawaiian and other Pacific Islanders that the males have more likelihood of having BMIs greater than females. These findings were in comparison to results to those of similar student populations in Lebanon University by Abou, Salameh, Nasser, Nasser and Godin (2016) and Kehoe, Krishnaveni, Veena, Guntupalli, Margetts, Fall and Robinson (2014) in South India where males had greater BMI than females. This contrasts with a research study by Sedibe (2017) one of South African students that showed that being male (OR = 0.29, 95% CI = 0.218-- 0.397; p = 0.00; OR = 0.401, 95% CI =

0.299-- 0.537; p = 0.00) related with reduction of the risk of being actually obese as well as being overweight than being a female.

Regarding ethnicity Freedman's study (2015) among different ethnic groups found that ten percent of Asians were underweight while forty percent of Hispanics were overweight or obese. It was also found that 47.0% of Hispanics and also 46.8% of non-Hispanic blacks possessed the highest possible incidence of excessive weight which was adhered to by 37.9% of non-Hispanic whites and 12.7% of. non-Hispanic Asians Concerning religious beliefs, research by Krista et al., (2016) among U.S.A. adolescents showed that religion pertaining to both the occurrence and also incidence of being overweight. It also was observed that some denominations and religious media practice, especially the more fundamentalist groups, stood at a higher risk of obesity but those who turned to religion as a way of consolation had a lower risk of obesity. Marriage status was discovered to be related to being overweight depending on to their end results, through Tzotzas (2014) among the cultivating nations where 2 very most plausible speculations to detail BMI boost during the course of relationship. These were the social commitment of relationship, which mention that married couples consume additional normal meals which are richer and also denser foods items as well as the hypothesis marriage market, which states that individuals who are married especially females, are no more regarded regarding bring in a friend as a result might allow their BMI to climb.

A study by Kirsten (2013) among university students showed prevalence rates of 8% obesity and overweight in girls where international datasets supported from the USA (36%), Philippines (32%), Mexico (29%), England (26.6%), Australia (24%), and Sweden (19.5%). It also reveals that disorders of eating incidence and obesity has been on the increase in the recent decades. This is particularly reaches teenagers the young adults who are female (Abou, Salameh, Nasser, Nasser & Godin, 2016). Rahim, Nabilla, Chin and

Sulaiman (2019) in a study on university students in Malaysia, noted that there was higher percentage of overweight and obesity 4.9% reported for female students than 4.2% male students.

According to Herrera, Rebato, Arechabaleta, Lagrange, Salces and also Susanne (2013) the incidence of skinny Venezuelan 10.3% of female as well as 10.7%, of male students, in comparison along with 14.5% as well as 14.9% excessive weight amounts. In Ghana, Nonterah, Debpuur, Agongo, Amenga-Etego, Crowther, Ramsay and also Rexford Oduro (2018) noted that the obesity overweight percentage was4.2% and 4.9% for male and female students, respectively. In evaluation only of 7.3% male and 5.3% of female mentioned for students in Malaysia in a study through Al-Rewashdeh et al., (2016) displayed a higher rate of underweight. A lot more so, the amounts of overweight and obesity Malaysian students 4.9% of female 4.2% of male corresponded with less values secured in this research study. There is one more performed on the students who are female of the Educational Institution of Kuwait. The underweight, overweight, as well as obese students' percentage were actually reported to be 10.3%, 29.5%, and 12.7%, respectively. As compared with their Kuwaiti counterparts, female Iranian students exhibited a lesser prevalence of obesity, overweight as well as higher underweight percentages. Among Saudi Arabian university students, 15.7% were obese, 21.8% were overweight and 5% were underweight. In evaluation, 5%, 21.8%, and 15.7% of Saudi Arabian university students were under a healthy weight, obese and also overweight respectively. In evaluation these results corresponded with those from Iranian students who are male, where 13.4% were overweight and 10.2% were underweight. Male students the Saudi Arabian were much more likely to be overweight as well as obese and this is likely to correspond to researches done in U.S.A. and also Lebanon.

On Waist Circumference (WC), the study found out that majority of the males had slightly lower Waist Circumference while majority of the females the waist circumference tended to be on the average standard. Waist circumference is used to indicate abdominal obesity and is highly feasible and a method that is inexpensive used to monitor fat distribution in the body and also to identify persons at greater risk of disease in a variety of settings. Waist circumference (WC) is used as an indicator of intra-abdominal adipose tissue, where high levels confer an increased risk of cardiometabolic disease. The results are in line with Zvonar, Štefan and Kasović (2019) that the effect of gender on waist circumference is stronger in Croatia. According to Tran, Blizzard, Luong, Le Van Truong, Tran, Otahal and Srikanth (2018) Waist Circumference is a significant predictor of nutritional status of both male and female.

The study also established that when it came to waist height ratio (WHtR) most students were found within recommended ratio for male and female (0.47 and 0.49 respectively). The study also established that WHpRfor for most students was also found within recommended ratio where waist-to-hip ratio of 0.85-0.89 for men and 0.75-0.79 for women is considered safe. Majority of the males and females had WHR of 0.85 and 0.81 respectively where the females had slightly higher by a ratio of 0.2. The findings show that most females were either average or at risk while more males ranged from excellent to average which is a risk factor to heart diseases. The findings concur with those by Stevens, Katz and Huxley (2011) in University of Queensland, Australia that waist-to-hip ratio increase with gender. In addition to this Han and Currall (2015) noted that age adjustment increases the relationship between waist and height ratio. Furthermore, Zafar's et al., (2007) study in Southern States and Colorado noted that for both men and women, the risk of heart disease and other problems related with being overweight rises sharply with a WHR of 0.1 or higher.

End results of the study further signified that there was no statistically considerable connection between Body mass mark as well as age. Age is just one of the major socio-demographic elements linked with nutritional status, measured using BMI as a stand-in where BMI is age particular. Given that BMI adjustments higher as individuals grow older, BMI-for-age may be used to examine individuals' adiposity. The BMI may ignore adiposity due to the effect of slim tissue loss related to age, primarily skeletal muscle mass, and body fat accumulation being characteristics of sarcopenic excessive weight which is seen in the elderly. The end results oppose Nonterah, Debpuur, Agongo, Amenga-Etego, Crowther, Ramsay and also Rexford Oduro (2018) in Northern Ghana where there is actually a solid relationship of BMI along with age as well as that the prevalence of the different BMI classifications differs by age. Much older participants were more likely to become underweight whereas the much younger generation were actually most likely to become obese and also overweight. Much higher age is actually typically linked with greater BMI though as body fat mass is known to reduce in much older persons, it might help in the reduced BMI associated with higher age. This coincides Reas, Nygård, Svensson, Sørensen as well as Sandanger (2010) amongst Norwegian men and women that stated that the best volume of BMI occurs for the young adults (20-29 years) and also agrees with a research by Vasconcelos (2015) among Vietnam youths which took note that adult college females aged in between 20 as well as 24 prevalence was actually 8.3% for under-weight and also 24.2% for obese. Researches in Bogalusa, Louisiana have revealed harmful nutritional status amongst younger adults 19-28 years (Demory-Luce, Morales, & Nicklas, 2004). Kenya's KDHS (2015) questionnaire shows that 9% of females 15-49 years are actually thin while one third of females (33%) are actually overweight or obese than males where overweight and obesity are actually even more popular among women in urban regions (43%), although still more than one quarter of females in rural areas (26%) are actually obese or even obese. Being overweight prevalence by utilizing BMI as a limit may ignore

the true level of weight problems across age as a result use of other nutritional status marks. Prevalence of malnutrition develops in a variety of forms (weight problems and being overweight/underweight) worldwide. This is actually rampant amongst adolescents as well as young people and also is of serious concern because of its own various damaging health implications (Demory-Luce, Morales, & Nicklas, 2004).

5.6 Socio-economic determinants of dietary practices and nutritional status of students 18-24 years of age attending colleges in NCBD

5.6.1 Socio-economic determinants of dietary practices of students 18-24 years of age attending colleges in NCBD

The findings obtained show there was actually no substantial connection between socio-economic elements and meeting energy requirements except the sources of financing, overall expenditure monthly, total food cost each month and, decision maker on food items purchase. These factors were actually discovered to become positively associated with students' satisfying their recommended dietary energy requirements. Surprisingly, there were actually no borders over various total expenditure categories monthly. In the present research study, the level of earnings certainly does not seem to have an effect on the degree of intake of energy. The affordable energy-dense in comparison foods rich in nutrients are likely to promote disparities that re socioeconomic regarding quality of diet and obesity. Socio-economic differences in food purchasing may arise from nutrient-rich high cost of foods in relation to energy-dense foods. Self-employed students seemed to have unmet needs for energy requirements while those employed or under the care of parents and relatives tended to over meet the energy requirements.

