AN ASSESSMENT OF NUTRITIONAL KNOWLEDGE, DIETARY PRACTICES AND NUTRITIONAL STATUS OF FEMALE STUDENTS ATTENDING TERTIARY INSTITUTIONS IN LUSAKA, ZAMBIA

By

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A dissertation submitted in partial fulfilment of the requirement for the degree of Master of Science in human nutrition

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DECLARATION

I, Mahamba Verity Muzeya, do hereby declare that this dissertation represents my own work and that it has not previously been submitted for any qualification to this or any other university.

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DEDICATION

This study is dedicated to my husband Boniface Shikaputo for the moral and financial support and to my young sister Nyaluwaya Muzeya, for continuous emotional and moral support. To my children Mwila Mpanga Sata, Chilufya, Chewe and Twange-Nkisu Shikaputo for the patience and understanding, for those times I was not there for them due to my hectic schedules. I am grateful to you all and I love you.

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ABBREVIATIONS

BMI: Body Mass Index

BCC: Behavioural Change Communication

CSO: Central Statistics Office

CVD: Cardiovascular Disease

FAO: Food and Agriculture Organisation

FFQ: Food Frequency Questionnaire

HIC: High Income Country

HTN: Hypertension

LMIC: Low and Middle-Income Countries

NCD: Non - Communicable Disease

NE: Nutrition Education

NIPA: National Institute of Public Administration

SPSS: Statistical Package for Social Sciences

UNZA: University of Zambia

UNZABREC: University of Zambia Biomedical Research Ethics Committee

WC: Waist Circumference

WHO: World Health Organisation

WHR: Waist - Hip Ratio

ZDHS: Zambia Demographic Health Survey

ZCAS Zambia Centre for Accountancy Studies

X^2: Chi-Square

IQR: Interquartile Range

OPERATIONAL DEFINITION OF TERMS

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

Fast foods : Mass-produced food that is prepared and served very quickly. The food is typically less nutritionally valuable compared to other foods and dishes.

Lifestyle : Way of life or standard of living commonly chosen as a means of survival or entertainment, or dictated by the environment, economy or religion (Contento, 2008)

Malnutrition : Malnutrition is any physical condition resulting either from an inappropriate or inadequate diet, such as a diet that either provides too much or too little of necessary nutrients or from a physical inability to absorb or metabolize nutrients (Silangwe, 2013)

Nutrition Knowledge: Refers to demonstrated ability to reproduce from memory facts and principles of nutrition related to the general health of an individual (Miller and cassady, 2015)

Nutrition Transition : The shift in dietary consumption and energy expenditure that coincides with economic, demographic, and epidemiological changes.

Obesity : Body weight that is higher than what is considered a healthy weight. It describes individuals with a BMI equal to or more than 30 kg/m^2

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

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

ABSTRACT

University students tend to adopt unhealthy dietary practices when they move from a family home to attend school. Lack of quality foods can undermine health and wellness, leading to malnutrition and in the long run non-communicable diseases. Furthermore, malnutrition in women of reproductive age can increase risks of poor maternal health outcomes. Studies have shown that nutritional knowledge if implemented can lead to improved dietary practices and healthier lifestyles. It is observed that women are particularly affected by the nutrition transition, exemplified by a shift from traditional to globalized diets in urban populations. This study aimed at assessing the association between nutritional knowledge, dietary practices and nutritional status among female students aged 20- 35 years in three tertiary institutions of Lusaka. A total of 290 students participated, and a validated self – administered questionnaire consisting of students' socio-demographic, nutrition knowledge and dietary practices was used. A food frequency questionnaire established individual students' food intake. Weight, height and waist circumference were measured. Data were analyzed using Statistical Package for Social Sciences (SPSS Version 23) and MS Excel. Results indicated that the mean age for students was 22± 0.39 years. The median body mass index was 23.8 kg/m^2 and interquartile range of 6.55 kg/m^2. Students with normal body mass index were 53.8%, overweight and obesity were at 23.2 % and 15.5 % respectively, 7.42 % of students were underweight. The median waist circumference was 77cm with the interquartile of 14 cm, 83.8% had normal waist circumference and 16.2% had abdominal obesity. The mean nutritional knowledge score was 66.3% ±17. Students indicated that they obtained nutritional information from the internet followed by television. General dietary practices indicated that 62.1 % of the students exhibited poor dietary practices. Meal patterns before tertiary school and current meal patterns indicated that students had reduced eating breakfast, lunch and supper ($p < 0.05$), snacking on daily popcorn, potato chips and fruits was observead. There was no statistically significant ssociation between students' nutritional knowledge scores and , asbody mass index well as with waist circumference. Further findings showed that there was no significant association between dietary practices and nutritional status of female students ($p > 0.05$). In conclusion, despite most students having a normal nutritional status, the prevalence of overweight and obesity was still notable. Also, despite students possessing adequate nutritional knowledge, they still exhibited poor dietary practices.

Keywords: *nutritional knowledge, dietary practices, nutritional status, gender*

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Good nutrition is the basic factor for optimum growth, development and maintenance of health throughout life, and influences the performance of other developmental processes (Dunneram and Jeewon, 2015). Lack of sufficient and quality food undermines the quality of health and the wellness of the population of all ages (Abraham et al., 2018). The nutritional status of a woman plays a key role in her health and is likely to negatively affect the birth outcomes of her children. Malnutrition in women can lead to future risks of poor maternal health, which consequently increases the national health burden. Individuals who do not get enough energy or key nutrients cannot sustain healthy and active lives which result in poor physical and mental development, devastating illness and death (Burchi et al., 2011).