This concurs with a research study through Nayga (2010) embarked on in American's young adults which showed that the income status of these young people determined their consumption of energy abundant food items. Moreover, this study verified that the income was actually a notable factor influencing the intake of all nutrients examined except

carbohydrate. James, Nelson, Ralph and also Leather's research (2017), among diverse countries added that low socioeconomic groups purchase foods richer in energy to aid in satisfying hunger, where protective food rich nutrients are more expensive than per unit of energy and affordable in households of high income. The results also agree with Marques-Vidal, Paccaud,Mayen, Bovet as well as Stringhini (2014) study amongst adolescents in Seychelles that a greater purchasing power was related to much higher power intake which high-income individuals had greater power intake, mirroring a more access to cost-effective energy rich foods as well as more costly and high quality meals. In a similar way, Chen et al., (1995) reported that China had additionally switched its styles in diet regimen because of economic changes where individuals had more amount of money to spend in purchasing additional processed meals, which are even more energy-rich foods.

The findings show no considerable relationship between any of the socio-economic variables as well as meeting the suggested intake of overall protein. Participants tended not to comply with the recommended protein intake no matter their economic standing. Remarkably freelance students tended not to meet the recommended overall proteins as matched up to those under the care of parents or guardians and also those employed. No primary distinctions were actually documented between monetary expenditure amounts and also those behind making decisions on food expense as well as complying with the recommended healthy protein intake. Deliens et al., (2014) observed that food items costs and personal finances determined students' intake of meals rich in healthy protein in a Belgian Educational institution. A comparable research study by Akinyemi (2009) in Queens University Students of Lagos State Nigeria showed there was healthy protein deficiency caused by failure to afford food items abundant within this nutrient as a result of poverty or by non-availability of food items. According to Marques-Vidal, Paccaud,Mayen, Bovet as well as Stringhini (2014) socio-economic status that is high is actually associated with greater intake of food rich in protein. It also states that low as well as lower-middle-

income countries had low diet plan intake. The study noted that high socio-economic status is actually measured with revenue, education, or even metropolitan location which were significantly associated with higher intake of protein. Urban location as well as higher SES were actually considerably related to a high consumption of protein which showed an increasing intake of a foods from animals which accompanied the nutritional transition. However, in Brazil, and SES which is high was related with decreased intake of protein (Possa, Castro, Sichieri, Fisberg & Fisberg, 2017).

Further, the logistic regression findings revealed that no socio-economic variables investigated in the present research study possessed significant association along with satisfying the recommended total fat intake. The results show that students over consumed the recommended fat intake no matter of their socioeconomic status. We have to be actually mindful of the proof that recommends lesser socio-economic groups specifically those in urban areas to be even more very likely to consume diets higher in fats. Begum, Farooq, Khan, Begum and also Khan (2010) study amongst college students in Nigeria showed that the socio-economic factors like month to month overall income has a relationship along with consumption of fatty rich foods items. Monthly total earnings possessed significance in consumption of edible fats. It likewise showed that there was actually a considerable significance between the decision maker on food items to be consumed and the intake of carbohydrates. Nonetheless, there was actually no notable relationship between carbohydrates intake as well as other socioeconomic factors.

There was no relationship which was statistically significant between any of the socioeconomic factors and the intake of vitamin C, the findings obtained show that the students did not consume the recommended daily intake requirements for vitamin as well as vitamin C within this group results from the lowered usage of vegetables as well as fruit products. It was actually additionally highlighted that there was actually a significant

relationship between the decision maker on meals consumed as well as the intake of calcium however altogether, there was actually propensity not to comply with the encouraged intake of calcium around all the numerous socio-economic variables. These findings are actually substantiated by those of Bromage et al., (2016) who carried out a research on Bangladesh adolescents and discovered that there were actually several socio-economic variables that have converged inclining the populace to common calcium deficiencies along with disproportionately restricting access to dietary calcium sources.

The findings further agree with Barley et al., (2010) who observed that socio-economic factors like household income influenced consumption of food rich in calcium nutrients. High income individuals usually tended to consume more of calcium than low-income people. Intervention on nourishment to improve intake of calcium is a necessity to focus on suitable support into improving the calcium rich meals accessibility. An ample intake of calcium lowers the danger of osteoporosis with higher acquisition of bone tissue during development in later life stage. This is backed up by findings by KDHS (2015) that state that the Kenyan constitution identifies health and nutrition as well as appropriate food items as an individual's right. Everyone has the right to the right to meals that is adequate, of reasonable quality and be without hunger (Article 43) and also it is actually the right of every child to possess essential nourishment (Article 53).

5.6.2 Socio-economic determinants and nutritional status of students 18-24 years of age attending colleges in NCBD

The determinants of socio-economic of the study were the source of income, decision maker on food purchase on what is to be cooked, average spending on food per month and total general expenditure per month. From this study majority of students who had source of finance as parent, spent more on food and had influence on food choice decision maker had normal BMI. Socio-economic factors contribute to large difference in BMI when it

comes to low and countries of middle-income whereby there is a large difference in BMI showing under nutrition that is in existence and rising of obesity and overweight cases. A study by Ene-Obong (2010) in Enugu State, Nigeria that was carried out to establish the effects of socioeconomic and cultural factors where focus group discussions revealed that sex discrimination in education prevailed where resources were limited. Further, Brent (2018) study among USA students revealed that socioeconomic factors have direct and indirect affect the individuals' nutritional status. These factors couple with increased risk for weight gain, obesity and even under-nutrition, in turn contributing to the development of a number of diseases that are chronic including high cholesterol, cardiovascular disease, high blood pressure, and diabetes. A study by Barros, (2018) among 58 countries found that socioeconomic factors contribute to a great proportion of difference in populations BMI with 47·1% for communities and 14·8% and also variance of inter-individual being about 2%. This relates to Barros (2018) study conducted in Europe, Latin America and central Asia which showed that the BMI of participants increasing with a decrease SES in poorer countries, and decreased with an increase in SES in richer ones.

More so Kim, Kawachi, Coull and Subramanian (2018) research in low as well as middle-income countries supports the outcomes that socioeconomic factors result in variation in BMI all over different populations. Similarly, a research carried out by Fernald (2007) amongst young Mexican adults noted that BMI and household income were actually significantly associated. This research even further revealed that there were positive associations between socio-economic elements as well as BMI in low-income people, which were very likely to be associated with meal supply, changing lifestyles, usage trends, food items make-up, and also social elements. Socio-economic factors like learning, earnings, and line of work, frequently result in the differences in BMI. According to Yadava and Choubey (2014) earnings as well as education have substantial relationships with BMI. In addition, the research study carried out by Gimeno Ruiz de Porras, Zepeda

Tello, Camacho, Hernández Ávila, Basto Abreu, and Barrientos Gutiérrez, (2018) in Mexican youths signified that higher status of earning linked with poor BMI in females whilst, an increase in assets that were family was actually associated with higher BMI in men. Delvarianzadeh (2016) in his study carried out in higher SES college students acknowledges that the students' BMI and energy intakes were actually favorably associated. Majority of these students (73.91%) in Delvarianzadeh (2016) research were actually of normal BMI, though some malnourishment instances including both underweight as well as overweight were noticed among the students. Further Devaux's study (2014) in developing nations discovered a favorable connection between health and nutrition as well as education and learning had a correlation because of the factors probably unnoticed which have an effect on both education as well as nutrition. The study was actually certainly not mutually special, and is most likely to offer the clearest explanation of the steady strong correlations in between education as well as nutrition, or excessive weight that is actually discovered throughout nations.