Malnutrition refers to any physical condition resulting either from an inappropriate or inadequate diet, such as a diet that either provides too much or too little of necessary nutrients or from a physical inability to absorb or metabolize nutrients (Müller and Krawinkel, 2005; Webb et al., 2018). An adult with Body Mass Index (BMI) of less than 18.5kg/m^2 is considered undernourished, whilst above 25kg/m^2 is considered overweight (World Health Organisation, 2004). Both these forms of malnutrition are prevalent in low-income countries and are related to food shortages and unequal distribution of wealth. Additionally, the transition from undernutrition to overweight and obesity among women has been observed, and the double burden of malnutrition placed on families and health services is becoming evident, particularly in some urban areas (Central Statistics Office, 2014). This may lead to an eventual rise in non- communicable diseases (NCDs) risk among women. According to the World Health Organisation (WHO), NCDs were estimated to account for 26% of total deaths between 2009 and 2011 among women. During this time, diabetic cases increased from 5,632 to 22,765, and cervical cancer cases rose from 394 to 1,545. Furthermore, hypertension cases increased by 42% from 101,181 to 144,071 over the same period from 2009 to 2011 (WHO, 2017).

In order to remain healthy and physically active and enjoy a healthier lifestyle, it is necessary to obtain good nutritional knowledge and implement it (Plotnikoff et al., 2015). Given that one of the main goals of learning institutions is to broaden knowledge of people of the society, enhancing the nutrition attitudes, knowledge and practice of students have high importance because this subsequently will lead to a more food-conscious society and more healthier population (Plotnikoff et al., 2015). Knowledge about healthy food choices and food safety can be predisposing factors for improving eating habits and adopting a healthy diet.

Dietary patterns play a significant part in the maintenance of human health and are determined by various social, cultural, and economic lifestyles; Proper dietary patterns sustain health, prevent diseases, help normal development, and also play important roles in maintaining mental and emotional stability (Gómez-Pinilla, 2008; Ohlhorst et al., 2013)

The few last decades in Sub-Saharan African countries have seen increasing urbanisation and globalisation. This is characterised by substantial growth of the food industry and marketing systems, which promote the consumption of refined foods and carbohydrates, foods with high sugars, fats, highly salted and processed meats (Steyn and Mchiza, 2014). Furthermore, consumption of these foods tied with sedentary lifestyles has been associated with overweight, obesity and NCDs (BeLue et al., 2009).

Based on the previous understanding of the epidemiologic transition, NCDs and obesity have generally been regarded as diseases of affluent societies or high-income countries (HIC). The nutrition transition in low - middle-income countries (LMIC) is just taking its toll and therefore very few studies in this area have been documented, however, current evidence (MOH, 2018) suggests that the prevalence of cardiovascular diseases, diabetes and risk factors such as obesity have been just as high in LMIC as is in HIC.

There is an emerging problem of obesity in Zambia among women. It was observed that obesity among Zambian women increased from 17% in 1993 to 23.1% in 2014 (Amugsi et al., 2017). Overweight women of reproductive age are particularly at risk for transition to obesity (Hillemeier et al., 2011); and therefore are subsequently prone to pregnancy-related hypertension and pre-eclampsia, which are associated with a more than doubled risk of stillbirth and perinatal death. Further risks include gestational diabetes and increased chances of miscarriages between 25%–37% higher compared with lean pregnant woman (Guelinckx et al., 2008), the study further highlights that gestational diabetes increases the risk of foetal macrosomia (birth weight > 4.5 kg at any gestational age) and the development of diabetes later on in life, 70% of the obese women with gestational diabetes develop type 2 diabetes within 15 years of delivery, compared with lean women. However maternal under-nutrition equally poses devastating effects on a large proportion of women in many developing countries (Guelinckx et al., 2008), but has received little attention as an important determinant of poor maternal, newborn, and child health (MNCH) outcomes such as intrauterine growth restriction, preterm birth (PTB), and maternal and infant morbidity and mortality (Abu-Saad and Fraser, 2010).

This study seeks to assess the association between the nutritional status of female students aged between 20 - 35years and their nutritional knowledge, and dietary practices in three selected tertiary institutions of Lusaka.

1.2 Statement of the problem

The transition from adolescence to adulthood and change of environment from a home setup to the university can render students nutritionally vulnerable (Manwa, 2013). Students may struggle to adjust to the new situation, where self-meal preparation comes into the picture as well as coping with class activities.

The nutrition transition has become a growing concern in Zambia and has started recording cases of NCDs which include type 2 diabetes, obesity, stroke and cardiovascular diseases. Further findings have suggested that urban women are twice as obese as rural women with urban obesity prevalence reaching 32% (Central Statistics Office, 2014). Studies show that insufficient nutrition knowledge and not maintaining a healthy diet results in NCDs. Adequate nutritional status of women is important for good health and increased work capacity of women themselves as well as for the health of their offspring (Bhandari et al., 2016). Female students are an important population which is at a key crossroads in nutritional health. The cycle of malnutrition if not addressed effectively by achieving a normal body weight prior to or after conception continues even in the coming generations.

Furthermore, the fast food market may affect the eating habits of these students because they are readily available, affordable, convenient and tasty (Deliens et al., 2014). In this regard, nutritional knowledge may act as a limiting factor against dietary practices (food choices and eating patterns).

Studies conducted in universities and colleges in other countries provide evidence that nutritional knowledge, food choices and eating patterns are key factors in the prevention and reduction of risks associated with early onset of chronic diseases and obesity. This is particularly noted if adopted during the early years of adulthood (Kinyua, 2013; Sakamaki et al., 2005; Thielemann, 2012)There is a need, therefore, to assess the nutritional knowledge and dietary practices on the nutritional status of female students in Zambia considering that there is no data available on the female students in tertiary institutions.

1.3 Justification and significance of the study

Nutritional knowledge and dietary practices are key in maintaining a good nutritional status and in the prevention and reduction of risks associated with early onset of obesity and other chronic diseases, particularly if adopted during early years of adulthood.