It was also established that socio-economic factors determine WHpR of students. Educational status of students also determined their WHpR. According to the results, WHpR decreased as the socio-economic status goes up. These findings agree with those of Rastegari, Noroozi and Paknahad (2017) in their study conducted in Mexico that suggested that there is a significantly statistical relation between work, and WHpR. It also relates with a study by Kang et al., (2015) where the researchers observed that the WHpR was associated with socio-economic status among Hong Kong students. The researchers further stated that it seemed that students with higher socio-economic status paid more attention to condition of their health having much concern regarding it because of the complications that are associated with carrying extra fat of tissue. Furthermore, the income of students determined WHpR. High income is associated with waist-to-hip ratio of higher odds. The results are in line with those of Ishizaki, Morikawa, Nakagawa, Honda, Kawakami,

Haratani and Yamada (2014) that suggested that WHpR was associated with household income. Mandonca et al., (2015) observed that WHtR was found to stratify cardiometabolic risk factor further to levels beyond percentile of BMI category alone. There is limited literature on studies done on WHtR of college students.

Regarding education and learning status through Cutler as well as Lleras-Muney (2010) in developing nations revealed students along with additional education years were much less ikely to consume a whole lot or even usage illegal drugs, smoke cigarettes, be overweight or even overweight. The much more educated were much more likely to perform workout and to take preventative care such as vaccinations, pap smears colonoscopies, as well as mammograms. They identified the relationship between wellness and education and there seems non-linear for weight problems, with more effects incorporated years of education. In contrast an estimation of cross-sectional research of twins administered through Webbink et al., (2008), affirms a relationship that is adverse in between learning as well as the possibilities of being overweight. It does certainly not detect central excessive weight and also the adverse cardiometabolic danger amongst obese populace, yet additionally determines persons inclined to sugar metabolism disability discovered to have ramifications for the primary care process. KDHS (2016) study shows that youth from higher SES metropolitan places are actually biggest portion that is actually either obese or overweight. There are studies tailored where interventions are required to come up with obesity prevention strategies that are evidence-based for this high-risk in the country.

5.7 Dietary intake and BMI of students 18-24 years of age attending colleges in NCBD

On comparing dietary intake with the BMI status of the students, the only significant association observed was with carbohydrates, where the obese students consumed more carbohydrates than their counterparts who were underweight, normal weight and overweight. Male students about 33.3% of as well as female students about 29.1% ate fast

foods numerous times per week. This showed that male and female students (16.7% and 20.9%) were actually skinny whereas male and female students (17.8% and 10%) were actually over weight.

Yet another similar study through Shommo amongst students in Hail College, in Saudi Arabia obesity occurrence grades was actually n (%); 43(43%) being overweight quality I, 17(17%) weight problems level II, and also 8(8%) were actually quality III excessive weight. Intake quality food items as explained in weekly frequency disclosed that: eggs, sweets as well as sweets, non-alcoholic drinks, vegetables, milk items, choices, shells rice, and various other carbohydrate meals were actually highly taken in. Most of the students 65% consumed rice along with chicken (Kabsa) as staple food, whereas 4% ate other starched meals. They also ate a lot less servings (≤ Once/week) of white potato, breadstuff, fruit juices, and soft drinks. The higher consumption of power heavy meals could be in charge of their raising calories affirmation in form adipose tissue. Better, a contrasting study carried out by Becerra-Bulla (2015) in College of Colombia students determined that according their BMI results, approximately three fourths of students were actually categorized as having normal BMI. Males possessed a lot more malnutrition incidence than female. Majority of the students 70% ate dairy and dairy products, while those that took in meat product everyday were 61%. These students consumed too much protein and fat in diet in comparison to Colombia recommendations.

An identical research by Ismail on College of KwaZulu-Natal students showed that majority of them set within the normal category of BMI (64.9%) with their BMI being 23.5 kgm^2. Overweight and weight prevalence was higher among the female (22% and also 11.5%) than the male (13.3% and also 2.4%) while even more male students were actually within the regular BMI classification (77.3%).

Yet in another study by Momanyi (2014) among Maseno Univerity students in Kenya 33.8% consumed two meals a day while 63.5% ate three meals per day and 2.7% had eaten four meals a day throughout their operating time. Lack of any kind of a meal product amongst these students embodied 35.1% while at the exact same time the accessibility of fast foods had the minimal impact on the students with a 17.6% representation. More than 50% of these respondents had an indication that they do not meet their nutritional requirements with the available foods.

5.8 Conclusions

Objective 1: On determining the socio-economic and demographic characteristics of students attending colleges in NCBD, majority of the students were female 19 -21 years of age and at first year of study. Most of the participants' depended on their parents or relatives.

Objective 2: On determining the dietary practices of students attending colleges in NCBD, majority of the students consumed macronutrients that were within the RDAs except for dietary protein and fibre, where the majority consumed lower than recommended allowances.

Objective 3: On determining status of nutrition for students 19-24 years old who were attending NCBD colleges, majority of them had normal BMI, WHR, WHTR and waist circumference. Only 2.8% males and 2.5% females were at risk for cardiovascular disease respectively.

Objective 4: On determining the demographic components of practices of diet and status of nutrition of students attending colleges in NCBD, the socio-demographic factors of dietary intake were Gender, Age, marriage status, Ethnicity as well as religion. Because of the monitored significant relationship in between demographic characteristics as well as gender, age and also status the blanketed hypothesis (Ho4) that there is no significant relationship for demographic characteristics and nutritional status of students was **rejected**.

Objective 5: On identifying the socio-economic determinants of practices of diet and status of nutrition of students 19-24 years old in NCBD in colleges, the socio-economic determinants of intake of diet were sources of finance, average total expenditure per month, and average total food expenditure per month and decision maker on food purchase. As a result of the observed significant association between economic characteristics and dietary practices the blanketed hypothesis (Ho_2) that there is no significant relationship for socio-economic characteristics and practices of diet of students was **rejected.**

Objective 6: On comparing dietary intake with the BMI status of the students, the only significant association observed was with carbohydrates. As a result of the observed significant association between BMI and carbohydrates consumption, the blanketed hypothesis (Ho_5) that there is no significant relationship between practices of diet and status of nutrition of students was **rejected.**

In addition, there was actually no significant association between socio-economic elements and dietary patterns except the sources of financing, typical overall expenditure monthly, normal total food cost each month and, decision creator on food items investment therefore the blanketed Hypothesis (Ho_1) there is no significant relationship between socio-economic characteristics and practices of diet of students 19-24 years old attending colleges in NCBD was **rejected.**

From this study majority of students who had source of finance as parent who was principal food choice decision maker spent more on food and had normal BMI so in line with the blanketed hypothesis (Ho_3): there is no significant relationship for socio-economic characteristics and the status of nutrition students 19-24 years old attending colleges in NCBD was therefore **rejected.**

5.9 Recommendations

The National School Meals and Nutrition Strategy 2017-2022 states that, the Government recognizes that it requires multi-sectorial planning and intervention for full achievement of

the School Nutrition and Meals strategic objectives. This can be coordinated by the Ministry of Education Science and Technology with the key actors participating; health, agriculture, social protection and finance sectors, among others. This is to synergize the different sectors are a key components for improving the implementation quality, add value to the chain of supply, and capitalize on the utilizing resources and personnel. Based on the study findings, the recommendations that were made are as follows:

5.9.1 Recommendation for policy

1. The colleges need to consult nutrition experts to assist in the development of school guidelines for the food outlets within the college environment that sell healthy food to their students.
2. Food outlets within college environment need to follow guidelines in the National School Meals and Nutrition Strategy in ensuring there is a provision of nutritious varied, acceptable, convenient, and affordable meals for students so as to discourage them from relying on convenient fast foods that are unhealthy.

5.9.2 Recommendation for practice

1. College students were found have poor dietary patterns including eating unhealthy foods skipping meals and overeating. Healthy dietary practices are required among many college students to overcome this. This can be achieved by colleges encouraging the students to eat healthy meals through health talks organized by college administration. College administration therefore need nutrition awareness so as to encourage positive peer influence with regard to healthy eating through organized talks, social media and other campaign tools.
2. Nutrition sensitization among students should be conducted by college student welfare authorities in conjunction with food nutritionist experts to inform college students of the benefits and harm associated with various types of food sold by the service providers.

5.9.3 Recommendations for further study

i. The current study focused on demographic and socio-economic determinants of practices of diet among young adults attending NCBD Commercial Colleges. A study that is comparative could be carried out to allow comparison of the dietary practices of the rural and urban settings. This would help facilitate in the development of interventions that are all-inclusive to reduce poor dietary practices among young adults attending commercial colleges.

REFERENCES

Abou Abbas, L., Salameh, P., Nasser, W., Nasser, Z., & Godin, I. (2016). Body mass index and psychological distress among Lebanese University students: examining the moderating effect of gender. *International journal of adolescence and youth*, *21*(3), 332-340.