Students, in general, tend to adopt dietary practices that are unhealthy when they move away from a family home to school (Tanton et al., 2015) but female students in tertiary institutions are particularly important because they are in their reproductive stage and bearers of the next generation. Poor health may decrease human capacity, causing huge unforeseen losses due to low productivity differences between healthy and unhealthy individuals. Furthermore, obese women are more likely to develop pregnancy complications, such as gestational diabetes, hypertensive disorders of pregnancy such as pre-eclampsia and caesarean section delivery due to macrosomia, (Choi et al., 2008; Hillemeier et al., 2011). A tertiary institution is seen as a place where students can be impacted by nutrition knowledge through education to promote good dietary practices to adopt for good health throughout their life and that of their offspring. However, nutritional education in tertiary institutions of learning has been limited to nutrition and health courses (Kinyua, 2013).

There has been no research conducted in these institutions that assessed the association between nutritional knowledge and dietary practices and the nutritional status of female students aged 20 - 35 years in tertiary institutions. Therefore, this study will give us an understanding of the relationship between nutritional knowledge and dietary practices and the nutritional status of female students in tertiary institutions. It will further enlighten the development of effective nutritional programs that will perpetuate lifestyle changes and improve healthy eating habits among female students for better nutritional outcomes throughout their lives.

1.4 Purpose of the study

The purpose of the study is to assess the nutritional knowledge, dietary practices and nutritional status of female students aged between 20- 35 years in three (3) selected tertiary institutions of education in Lusaka province.

1.5 Specific research objectives

1. To measure the nutritional status of female students in three selected institutions.
2. To assess the nutritional knowledge of female students in these institutions
3. To assess the dietary practices of female students in three selected institutions
4. To determine the association between nutritional knowledge and dietary practices and the nutritional status of female students in selected institutions

1.6 Research questions

1. What is the nutritional status of female students in three selected institutions?

2. What is the level of nutritional knowledge of female students in the three selected institutions?
3. What are the common dietary practices of female students?
4. Is there an association between nutritional knowledge, dietary practices and nutritional status of female students?

1.7 Limitations

The study had some limitations: Data was collected at the time when students were preparing and writing examinations and end of term tests. This could raise questions on the validity of the responses given as students were more likely to be stressed at the time. The students were also subject to recall bias especially on their dietary practices.

Further, the cross-sectional nature of the data does not allow examining causality in the relationships between nutritional knowledge and nutritional status, as well as dietary practices and nutritional status of the study population, therefore, it is difficult to determine whether the established nutritional status is an outcome of exposure to dietary practices prior to or during tertiary education.

1.8 Delimitation

The study was delimited to institutions that are in close proximity to fast food outlets; therefore, the findings of the study cannot be generalized to learning institutions that provide catering services to their students.

CHAPTER TWO: LITERATURE REVIEW

2.1 Nutritional knowledge and its implications

Nutrition knowledge mostly refers to information of ideas and practices associated to nutrition and health including information of diet and health, diet and disease, foods signifying major sources of nutrients, and dietary guidelines and recommendations (Miller and Cassady, 2015).

Yahia et al., (2016) explored whether increased nutrition knowledge was associated with a reduction in unhealthy fat consumption among university students in Michigan, US. In this study, students who presented greater knowledge in nutrition were observed to have consumed lower amounts of total fats, saturated fat and cholesterol per day in comparison to students with lower nutrition knowledge scores. Evidence in this study suggests that students who were empowered by this nutritional knowledge had the basic skills needed to make healthy lifestyle choices. Also established was a high mean difference between genders; female students had greater nutrition knowledge than male students. These findings were attributed to the likelihood that women were more interested in diet, nutrition, and body weight than men, particularly during the college years**.**

Certain nutritional knowledge is required to be able to make changes in one's eating pattern. It has been recognized that there are two unique patterns in the relationship between nutritional knowledge and obesity, firstly; nutritional knowledge could be a preventive measure of obesity in the case that more nutritional knowledge leads to a lower likelihood of being obese and secondly; nutritional knowledge could also be sensitive to obesity, in the case that obesity leads to greater nutritional knowledge. Both the sensitive and preventative effects must be symbiotic while estimating their size in terms of nutritional knowledge with obesity as may lead to biased and insignificant assessments (Zhou et al., 2017). However, knowledge is just the first step and will not automatically lead to healthier food choices.

Consumer food preferences can be affected by many factors such as; personal roles and experiences, social, cultural and physical environments to which a person has been exposed (Slavica et al., 2013). The changing lifestyle, particularly in urban areas as more people continue to increasingly eat away from home, raises the need to enhance consumer knowledge (Contento, 2008). This knowledge is required as a first step to assist consumers to be aware of products. Consumer awareness may come in handy in the result of manufactured food products; many people are unaware of the different ingredients and their names and consequently their effects on the health. Consumer knowledge, attitudes, food choices and dietary behaviour can be changed through communication and presentation of facts (Verbeke, 2008).

In this day and age, social media platform is significantly popular and has an influence on sensitizing of individuals on their behaviour and patterns, they provide exposure and reinforcement on the society (Dagan et al., 2015). Dissemination of information using social media can provide a great opportunity to widen the scope of nutrition education programs, by using different platforms like; Facebook, Twitter, and Pinterest, to carry out dietary behaviour change interventions (Dumas et al., 2018). Studies have established that internet is widely popular among student at tertiary institutions and it is the major source of nutritional information on diet, disease and obesity (Elhassan et al., 2013a; Nmor, 2014). While the impact of social media may sometimes be very strong and thus influence the setting out of behavioural patterns sometimes, the question of whether this nutritional knowledge is accurate comes in play; therefore, the need for other reliable sources such as teaching institutes to be actively involved to ensure the information being relayed is reliable.