Adejumo L., (2014). Fruit and vegetable consumption among students of tertiary admitted to nutrition and dietetics programs in the National University of Colombia. Adulthood? African Journal of Primary Health Care & Family Medicine4(1): http://dx.doi.org/10.4102.

Ahern, D. K., (2007). Challenges and opportunities of eHealth Research. *Am J Prev Med*., 32: S75–S82.

Akinyemi, O., and Ibraheem, A.G. (2016). Assessment of Nutritional status of Queens

Al-Rethaiaa, A. S., Fahmy, A. A., & Al-Shwaiyat, N.M., (2010). Obesity and eating habits among college students in Saudi Arabia: A cross sectional study. *Nutr. J.*, 9: 39.

Al-Rewashdeh, Y., et al., (2010). Anthropometry and Dietary Assessment of Males and

American College Health Association (2006). American College Health. *J Am Coll Health*, 56:463–68.

American College Health Association (2008). National College Health Assessment Spring 2007 reference group data report (abridged). *J Am Coll Health*, 56:469–79. doi:10.3200/JACH.56.5.469-480.

Arnet, J. (2014). Emerging Adulthood: The Winding Road from the Late Teens Through the Twenties (2nd Edition). Oxford University Press

Association National College Health Assessment Spring (2005). Reference Group Data Report (Abridged). *J Am Coll Health*, 55:5–16.

Austin, G., (2014). The importance of representative samples and how to get them. *Austin Research.*

Barley, R., Dodd, K., Gahche, J., Dwyer, J., McDowell, M., Yetley, E., Sempos, C.,Burt, V., Radimer, K. & Picciano, M. *(*2010*).* Total folate and folic acid intake from foods and dietary supplements in the United States: 2003-2006. *Am. J. Clin. Nutr.*, 91, 231–237.

Barros, A. J. (2018). The charade of socioeconomic body-mass index determinants. *The Lancet Global Health*, *6*(7), e710-e711.

Basto- Abreu, A., Barrientos- Gutiérrez, T., Zepeda- Tello, R., Camacho, V., Gimeno Ruiz de Porras, D., & Hernández- Ávila, M. (2018). The Relationship of Socioeconomic Status with Body Mass Index Depends on the Socioeconomic Measure Used. *Obesity*, *26*(1), 176-184.

Begum, S., Farooq, M., Khan, M., Begum, N., & Khan, A. (2010). Influence of socio-economic factors on food consumption pattern in district Nowshera. *Sarhad J. Agric*, *26*(3), 405-408.

Betts, N.M., Amos, R.J., Georgiou, C., Hoerr, S.L., Ivaturi, R., Keim, K.S., Tinsley, A., & Voichick, J. (1995). What young adults say about factors affecting their food intake. *Ecol Food Nutr*., 34:59–64.

Borreli, L., (2014). Food Insecurity: Why 59% of College Students May Suffer from Malnutrition. *Healthy Living.*

Brown, O, O'Connor L, Savaiano D. Mobile MyPlate: A pilot study using text messaging to provide nutrition education and promote better dietary choices in college students. J Am Coll Health. 2017; 62:320-27.

Burger, K.S., Kern, M., Coleman, K.J. (2007). Characteristics of self-selected Portion size in young adults. *Journal of the American Diet. Assoc.*, 107(4):611–618.

Byrne, S., Allen, K., Dove, E., Watt, F. & Nathan, P. *(*2008*).* The reliability and validity of the dichotomous thinking in eating disorders scale. *Eat. Behav.*, 9*, 154–162.*

Campbell, K.L., Ash, S., Bauer, J.D. (2008). The impact of nutrition intervention on quality of life in pre-dialysis chronic kidney disease patients. *Clin Nutr*., 27(4):537–544.

Cancel-Tirado DI, Lopez-Cevallos DF, Patton-Lopez MM, and Vazquez L, (2014). Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of Nutrition Education and Behavior*. American College Health Association.

Cardinal, B. J,. (2014). Factors influencing the exercise behavior of adults with physical

Carroll, S.L., Lee, R.E., Kaur, H., Harris, K.J., Strother, M.L., & Huang, T.T. (2006). Smoking, weight loss intention and obesity-promoting behaviors in college students. *J Am Coll Nutr*., 25(4): 348–53.

Chhabra, V. L., Grover, Aggarwal, K., & Kannan, A.T. (2006). Nutritional Status and Bood Pressure of Medical Students in Delhi. *Indian Journal of Community Medicine,* Vol. 31, No. 4, 248 P.

CIA World Fact book (2019). "Pew Research Center's Religion & Public Life Project: Kenya"

Cline C., (2015). Marital status and educational level associated to obesity in Greek adults: College Students of Lagos State, Nigeria. Pakistan Journal of Nutrition, 8:937-939.

Crombie, A.P., Ilich, J.Z., Dutton, G.R., Panton, L.B., & Abood, D.A. (2009). The freshman weight Gain phenomenon revisited. *Nutr Rev.*, 67:83–94.

Crow, S., Zander, K., Crosby, R., & Mitchell, J. *(1996).* Discriminant function analysis of depressive symptoms in binge eating disorder, bulimia nervosa, and major depression. *Int. J. Eat. Disord.*, 19, 399–404.

Cynthia L. Ogden, Ph.D.; Molly M. Lamb, Ph.D.; Margaret D. Carroll, M.S.P.H.; and Katherine M. Flegal, (2012). Relationship of Demographic Characteristics and BMI with Health Literacy in Pacific Islander Care-Giving Adults. University – Provo

Dapare et al., (2016). Nutrient Intake, Physical Activity and Nutritional Status among

Dars,S., Sayed,, K., Yousufzai Z. (2014). Relationship of menstrual irregularities to BMI and nutritional status in adolescent girls. *Pak J Med Sci.* 2014 Jan-Feb; 30(1): 141–144. doi: 10.12669/pjms.301.3949.

De Irala-Estevez, J., Groth, M., Johansson, L., Oltersdorf, U., Prattala, R. & Martinez Gonzalez, M.A. (2000). A systematic review of socioeconomic differences in food Habits in Europe: consumption of fruit and vegetables. *European Journal of Clinical Nutrition,* 54: 706-714.

Deliens, T., Peter, C., De-Bourdeaudhuij, I., & Deforche, B., (2014). Determinants Of eating Behaviour in university students: a qualitative study using focus group discussions. *BMC Public Health,* 2014, 14:53.

Delvarianzadeh, M., et al., (2016). Iranian Journal of Health Sciences 2016; 4(4): 56-68http:// jhs.mazums.ac.irIran J Health Sci 2016; 4(4): 56Assessment of Nutritional Status and Its Related Factors among Iranian University Students: A Cross-Sectional study.

Demory-Luce, D., Morales, M., Nicklas, T. *et al.*, (2004). Changes in food group consumption patterns from childhood to young adulthood: the Bogalusa Heart Study. *J Am Diet Assoc.*, 104: 1684–1691.

Deurenberg, P., Weststrate, J.A., & Seidell, J.C. (1991). Body mass index as a measure of

Devaux M., (2014). Exploring the Relationship Between Education and Obesity. dieters and non-dieters.

Dietz, W. *(*1998*.)* Health consequences of obesity in youth: childhood predictors of adult disease*. Pediatrics.* 101*, 518–525.*

Dodd, L.J., Al-Nakeeb, Y., Nevill, A., Forshaw, M.J. (2010) Lifestyle risk factors of students: A cluster analytical approach. Preventive Medicine 51:73–77 doi: 10.3390/nu11051058. PMCID: PMC6566441.

Elsayed, E. F., Tighiouart, H., Weiner, D. E., Griffith, J., Salem, D., Levey, A. S., & Sarnak, M. J. (2008). Waist-to-hip ratio and body mass index as risk factors for cardiovascular events in CKD. *American Journal of Kidney Diseases*, *52*(1), 49-57.

Ervin, R., Wang, C., Wright, J. & Kennedy-Stephenson, M. *(*2004*).* Dietary Intake of Selected Minerals for the United States Population: 1999–2008. Hyattsville, MD*: National Center for Health Statistics.* Ethnic Backgrounds of Tripura, a North-East State of India.

Evans E. Understanding weight management perceptions in first-year college students using the health belief model. J Am Coll Health. 2014; 62:488-97

Fairburn, C. & Beglin, S. *(*1994*).* Assessment of eating disorders: interview or self-report questionnaire? *Int. J. Eat. Disord.*, 16*, 363–370.*

Fernald, L. C. (2007). Socio-economic status and body mass index in low-income Mexican adults. *Social science & medicine*, *64*(10), 2030-2042.

Flegal, K.M., Caroll, M.D., Ogden, C.L., & Johnson, C.L. (2002). Prevalence and trends in obesity among US adults, 1999–2000. *Journal of American Medical Association*, 288:1723–37.

FoodFinder database. Medical Research Council of South Africa food composition database. SA HealthInfo.http://www.mrc.ac.za/FoodComp/

Franko, D.L., et al., (2008). Motivation, self-efficacy, physical activity and nutrition in college students: Randomized controlled trial of an internet-based education program. *Prev Med*. 47(4):369–377.

Georgiou, C.C., Betts, N.M., Hoerr, S.L., Keim, K., Peters, P.K., Stewart, B., & Voichick, J. (1997). Among young adults, college students and graduates practiced more healthful habits and made more healthful food choices than did non-students. *J Am Diet Assoc.*, 97:754–759.

Goodwin, L., et al., (2011). Development of the University Health Index to Examine the Interface between Campus Environment and Nutrition, Physical Activity, and Weight in College Students. University of Arizona. *Ebook,* Page 23.

Government of Kenya. Kenya National Nutritional Action Plan (2011-2017).

Greaney, M.L., Less, F.D., White, A.A., Dayton, SF., Riebe, D., Blissmer, B., Shoff, S., Walsh, J.R. & Greene G.W. (2009). College Students' barriers and enablers for healthful weight management: a qualitative study**.** *J Nutr Educ Behav.*, 41(4)**:**281-286.

Grier S, Davis B (2013) Are All Proximity Effects Created Equal? Fast Food near Schools and Body Weight Among Diverse Adolescents. Journal of Public Policy & Marketing 32: 116–128.

Hakim, N., N.D. Muniandy D., and Danish A. (2012). Nutritional Status and Eating Practices among University Students in Selected Universities in Selangor, Malaysia. Asian Journal of Clinical Nutrition Volume 4 (3): 77-87, 2012.

Harrison, G. et al., (2000). Underreporting of Food Intake by Dietary Recall Is Not Universal: A Comparison of Data from Egyptian and American Women. *American Society for Nutritional sciences.*

Hawk, S. N., & Englehardt, G.K., & Small, C. (2012). Risks of iron deficiency among vegetarian college. *Health*, Vol.4, No.3, 113-119.

Hee-TaikKang Hye-ReeLee Yong-JaeLee John A.Linton Jae-YongShim (2000), volume 105 / Issue 6; 117(2):577.

American Academy Of Pediatrics. Herrera, H., Rebato, E., Arechabaleta, G., Lagrange, H., Salces, I., & Susanne, C. (2013). Body mass index and energy intake in Venezuelan University students. *Nutrition research*, *23*(3), 389-400.

Higgins, M., Kannel, W., Garrison, R., Pinsky, J. & Stokes, J. *(1988).* Hazards of obesity-the Framingham experience. *Acta. Medica. Scand.*, 723, *23–36.*

Hilger, J., Loerbroks, A., Diehl, K. (2017) Eating behaviour of university students in Germany: Dietary intake, barriers to healthy eating and changes in eating behaviour since the time of matriculation. Appetite 109:100-107.

Huang, T.K., Jo Harris, K., Lee, R.E., Nazir, N., Born, W. and Kaur, H. (2003). Assessing Overweight, Obesity, Diet, and Physical Activity in College Students. *Journal of American College Health,* vol. 52, no 2, pp. 83-86.

Ishizaki, M., Morikawa, Y., Nakagawa, H., Honda, R., Kawakami, N., Haratani, T., & Yamada, Y. (2014). The influence of work characteristics on body mass index and waist to hip ratio in Japanese employees. *Industrial health*, *42*(1), 41-49.

Ismail R. et al., (2016). Determining the relationship between added sugar intake and body mass index (BMI) among undergraduate students between the ages of 18-25 years studying at the University of KwaZulu-Natal, Pietermaritzburg campus

James, W. P. T., Nelson, M., Ralph, A., & Leather, S. (2017). Socioeconomic determinants of health: the contribution of nutrition to inequalities in health. *Bmj*, *314*(7093), 1545.

Jolliffe, D. (2011). Overweight and poor? On the relationship between income and the body mass index. *Economics and Human Biology,* 9(4), 342-355. doi: 10.1016/j.ehb.2011. 07.004

Kashubeck-West, S., Mintz, L. & Saunders, K. *(*2001*.)* Assessment of Eating Disorders in Women. *Counsel. Psychol.,* 29, 662–664.

Kehoe, S. H., Krishnaveni, G. V., Veena, S. R., Guntupalli, A. M., Margetts, B. M., Fall, C. H., & Robinson, S. M. (2014). Diet patterns are associated with demographic factors and nutritional status in S outh I ndian children. *Maternal & child nutrition*, *10*(1), 145-158.

Kennedy-Stephenson, M., & Johnson, C. *(*2008*).* Blood Folate Levels: The Latest NHANES Results. Hyattsville, MD*: National Center for Health Statistics.*

Kim, R., Kawachi, I., Coull, B. A., & Subramanian, S. V. (2018). Contribution of socioeconomic factors to the variation in body-mass index in 58 low-income and middle-income countries: an econometric analysis of multilevel data. *The Lancet Global Health*, *6*(7), e777-e786.

Kipping, R.R., Campbell, R.M., MacArthur, G.J., Gunnell, D.J., Hickman, M. (2012). Journal of Public Health 34(S1): i1 –i2 doi:10.1093/pubmed/fdr122.

Korean National Health and Nutrition Examination Survey (KNHANES) (2007–2009). Relationship between employment status and obesity in a Korean elderly population.

Lassetter J., Brigham R. N., Clark L., FAAN R. N., (2014). The Relationship Between

Elect Demographic Characteristics and Body Mass Index Among Native Hawaiian and Other Pacific Islander Caregiving Adults. Brigham Young University – Provo.

Levitsky, D.A., Halbmaier, C.A., & Mrdjenovic, G. (2004). The freshman weight gain: a model for the study of the epidemic of obesity. *Int J Obes Relat Metab Disord*., 28(11):1435–42.

Mae, S., and Ipsos (2018). How America Pays for College. Ipsos Public Affairs.

Makena, J., (2018). Property developers eye big profits from student housing.Mansoura University, Egypt.

Mattern, K. et. al., (2014) Broadening the Definition of College and Career Readiness: A Holistic Approach. *ACT Research Report Series*.

Mayen, A. L., Marques-Vidal, P., Paccaud, F., Bovet, P., & Stringhini, S. (2014). Socioeconomic determinants of dietary patterns in low-and middle-income countries: a systematic review. *The American journal of clinical nutrition*, *100*(6), 1520-1531.

McCarthy, P. L., Christoffel, K. K., Dungy, C. I., Gillman, M. W., Rivara, F. P., & Takayama, J. I. (2000). Race/ethnicity, gender, socioeconomic status-Research exploring their effects on child health: a subject review. *Pediatrics*, *105*(6), 1349-1351.

Melissa, C., Nelson, Katherine, L., Mary, S., & Ehlinger, E. (2008). Credit Card.

Misra, R. & McKean, M. (*2000*). College students' academic stress and its' relation to their anxiety, time managements and leisure satisfaction. *Am. J. Health Stud.,* 16, 41– 51.

Mitchell, J. & Peterson, C. (2005). Assessment of Eating Disorders. *New York, NY.*

Mobile Research at UCF (2018). Mobile Survey Report.

Momanyi, M. M., (2014). Influence of Dietary Patterns on Nutritional Status Among Female Students in Maseno Univerity. School of Public Health and Community Development.

Nayga, R. M. (2010). Effects of socioeconomic and demographic factors on consumption of selected food nutrients. *Agricultural and Resource Economics Review*, *23*(2), 171-182.

Nelson, M. C., Story, M., Larson, N.I., Neumark-Sztainer, D., & Lytle, L.A. (2008). Emerging Adulthood and college-aged youth: an overlooked age for weight-related behavior change. *Obesity*, 16(10):2205–2211.