2.2 Impact of nutrition education on nutritional status of students

McNulty (2013) defined nutrition education (NE) as:

> *'Instruction or training intended to lead to acquired nutrition-related knowledge and/or nutrition-related skills to be provided to an individual; a combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food- and nutrition-related behaviours conducive to health and well-being. NE can be delivered in multiple ways and involves activities at the individual, community and policy levels' (p. 5)*

Hence, behavioural change communication is an important aspect of NE. Nutrition education is important because it helps people in making dietary choices. However, the increasing complexity of this food environment demands consumers who are nutritionally literate to understand food labelling which may be confusing in certain cases (Contento and Swartz Rose, 2011).

General guidelines could be utilized in promoting the consumption of healthful foods, NE and its combination with supplement provision has a positive effect and can to be best methods for enhancing students' eating habits and promoting healthier diets and lifestyle (Lua and Wan Putri Elena, 2012). As evidenced in a three-day class based intervention study by (Ha and Caine-Bish, 2009) on 80 college students at the Midwestern University in Chicago examined the effect of nutrition intervention. Students indicated to have significantly increased their consumption of fruit and vegetable in their diets. The study also showed that classroom nutrition intervention of increasing fruit and vegetable consumption by college students was a cost-effective approach. Similar results have been observed in an experimental and prospective study with a sample size of

72 was conducted to examine the effect of nutrition education on the knowledge, attitude, and performance of the girl students at primary schools in Shahr-e-Kord city and about the reduction of unhealthy foods consumption. The baseline scores of pupils‟ nutritional knowledge, attitude, and performance in the two experimental and control groups were low before the educational intervention. After the intervention, pupils' knowledge, attitude, and performance regarding the consumption of unhealthy food intake increased significantly. These results highlight the positive effect of education on improving pupils' knowledge, attitude, as well as promoting their performance in decreasing the consumption of the unhealthful foods (Vardanjani et al., 2015).

Another cost-effective approach to achieving an improved dietary intake among university students, observed to work is; the multimodal nutrition education intervention (NEI) by use of conventional methods such as lectures, use of brochures and of course text messaging (Shahril et al., 2013). However, this approach may be limited to design and deliver NEI for university students as using conventional methods alone might not attract this age group. Therefore, combining both the latest technology through social media and conventional method could be a sustainable means in disseminating NEI. Currently, only a few NEI have targeted college or university students worldwide relative to interventions designed for children and the elderly (Shahril et al. 2013). In Africa, most NEI have placed an emphasis on the young children and pregnant women; and in Zambia particularly, NEI literature has not been presented in this review because no such studies have been documented for tertiary institutions.

2.3 Factors affecting student food choices

According to (Contento, 2007), people's food choices are influenced by aspects that include biological factors and experiences with food. Biological factors are determined by behavioural tendencies; and include human liking for sweet food at birth and disliking for bitter and or sour food, hunger/satiety mechanisms, and sensory-specific satiety. Regarding knowledge with food, humans have the capacity to learn to like foods through associative training, both biological and communal.

A considerable body of literature exists on food choices and how it continues to be influenced by a wide range of factors such as advertisements through social marketing, economic status and environmental concerns (Contento, 2008; McNulty, 2013). There has been an increased demand for food and markets have responded by providing fast and convenient foods. This has resulted in an increase in processed and imported foods, which have continued to replace fresh and culturally accepted foods (Contento 2008). The complexity of the food markets requires people who are nutritionally literate and are able to make wise choices.

Students often times fall prey to media and advertising, in a qualitative study carried out on a sample of 35 Belgium students with mean age of 21 years determined the eating behaviour in university students using focus group discussions established that; students felt influenced by media and advertising and were more likely to make impulsive decisions in selecting food upon seeing an advert on television. Another important factor established in this study that contributes to students' choice of food was the taste of food. In this study, it was concluded that the taste of food can make students eat unhealthily; however, it can help them make healthy choices as well (Deliens et al., 2014).

Moving away from the family home and assuming responsibility for food preparation and purchasing for the first time affects the dietary habits of students. It has been established that students living at home do not show major changes in their eating habits ((Papadaki et al., 2007), in contrast, students living away from a family home develop less desirable habits that adversely affect their nutritional status (Manwa, 2013). Sadly, the consumption of fast food is practically common among students, because of convenience, taste, availability and affordability. It has been established that lack of time, cooking skills and not being home, fuels undesirable dietary habits (Dalrymple, 2013).

The influence of food environments on dietary intake and adiposity is another area of concern among students. Food environments encompass vending machines, takeaways, cafes, restaurants, supermarkets, and convenience stores. These foods tend to be less healthful and are linked with fat intake and obesity (Townshend and Lake, 2017). In learning institutions it has been established that vending machines influence food choices of students, they have a wide variety of options available, ranging from classic burgers and fries to fresher salad choices (Gradidge and Cohen, 2017). Such environments must be regulated with a code of ethics to address the marketing of unhealthy foods. Therefore, regulating the 'obesogenic' environment could produce a more lasting effect on behavioural change (Osei-Assibey et al., 2012)

Very few studies conducted in Africa have explored food choices among female students in tertiary institutions. According to (Jaacks et al., 2015), more research on the factors that influence food choices in LMICs is needed to better target obesity prevention efforts.

2.4 Eating patterns of students

Dietary issues and eating patterns of students are of special interest because young adulthood is a critical age of childbearing and they contribute to the nation's productivity (Bhandari et al. 2016). Dietary practices are also important because they reveal a comprehensive impression of the types

of foods available within a population as well as the nutrient content taken by individuals or groups of people. Specific nutrients are vital for human life. and they are needed in varying amounts for human metabolism, growth, reproduction and other vital activities of life (Omage and Omuemu O, 2018, 2018). Therefore, dietary patterns should suit the age and sex of an individual, so as to maintain good health. Young adults are vulnerable to irregular eating patterns so they are at risk of lacking nutrients and dietary excesses of selected nutrients (El Ansari et al., 2012; Manwa, 2013)

If students are living with their family, they are less worried about what to eat because meals are readily prepared by other family members and hence are less stressed about what and when to eat, Deliens et al. (2014) shows that students are inconsistent in their meal patterns on eating practices that a high percentage of them have unhealthy eating practices with inadequate or inappropriate than recommended dietary guidelines for most food groups (Elhassan, Gamal, and Mohammed 2013; Tanton et al. 2015), thereby being predisposed to macro/micronutrient deficiencies. However, it has been argued that these eating practices are as a result of eating habits created during childhood and adolescence and can persist in adulthood (Movassagh et al., 2017).