Nelson, M., (2008). Debt, Stress and Key Health Risk Behaviors among College Students. *American Journal of Journal of Health Promotion*, Vol. 22, No. 6, pp. 400-407.

Nelson, T. F., Gortmaker, S.L., Subramanian, S.V., & Wechsler, H. (2007). Vigorous physical activity among college students in the United States. *J Phys Act Health*, 4:495–508.

Noll, E., (2017). College Students with Children: National and Regional. Institute for Women's' Policy Research. Obesity and eating habits among college students in Saudi Arabia, (20150. A cross sectional Study.

Nonterah, E. A., Debpuur, C., Agongo, G., Amenga-Etego, L., Crowther, N. J., Ramsay, M., & Rexford Oduro, A. (2018). Socio-demographic and behavioural determinants of body mass index among an adult population in rural Northern Ghana: the AWI-Gen study. *Global health action*, *11*(sup2), 1467588.

Odenigbo, U. M., Odenigbo, U. C., Oguejiofor, O. C., & Adogu, P. O. U. (2011). Relationship of waist circumference, WHpRand body mass index as predictors of obesity in adult Nigerians. *Pakistan Journal of Nutrition*, *10*(1), 15-8.

Ogden, C., Flegal, K., Carroll, M., & Johnson, C. (2002). Prevalence and trends in overweight among US children and adolescents, 1999–2000. *Journal of American Medical Association*, 288:1728–32.

Ogden, C.L., Carroll, M.D, Curtin, L.R., McDowell, M.A., Tabak, C.J., & Flegal, K.M. (2006). Prevalence of overweight and obesity in the United States, 1999–2004. *Journal of American Medical Association*, 295(13):1549–55.

Omage K. and Omuemu V. O., (2018). Assessment of dietary pattern and nutritional status of undergraduate students in a private university in southern Nigeria. 2018 Oct; 6(7): 1890– 1897. Food Sci Nutr. Aug 22. doi: 10.1002/fsn3.759.

Pineda, F., & Kleiner, B.H. (2005). Management of operations in the snack industry. *Management Restaurant News*, 28(2/3):118–126. Race/Ethnicity, Gender, Socioeconomic Status—Research Exploring Their Effects on Child Health: A Subject Review.

Possa, G., Castro, M., Sichieri, R., Fisberg, R. M., & Fisberg, M. (2017). Dairy products consumption in Brazil is associated with socioeconomic and demographic factors: Results from the National Dietary Survey 2008-2009. *Revista de Nutrição*, *30*(1).

Racette, S.B., Deusinger, S.S., Strube, M.J., Highstein, G.R., & Deusinger, R.H. (2008). Changes in weight and health behaviors from freshman through senior year of College. *J Nutr Educ Behav*., Jan-Feb; 40(1):39–42.

Rahim, A., Nabilla, N., Chin, Y. S., & Sulaiman, N. (2019). Socio-Demographic Factors and Body Image Perception Are Associated with BMI-For-Age among Children Living in Welfare Homes in Selangor, Malaysia. *Nutrients*, *11*(1), 142.

Rastegari, Z., Noroozi, M., & Paknahad, Z. (2017). Socioeconomic and reproductive determinants of waist-hip ratio index in menopausal women. *Journal of mid-life health*, *8*(4), 170.

Reas, D. L., Nygård, J. F., Svensson, E., Sørensen, T., & Sandanger, I. (2007). Changes in body mass index by age, gender, and socio-economic status among a cohort of Norwegian men and women (1990–2001). *BMC public health*, *7*(1), 269.

Sakamaki, R., Toyama, K., Amamamoto, R., Liu, C.J. and Shinfuku, N. (2005). Nutritional knowledge, food habits and health attitude of Chinese university students: a cross sectional study. *Central Nutrition Journal,* vol. 4, no. 4, pp.1-9.

Salameh P,, Jomaa L,, , FarhatG., , ZeidanN., and Baldi I. (2014). Assessment of Dietary Intake Patterns and Their Correlates among University Students in Lebanon and for the Lebanese National Conference for Health in University Research Group

Published online 2014 Oct 21. doi: [10.3389/fpubh.2014.00185] PMCID:: 25374885.

Samuelson, G. (2000). Dietary habits and nutritional status in adolescents over Europe. An overview of current studies in the Nordic countries. *European Journal of Clinical Nutrition,* Mar;54 Suppl 1: S21-8.

Schroeter C., (2014). Fruit and Vegetable Consumption among College Students in Second Cycle Students in Tamale, Ghana.

Selkowitz, A. (2000). The College Students Guide to Eating well in campus. Bethesda.

Semproli S. et al., (2007). Childhood malnutrition and growth in a rural area of Western Kenya. *Am J Phys Anthropol.*, 132(3):463-9.

Senekal M., et al., (2016). Weight-loss strategies of South African female university

Smith, D, Cummins S, Clark C, Stansfeld S (2013). Does the local food environment around schools affect diet? Longitudinal associations in adolescents attending secondary schools in East London. BMC public health 13: 70. Pmid: 23347757.

Steenhuis, Ingrid, H.M., Waterlander, Wilma, E., De Mul, & Anika (2011). Consumer food choices: The role of price and pricing strategies". *Public HealthNutrition* 14 (12):22206. Doi: 10.1017/S1368980011001637, PMD.

Stevens, J., Katz, E. G., & Huxley, R. R. (2011). Associations between gender, age and waist circumference. *Obesity and metabolism*, *8*(1), 68-69.

Steyn, N.P., Senekal, M., Brtis, S. & Nel, J. (2000). Urban and rural differences in Dietary intake, weight status and nutritional knowledge of black female students. *Asia Pacific Journal of Clinical Nutrition,* vol. 9, Issue.1. p. 53-59.

Stockton, Baker, S., David (2013). College Students Perception of Fast Food Restaurants. *American Journal of Health Education,* Vol. 44, No. 2 March-April 2013.

Talianova, M., Řeruchova, M., Slaninova, G. (2010) Nutritional status and dietary habits of high school and college students. School and Health 21:389-397. Health Education: International Experiences.

Thompson, F.E., & Subar, A.F. (2008). Dietary Assessment Methodology. In: Coulston, A.M., Boushey, C.T., editors. *Nutrition in the Prevention and Treatment of Disease,* 2nd edition. Chapter 1.

Tirosh, A., Afek, A., Rudich, A., Percik, R., Gordon, B., et al., (2010). Progression Of normotensive adolescents to hypertensive adults: a study of 26,980 teenagers. *Hypertension*, 56 :203–209.

Tirosh, A., Shai, I., Afek, A., Dubnov-Raz, G., Ayalon, N. et al., (2011). Adolescent BMI trajectory and risk of diabetes versus coronary disease. *N Engl J Med*., 364:1315–1325.

Topping, M., & Sergent, R.G. (2001). Racial and gender differences in weight status and dietary practices among college students. *Adolescent,* 36 (144): 819833 PMID1001049.

Tran, N. T. T., Blizzard, C. L., Luong, K. N., Le Van Truong, N., Tran, B. Q., Otahal, P., ... & Srikanth, V. (2018). The importance of waist circumference and body mass index in cross-sectional relationships with risk of cardiovascular disease in Vietnam. *Plos one*, *13*(5), e0198202.

Trockel, Mickey, T., Barnes, Mickael, & Egget, Deniss L. (2000). Health related variables and academic performance among first year students: Implications for sleep and other behaviors. *Journal of American College Health,* 49(3): 125-131.

Twenge, J., Gentile, B., DeWall, C., Ma, D., Lacefiled, K. & Schurtz, D. *(*2010*).* Birth cohort increases in psychopathology among young Americans, 1938-2007: a cross-temporal meta-analysis of the MMPI*. Clin. Psychol,. Rev.* 30,*145–154.*

Ulla Díez, S., & Pérez-Fortis, A. (2010). Socio-demographic predictors of health behaviors in Mexican college students. *Health Promot. Int.*, 25 (1):85-doi: 10.1093/heapro/dap047.

United States, (2005–2008). Obesity and Socioeconomic Status in Adults. University nursing students, Eastern Cape, South Africa: Article (PDF Available) *in* University Students from 22 Countries. 2014 Jul; 11(7): 7425–7441.Doi 10.3390/ ijerph110707425. PMCID: PMC4113885.

Van den Berg, V., Raubenheimer J. (2013). Food insecurity among university students in a developing country. University of the Free State, South Africa.