A balanced diet covers all the important macro-nutrients like protein, carbohydrates, and fat along with micronutrients which include vitamins and minerals that a person needs to eat. Figure 1 illustrates the food pyramid for various food groups which constitute a balanced diet, with their respective servings per day to promote good health in women (Shanmunkha, 2018). The food pyramid indicates which food varieties to eat more and which ones to eat less. Like bigger servings should come from whole grain foods that are less processed, a variety of fruits and vegetables of varying colour, legumes and animal proteins should be included in smaller amounts and fats in very small amounts.

It is recommended that a daily intake of at least three meals a day for nutrient adequacy. According to Hakim et al., (2012), breakfast is the most important meal that replenishes the body and brain after a night's sleep. Further, skipping or less adequate breakfast habits and snacking have been associated with lower nutritional status and risk of developing CVD and obesity among women in the reproductive age (Hakim et al., 2012; Nmor, 2014; Sakamaki et al., 2005) snacks tend to be high in sugar, sodium, and fat, while relatively low in vitamins and minerals, which increase the risk for developing obesity, heart disease, osteoporosis, dental cavities and various types of cancers..

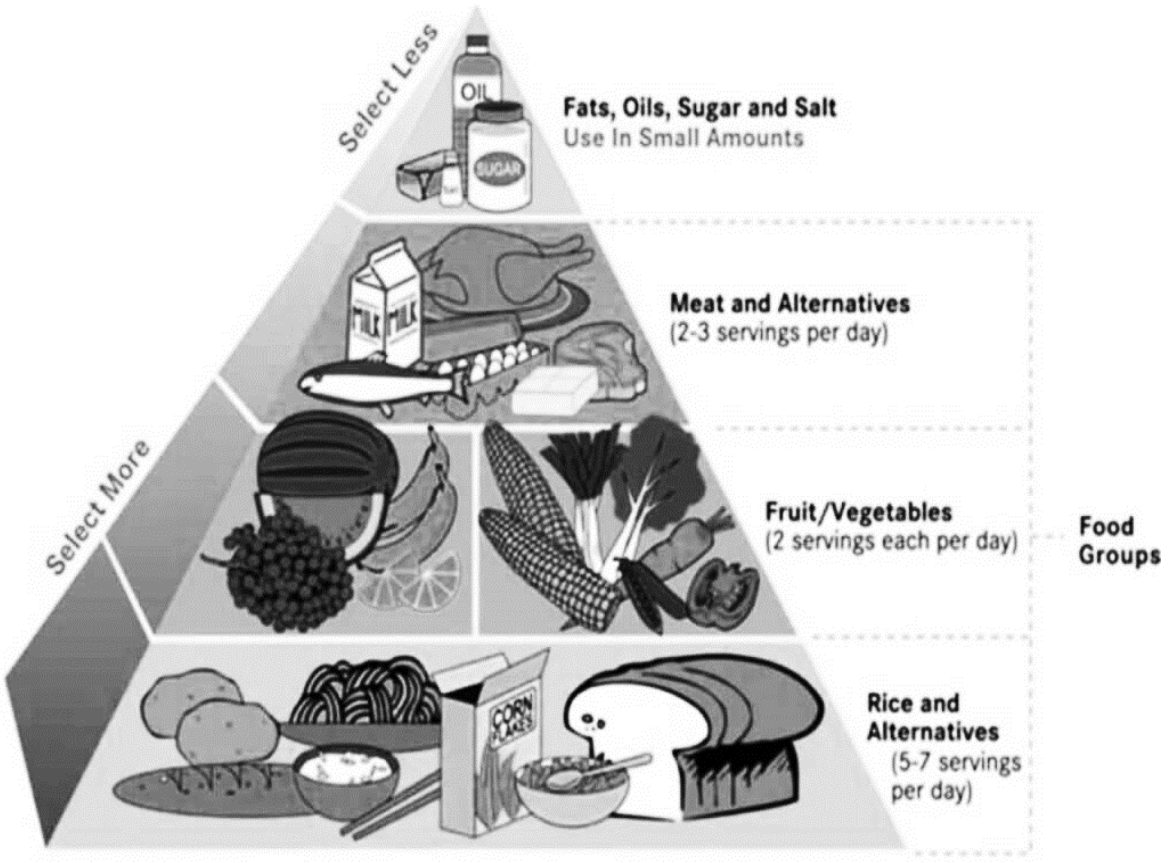

Figure 1 Food pyramid guide (Shanmunkha, 2018)

2.5 Urbanization and nutritional status of women

Growing urbanization is associated with obesogenic dietary behaviours which include sedentary lifestyle coupled with the availability of refined foods, high-energy intake, high dietary fat and sugar intake, low-fibre fruit and vegetable intake or a combination of the above. Several of these dietary habits and behaviours are linked to the adoption of a more Western lifestyle and represent the nutrition transition in developing countries (Micklesfield et al., 2013; Neupane et al., 2016). According to (BeLue et al., 2009) these transitions create enormous public health challenges and the inability to address the problem may impose a significant burden for the health sector and the economy of sub-Saharan African countries. Women of childbearing age are a critical point of intervention, with pre-pregnancy BMI being a strong predictor of child health outcomes (Jaacks et al., 2015). Obesity has shown to increase the risk of pregnancy-related hypertension and pre-eclampsia among women of the childbearing age and is associated with a more than doubled risk of stillbirth and perinatal death (Dunneram and Jeewon 2015).