Vasconcel, et al., (2014). Prevalence and factors associated with nutritional status among female University students in Florianópolis, DOI: 0037.2013v15n3p326.

Vella-Zarb, RA, Elgar FJ (2010). Predicting the 'freshman 15': environmental and psychological predictors of weight gain in first-year university students. Health Educ J, 69(3):321–32.

Wahl, R. (1999). Nutrition in the adolescent. *Pediatric Annals*, 1999 Feb; 28(2) :107-11.

Wanjiru, H., (2018). Top 10 most educated tribes in Kenya Author: 21223 Category: Facts and Life Hacks Education. /282665-top-10- educated-tribes-kenya.html#282665

Williams, J, Scarborough P, Matthews A, Cowburn G, Foster C, Roberts N, et al. (2014) A systematic review of the influence of the retail food environment around schools on obesity-related outcomes. Obes Rev 15: 359–374. pmid:24417984

Zafar, S., ul Haque, I., Butt, A.R., Mirza, H.G., Shafiq, F., ur Rehman, A. and Ullah Ch, N. (2007). Relationship of body mass index and waist to hip ration measurements with hypertension in young adult medical students. *Pakistan Journal of Medical Sciences*, vol. 23, pp. 1-9.

Zvonar, M., Štefan, L., & Kasović, M. (2019). Percentile Curves for Body-Mass Index, Waist Circumference, Waist-To-Height Ratio and Waist-To-Height Ratio (Exp) in Croatian Adolescents. *International journal of environmental research and public health*, *16*(11), 1920.

APPENDICES

Appendix A: Introduction and informed consent to students

My name is Florence Mwanthi. I am a student at Kenyatta University in the department of Food, Nutrition and Dietetics. I am conducting a study for a partial fulfilment of my Master of Science degree and I would like to request you to cooperate and give honest responses in this study. I will ask questions on your food intake and this information will be kept confidential. I will also ask questions on students' food intake from operators of food outlets within the college environment.

Title of the study

You are invited to participate in a research study about Socio-Economic and Demographic Determinants of Dietary Practices of Young Adults Attending Commercial Colleges in Nairobi's Central Business District, Kenya

Procedures

1. The researcher will take your waist and hip circumferences with a tape measure.
2. The weight will be taken with weighing machine when you have minimal clothing.
3. The height will be measured using stadiometer while standing upright at $90^{0.}$
4. You will also be asked to fill in a questionnaire about yourself and the foods you have consumed in the previous 24 hours or the last 7 days.

Your participation will last approximately 15 minutes.

Benefits and compensation to participants

Participation is voluntary and free where there are no costs involved or payment to participants. The participants will be able to know the BMI, advised on better dietary practices for good nutrition status and their questions on nutrition related matters will be answered. There will be no payment in cash or in-kind for participation in this study.

Risks

There are no risks involved in this study for the procedures to be performed are participants' answering of the questions in the questionnaire and the co-operation taking the body measurements. There will be no administration of any substances, chemicals or drugs to study participants.

Confidentiality

While there will be scientific publications as a result of this study, your name or identity will not be used. Only group characteristics will be published.

Voluntary participation

Participation in this study is entirely voluntary. You can withdraw from the study at any point in time and decline to answer any question(s). We however, encourage you to participate as the findings will be useful to you as well as stakeholders such as college administration, the Ministry of Health and NGOs who make policies to help put in place measures to improve students' nutrition status. BMI will be given and advised on better dietary practices for good nutrition status and their questions on nutrition related matters will be addressed.

Whom should I contact if I have questions?

This study has been cleared by Kenyatta University Ethical Review Committee (KUERC). Should you have any questions or concerns about the research at any time about your rights as a research participant contact KUERC on +254028703026.

Your signature indicates that you have read this consent form, had an opportunity to clarify about your participation in this research and voluntarily consented to participate.

Thank you.

Florence Mwanthi.

For participant's use:

I declare that I have read and understood the information that participation is voluntary.

I agree to the above and hereby accept to participate.

Participants signature/ thumb print: …….. Date……

Appendix B: List of Colleges

Sr.	Name of college
1.	Kenya Institute of Management
2.	Zetech College
3.	Nairobi Institute of Business Studies
4.	Beams College
5.	Aviation College
6.	Kenya Institute of Professional Studies
7.	Dima College
8.	Kenya College of Commerce and Hospitality
9.	East Africa Commercial College
10.	Nairobi Institute of Development Studies

Appendix C: Introduction and informed consent to KIIs

My name is Florence Mwanthi. I am a student at Kenyatta University in the department of Food, Nutrition and Dietetics. I am conducting a study for a partial fulfilment of my Master of Science degree and I would like to request you to cooperate and give honest responses in this study. I will ask questions on students' food intake from your food outlet and this information will be kept confidential.

Title of the study

You are invited to participate in a research study about Socio-Economic and Demographic Determinants of Dietary Practices of Young Adults Attending Commercial Colleges in Nairobi's Central Business District, Kenya

Procedures

I will ask you questions on the type of foods sold in this outlet, students' frequency of visit to this outlet, the frequently consumed meals and why they are consumed and the average food price in this outlet

Your participation will last approximately 15 minutes.

Benefits and compensation to participants

Participation is voluntary and free where there are no costs involved or payment to participants. You will be advised on better dietary practices for good nutrition status and their questions on nutrition related matters will be answered. There will be no payment in cash or in-kind for participation in this study.

Risks

There are no risks involved in this study for the procedures to be performed are participants' answering of the questions in the questionnaire.

Confidentiality

While there will be scientific publications as a result of this study, your name or identity will not be used. Only group characteristics will be published.

Voluntary participation

Participation in this study is entirely voluntary. You can withdraw from the study at any point in time and decline to answer any question(s). We however, encourage you to participate as the findings will be useful to you as well as stakeholders such as college administration, the Ministry of Health and NGOs who make policies to help put in place measures to improve students' nutrition status. You will be advised on better dietary practices for good nutrition status and your questions on nutrition related matters will be addressed.

Whom should I contact if I have questions?

This study has been cleared by Kenyatta University Ethical Review Committee (KUERC). Should you have any questions or concerns about the research at any time about your rights as a research participant contact KUERC on +254028703026.

Your signature indicates that you have read this consent form, had an opportunity to clarify about your participation in this research and voluntarily consented to participate.

Thank you.

Florence Mwanthi.

For participant's use:

I declare that I have read and understood the information that participation is voluntary.

I agree to the above and hereby accept to participate.

Participants signature/ thumb print: …….. Date……

Appendix D: Questionnaire to be administered to college students

Study: Socio-Economic and Demographic Determinants of Dietary Practices of Young Adults Attending Commercial Colleges in Nairobi's Central Business District, Kenya

For official use only:

Name of the College…… Number of students……

Please fill in the answers in the brackets as indicated in all sections *{ }*

Section A: Socio – Demographic Questionnaire

1. Sex Male { } Female { }

2. Date of birth? { }

3. Marital status Single { }

Married { }

4. Ethnicity { }

5. Religion { }

6. How many people live in your household with you included?

1	2	3	4	5	6	7	8	9	10

More than 10 people? Yes { } No { }

7. What course are you taking? { }

8. How long is the course taking? { }

9. Which is the year of your study? { }

10. For how long have you been studying? { }

Section B: Socio- economic Factors Questionnaire

Please fill only one response in the brackets as indicated in this section *{ }*

1. What are the sources of your finances?

a. Employed { }

b. Self-employed { }

c. Parents/relatives { }

d. Other (specify) { }

2. What is your average total expenditure per month?

1000-2000 { }

2000-4000 { }

4000-5000 { }

5000-6000 { }

6000 and above { }

3. What is your average food expenditure per month?

500 -1000 { }

1000 -2000 { }

2000 -2500 { }

2500 -3000 { }

3000 above { }

4. Do you have a radio or TV in your house? Yes { } No { }

5. What do you use for cooking?

Electric cooker { }

Charcoal burner { }

Stove { }

Others (specify) { }

Section C: Health Factors Questionnaire

1. Do you have any chronic disease(s)? Yes { } No { }

2. If yes, specify…….

3. Are you on any medical drugs? Yes { } No { }

4. If yes, how many types are they? One { } Multiple { }

5. When was the last time you visited a health centre?

a. A month ago { }

b. Two months ago { }

c. Three – four ago { }

d. Other, specify…….