In a review conducted in Mauritius on healthy diet and Nutrition Education (NE) program among women of reproductive age has shown that, obesity in pregnancy ignites gestational diabetes which

increases the risk of miscarriages of between 25 – 37% higher compared with lean women, foetal macrosomia (birth weight > 4.5 kg at any gestational age) and the development of diabetes later in life and sadly, 70% of the obese women with gestational diabetes develop type 2 diabetes within 15 years of delivery, compared with lean women (Dunneram and Jeewon 2015). On the other hand, under-nutrition equally poses devastating effects such as intrauterine growth restriction, preterm birth (PTB) and maternal and infant morbidity and mortality (Ramakrishnan, Imhoff-Kunsch, and Martorell 2014).

According to a report by the Central Statistics Office (2014), the Zambia Demographic Health Surveys of 2013/14 indicates a rise in overweight and obesity among urban women of Zambia with a prevalence of 32%. This has been attributed to increases in both education and household wealth, more than one-third of women in Lusaka are overweight or obese.

2.6 Nutritional status assessment

The nutritional status of women is a powerful indicator of nutrition security and it relates to pregnancy outcomes and productivity of a woman. Anthropometric measurements have long been used to assess the nutritional status of all age groups (Schutter, 2013; Vatsala et al., 2017)

2.6.1 Body mass index

Body mass index is widely employed for classifying the nutritional status. In adults, it indicates under and overnutrition (Zhou et al., 2017). Table 1 indicates the classification of BMI. According to WHO, BMI is an international standard that is used for adults and it uses weight and height to classify nutritional status by calculating the weight in kilogram per metre squared height of a person (WHO, 2006).

2.6.2 Waist-hip ratio and waist circumference

Waist-hip ratio (WHR), waist circumference (WC) and skinfold thickness are other anthropometric methods commonly used. Waist-hip ratio has been used in adults to determine central adiposity. The ratio distinguishes fat in the lower trunk (hip and buttocks) and upper area (abdomen and waist). It is obtained by dividing waist by hip circumference. According to Gibson (2005), in females, a WHR greater than 0.80 while a WHR greater than 0.95 in males indicate central (upper body) obesity and is associated to chronic diseases such as diabetes and cardiometabolic disease. In women, WC of greater than cut off levels of 88 cm is considered high risk in developing NCDs due to abdominal obesity. Waist Circumference is considered to be the most accurate way to ascertain general obesity in individuals and is the most reliable (Gibson, 2005).

2.6.3 Dietary assessment

According to Gibson (2005), dietary related assessment can be achieved through the use of food frequency questionnaire records of how often an individual eats specific foods. This method provides food items consumed over a specific time. It consists of simple and defined food categories and foods. It is easy to administer and obtain results and gives fewer burdens to the subject being interviewed. The information collected highlights food groups, therefore, scarce or excess nutrients intake can be picked out.

Table 1. Body Mass Index standardized classification by WHO.

Classification	**BMI(kg/m²)**	
	Principal cut-off points	**Additional cut-off points**
Underweight	**<18.50**	**<18.50**
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	**18.50 - 24.99**	**18.50 - 22.99**
		23.00 - 24.99
Overweight	**≥25.00**	**≥25.00**
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	**≥30.00**	**≥30.00**
Obese class I	30.00 - 34-99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: Adapted from (World Health Organisation, 2004)

CHAPTER THREE: METHODOLOGY

3.1 Study design

A cross-sectional study that is descriptive in nature was conducted, female students from three tertiary institutions were randomly selected for quantitative data collection.

3.2 Study site

The study was conducted in tertiary institutions of Lusaka province of Zambia. Institutions included: The University of Zambia (UNZA), Evelyn Hone College and National Institute of Public Administration (NIPA).

The University of Zambia, Evelyn Hone College and NIPA were purposively selected for the study based on their geographical location in urban Lusaka and for their close proximity to numerous food outlets which provide fast and convenient food.

3.3 Target population

The study targeted female students aged between 20 and 35 years old in the tertiary institutions of learning (University and colleges) regardless of their study field. The age range was arrived at because it is a childbearing age, and if they became undernourished or overweight/obese at this stage in their life they may have adverse health outcomes on themselves and of their offspring. First-year students and those living with family, as well as pregnant female students, were not included in the study. (Guelinckx et al., 2008; Ramakrishnan et al., 2014).

3.4 Sampling procedure

Lusaka province was purposively selected; this is because literature indicated that urban women are at risk of being obese (Central Statistics Office, 2014). The tertiary learning institutions were also purposively selected due to their locality to conventional foods and the number of respondents per institutions was also conveniently sampled. Hostel rooms were conveniently sampled because at the time of data collection most students were either preparing for their exams or resting, therefore only available rooms were sampled, individual students in the rooms were subjected to the eligibility creiteria thereafter study participants were selected using the simple random sampling within the rooms. Figure 2 illustrates the sampling procedure plan.

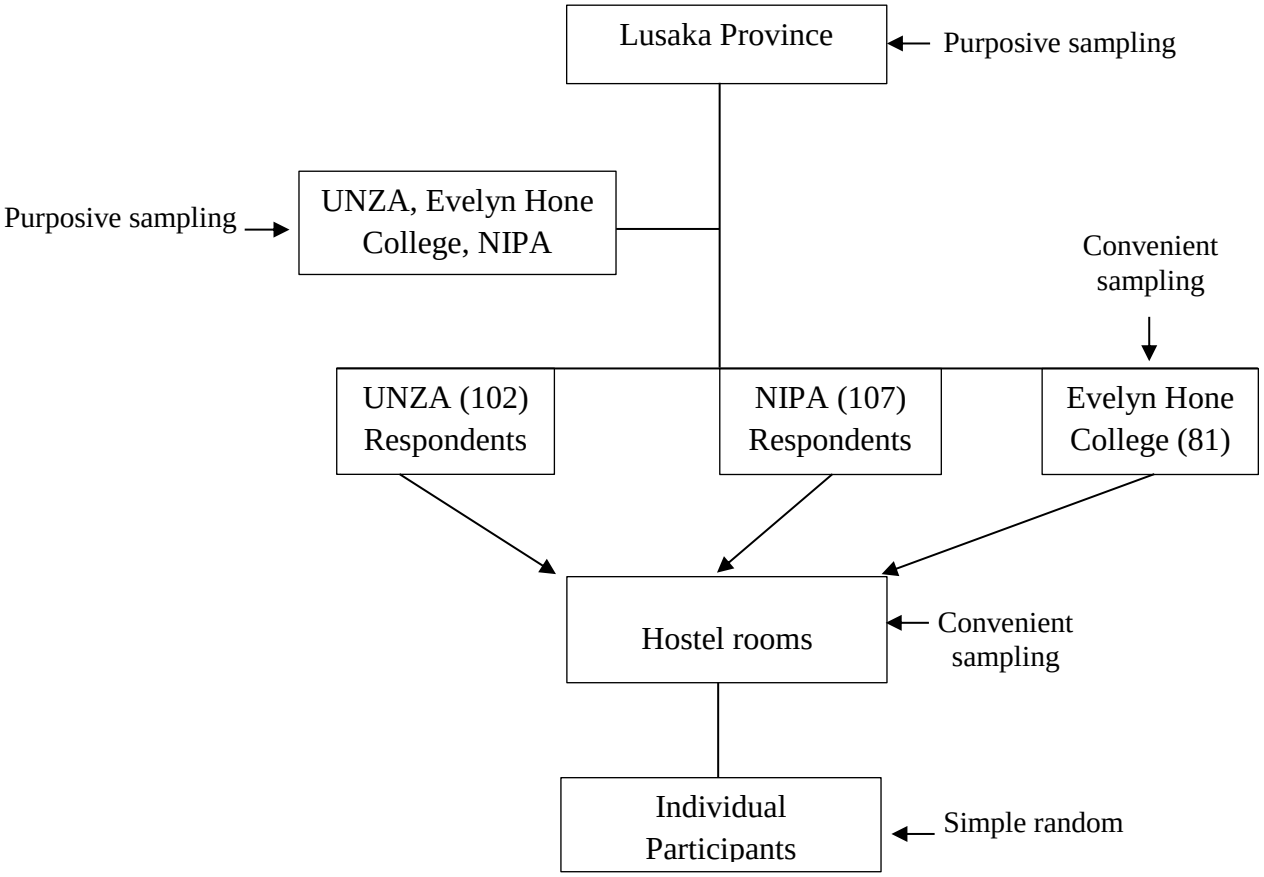

Figure 2 sampling procedure plan

3.5 Sample size calculation

The sample size was calculated using the Fischer formula $n = Z^2P(1-P) / d^2$ (Fischer el.al,1991) where: n was desired sample size, z was the standard normal deviate at the required confidence level (95%) = 1.96 and p was the prevalence of obesity in Zambian women. The documented prevalence of obesity in Zambian women from a report by CSO generated from the key findings of the ZDHS (Central Statistics Office, 2014); which indicated that obesity is an emerging problem among Zambian women and that 23% by 2014 were overweight to obese.

$$\underline{N = Z^2 P (1-P) / d^2}$$

$$= \underline{(1.96)^2 0.23 (1- 0.23) /} (0.05)^2$$

$$= \underline{3.8416 (0.23 – 0.77) /} 0.0025$$

= 272 factoring in 10% attrition = $\underline{299.2}$

The sample size was 299. Ten per cent (10%) attrition was used to take care of attrition and non-response as a result of the busy student schedules. A total of 290 respondents participated in the study.

3.6 Data collection methods / tools

Data was collected using a self-administered semi-structured questionnaire. The self-administered questionnaire comprised componets on socio-demographic data, nutritional knowledge and dietary practices as well as a food frequency checklist. The questionnaire was adapted from the eating practices and knowledge questionnaire and the nutritional survey questionnaire from studies conducted by (Dalrymple, 2013; Thielemann, 2012).

The social demographics captured data on respondent's age, the course is taken in nutrition before tertiary school, students' field of study and monthly food expenditure. Nutritional knowledge collected information on student's perception of food on macronutrients and micronutrients, diet and disease and food labelling. Also collected were the students' sources of nutrition information. To establish the overall dietary practices of the female students'; food choices consisted of Class A (the unhealthy food) with foods such as hamburgers, hot dogs, sharwama, steaks, sour cream, cheese, whole milk, butter, cake, pastry, ice cream, chocolate, chips, fried chicken and fried fish, while class B (healthy food) included foods such as lean meats, skinless poultry, fish, skim milk, low - fat dairy products, fruit desserts, vegetables, pasta, legumes (peas and beans) and, whole grain cereals (Thieleman, 2013), then sources of proteins consumed and eating patterns were considered. In addition to the food frequency questionnaire was used to collect information on how often a particular food is eaten. Anthropometric measurements on weight, height, and WC of the female students were taken and recorded. The students' weight and height were measured using a SECA (S-876) electronic scale and Stadiometer (Seca 217). Participants were weighed with minimal clothing to the nearest 0.1 kg and height were taken to the nearest 0.1 cm respectively. The students WC was measured using a standardized body measuring tape.

3.7 Pretesting/ calibration of tools

Data collection tools and equipment were pre-tested and validated at the Zambia Centre for Accountancy Studies (ZCAS). Ten respondents were selected to participate in the exercise. ZCAS was selected because it has the same characteristic of the proposed target population. The weight scale and the stadiometer were calibrated for accuracy to ensure that the correct readings are observed.