6. Are you on a special diet prescribed by the doctor? Yes { } No { }

7. If yes, why are you on special diet? ……..

8. Have you suffered from any of the following problems/ conditions over the previous months?

Disease/Illness	**Yes**	**No**
Nausea		
Vomiting		
Lack of appetite		
Others		

Section D: Anthropometric Sheet

Measurement	**1st reading**	**2nd reading**	**Average**
Hip (cm)			
Waist (cm)			
Height(cm)			
Weight(Kgs)			

Section E: Food Frequency Questionnaire (FFQ)

How often do you eat the following foods?

Food frequency questionnaire Number of times per day, per week or per month (**only use one option**)

Food Item	**Per Day**	**Per Week**	**Per Month**
Sweets, chocolates, fudge or toffees			
fast food: Chips, fish, chicken, crisp			
Cookies, rusks, cakes, pastries			
Processed meat: sausages, samosas, Smokies, ham			
Coffee			
Chocolate			
Tea			
Sugar			
Full-cream milk			
Low fat/semi-skimed/ skimed milk			
Eggs			
Peanut butter			
Legumes (baked beans, dried beans/peas, lentils)			
Chicken			
Red meat			
Fish			
Milk			
Bread			
Bread spread, i.e. butter/ margarine/honey			

Porridge (cooked)			
Cereals (Weetabix, cornflakes)			
Ugali, rice			
Margarine/ oil/ fat			
Fresh Fruit juice			
Fruits: excluding fruit juices and dried fruit			
Sweetened cold drink e.g. sodas			
Dark green leafy or dark yellow vegetables?			
Other vegetables/salad, e.g. cabbage, tomatoes, excluding potatoes			
Salt/ soup/ Royco			
Alcohol			

Remarks:

Section G: 24-Hour Dietary Recall Questionnaire

Please fill as appropriate in the spaces provided in the table below

What foods or drinks did you take yesterday from morning until bed time?

Meal	Dish	Ingredients	Method of cooking	Amount consumed in household measure	Amount consumed in metric measure	Score for nutrient
Breakfast						
Snack						
Lunch						
Snack						
Supper						
Snack						

2. What foods do you think you should eat but you do not have access to? ----------

3. Why do you think you need those foods? ----------

4. Who purchases food in your house? ----------

5. Who is responsible for food preparation in your house? ----------

6. How else do you get food other than purchasing? ----------

7. What is the common method of food preparation in your house? ----------

8. Do you eat at your regular times each day? {Yes} {No}

9. How many times do you eat per day?

   a. One { }

   b. Two { }

   c. Three-Four { }

   d. Others, Specify----------

10. Do you take any alcohol? {Yes} {No}

11. If YES, how many glasses do you consume per day? ----------

12. Do you smoke cigarettes? {Yes } {No}

13. If YES, how many cigarettes do you smoke per day? ----------

14. What influences the choice of your foods? ----------

Appendix E: Observation Checklist to be used to get data in the outlets within college environment

Please fill the form on the foods as consumed and priced.

Name of Food outlet	Priority of high to less consumed foods	Group of food	Price per unit
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		

Appendix F: Key Informant Interview Guide to be administered to operators of food outlets within college environment

1. What type of food outlet is operated in the college?

2. Do students frequently visit this outlet?

3. If yes why do they frequently visit?

4. If no why do they not frequently visit?

5. What are the frequently consumed meals here?

6. Why are the meals frequently consumed?

7. What is the average food price in this outlet?

APPENDIX G: TRAINING PROGRAMME

SCHEDULE TIME	ACTIVITY	FACILITATOR
8.30-9.00	Arrival and registration	Abraham
9.00-9.20	Opening prayer and introduction of participants	Paul
9.20-10.00	Purpose and objectives of the study	Florence
10.00-10.30	Break	
10.30-11.00	Methodology of the study	Florence
11.00-12.00	Research instruments	Florence
12.00-1.00	Interview techniques	Florence
1.00-2.00	Lunch Break	
2.00-3.00	Taking anthropometric measurements	Florence
3.00-4.30	Role play	All
5.00 pm	Closure and prayers	

APPENDIX H: RESEARCH PERMIT - NACOSTI

THIS IS TO CERTIFY THAT:

MS. FLORENCE MWENDE MWANTHI

of KENYATTA UNIVERSITY, 8791-300

NAIROBI,has been permitted to conduct

research in *Nairobi County*

on the topic: *SOCIO-ECONOMIC AND DEMOGRAPHIC DETERMINANTS OF DIETARY PRACTICES AMONG YOUNG ADULTS ATTENDING COMMERCIAL COLLEGES IN NAIROBI'S CENTRAL BUSINESS DISTRICT, KENYA*

for the period ending:

22nd February,2017

Permit No. : NACOSTI/P/16/07615/9156

Date Of Issue : 22nd February,2016

Fee Received :Ksh 1000

Applicant's

Signature

Director General

National Commission for Science, Technology & Innovation

APPENDIX I: AUTHORIZATION LETTER - NACOSTI

NACOSTI

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/16/07615/9156**

Date: **22nd February, 2016**

Florence Mwende Mwanthi
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Socio-economic and demographic determinants of dietary practices among young adults attending commercial colleges in Nairobi's Central Business District, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for a period ending **22nd February, 2017.**

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

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

DR. M. K. RUGUTT, PhD, HSC.
DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nairobi County.

COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 30124-00100, NBI
TEL: 341666

The County Director of Education
Nairobi County.

COUNTY DIRECTOR OF EDUCATION
NAIROBI
24 FEB 2016

APPENDIX J: RESEARCH AUTHORIZATION– KU GRADUATE SCHOOL

KENYATTA UNIVERSITY
GRADUATE SCHOOL

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

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

OUR REF: H60/CTY/PT/22816/12

Date: 1st July, 2015

The Principal Secretary,
Higher Education, Science & Technology,
P.O. Box 30040,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MS. FLORENCE M. MWANTHI REG. NO. H60/CTY/PT/22816/12

I write to introduce Ms. **Mwanthi** who is a Postgraduate Student of this University. She is registered for M.Sc. Degree programme in the **Department of Foods, Nutrition & Dietetics in the School of School of Applied Human Sciences.**

Ms. **Mwanthi** intends to conduct research for a proposal entitled, **"Socio-Economic and Demographic Determinants of Dietary Practices among Young Adults Attending Commercial Colleges in Nairobi Central Business District, Kenya".**

Any assistance given will be highly appreciated.

Yours faithfully,

KENYATTA UNIVERSITY OFFICE OF DEAN 27 JUL 2015 GRADUATE SCHOOL P.O. Box 43844-00100

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL

RM/cao

APPENDIX K: ETHICAL CLEARANCE – KU ETHICS REVIEW COMMITTEE

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Email: chairman.kuerc@ku.ac.ke
secretary.kuerc@ku.ac.ke
ercku2008@gmail.com
Website: www.ku.ac.ke

P. O. Box 43844 - 00100 Nairobi
Tel: 8710901/12
Fax: 8711242/8711575

Our Ref: KU/R/COMM/51/528

Date: 31st August, 2015

Florence Mwende Mwanthi
Kenyatta University,
P.O Box 43844, Nairobi

Dear Mwende,

RE APPLICATION NUMBER PKU/387/I356– "SOCIO-ECONOMIC AND DEMOGRAPHIC DETERMINANTS OF DIETARY PRACTICES AMONG YOUNG ADULTS ATTENDING COMMERCIAL COLLEGES IN NAIROBI'S CENTRAL BUSINESS DISTRICT, KENYA.".

1. IDENTIFICATION OF PROTOCOL
The application before the committee is with a research topic **"Socio-Economic and demographic determinants of dietary practices among young adults attending commercial colleges in Nairobi's Central Business District, Kenya."** received on 27th July, 2015 and discussed on 25th August, 2015.

2. APPLICANT
Florence Mwende Mwanthi

3. STUDY SITE
Nairobi's Central Business District, Kenya

4. DECISION
The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines **AND APPROVED that the research may proceed for a period of ONE year from 31st August, 2015.**

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

If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

KENYATTA UNIVERSITY OFFICE OF THE CHAIRMAN ETHICS REVIEW COMMITTEE P.O. BOX 43844 - 00100 NAIROBI

PROF. NICHOLAS K. GIKONYO
CHAIRMAN ETHICS REVIEW COMMITTEE

I ..Florence Mwanthi..accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of..28.09..... 2015.

cc. Vice-Chancellor