3. 8 Data analysis

Data obtained in this study was quantitative, nominal and ordinal in nature. It was analysed using the Statistical Package for the Social Sciences (SPSS) Software, version 23 and Micro soft Excel The analysis was conducted on nutritional knowledge, dietary practices and on the nutritional status of female students. Data analysis comprised of descriptive statistics such as frequencies, means (SD), medians (IQR), and percentages. Inferential statistics, Pearson correlation coefficient(r) and cross tabulation Chi-square test (X^2) were used for associations. A p-value of ≤ 0.05 was considered statistically significant.

3.8.1. Socio-demographic characteristics

These were presented in frequencies, mean and percentages

3.8.2. Nutritional status

Weight and height were used to calculate and classify the students' BMI with reference to Table 1. WC was also classified into normal and abdominal obesity, considering the waist threshold of 88 cm (Gibson, 2005).

3.8.3 Nutritional knowledge

The questionnaire was composed of nutritional statements to which the respondents were asked to agree or disagree. Following the FAO guidelines on assessing knowledge and dietary practices (Fautsch Macías and Glasauer, 2014), numerical responses were compared to the correct responses. A code of 1 was assigned to a correct response, otherwise, a code of 0 was assigned. Both percentages and scores were used as indicators of knowledge and were determined from the numerical indicators. For score-based indicators of knowledge, each respondent was given a score based on the number of correct responses provided. The knowledge score of the population was then calculated for each question by dividing the total number of correct responses by the number of respondents who answered the particular question. The scores were then classified as nutrition knowledgeable and not- knowledgeable. Further individual students cut off points were used and classified according to their performance (Nazni and Vimala, 2010); excellent- 80 and above, very good 79 -70, good 69 -60, satisfactory 59 -50, 49- 40 regular and 39 - 0 poor.

3.8.4. Dietary practices

Proportions for students dietary practices were derived from numeric indicators. Students who indicated to have been eating the class A foods which consisted of hamburgers, hot dogs, sharwama, steaks, sour cream, cheese, whole milk, butter, cake, pastry, ice cream, chocolate, chips, fried chicken and fried fish (fast foods) were considered to have poor dietary practices. Further, those

who indicated to have been eating animal protein only and those who skipped meals were also considered to have poor dietary practices. The numeric indicators were recorded in poor and good dietary practices (Fautsch Macías and Glasauer, 2014).

3.9 Ethical considerations

Ethical clearance for conducting the research study was acquired from The University of Zambia's Biomedical Research Ethics Committee (UNZABREC) ref: 003-04-18. An introductory letter to carry out the research was sought from the Head of Department – Food Science and Nutrition was presented to the Heads of institutions at UNZA, NIPA, Evelyn Hon College and ZCAS. Willing students signed the consent forms. Participants were clearly informed that participation in the research was entirely voluntary and that they may stop participating at any time if they so wished. Furthermore, it was clarified that they were free to leave out questions they felt were too personal. However, it was indicated that their cooperation was highly appreciated. They were also assured that the research will bring no harm to them if they decided to participate and confidentiality regarding their responses; to this respect, no identifying information was collected.

CHAPTER FOUR: RESULTS

4.1. Socio-demographic characteristics of students

A total of 290 female students completed the questionnaire. Table 2 shows the socio-demographics of students. The mean age was 22± 0.39 years with the minimum and maximum ages of 20 and 35, respectively. Students who had not taken a nutritional course before tertiary school were 59.7 % and 40% of them had taken a course in nutrition. Students were categorized into health science-based (33.4%; n=97) and non-health science-based (66.6%; n=193). The study population from NIPA was 36.9%, 35.2% were from UNZA and 27.9% were from Evelyn Hone College. The distribution of respondents according to their food monthly expenditure indicated that 61.7% (n =179) students spent less than K1, 000; and 3.8% (n =18) spent between K1, 500 - K2, 000.

Table 2. Socio-demographic characteristics of the female students

Variable	N= 290	Percentage
Age (years)		
20-24	267	92.1
25-29	14	4.8
30-35	8	2.8
Mean ± SD	22 ± 0.39	
Field of Study		
Health Sciences	97	33.4
Non - health Sciences	193	66.6
Monthly food expenditure (ZMK)		
<1000	179	61.7
1000 -1500	73	25.2
1500 -2000	11	3.8
>2000	18	6.2
Institutions of learning		
UNZA	102	35.2
NIPA	107	36.9
Evelyn Hon College	81	27.9

4.2. Nutritional status of female students using BMI and WC

The median and inter-quartile range (IQR) BMI (kg/m^2) was 23 (6.55), with minimum and maximum of 16.4 and 44 respectively. Table 3 shows categorised BMI and WC about 53.8 % (n=156) of the respondents had normal BMI, 23.2% (n = 68) were overweight and 12.8 % were obese. Cross-tabulation of BMI with whether a student took a course in nutrition or not, indicated that 31 % (n = 90) who had taken a course in nutrition had normal BMI while for those who had not taken a course in nutrition, 22.7% (n= 66) had normal BMI. Figure 2 shows the BMI based on whether a student had taken a nutrition course or not. Among overweight students, 14.1% (n=41)

had not taken a course in nutrition, further, 3.4% (n=10) underweight students had taken a nutrition course. The median (IQR) WC (cm) was 77 (14), minimum and maximum WC of 61 and 121, respectively. There was a significant association between BMI categories and monthly food expenditure of students, X^2 =18.697, p = 0.028. There was no significant association between BMI and nutrition course taken, X^2= 2.855, p > 0.05, further, there was nostatistically significant association between WC and nutrition course taken, X^2 = 231, p > 0.05.

Table 3. Categorised BMI and WC of female students

Variable	Category	N= 290	Percentage
BMI	Underweight	21	7.24
	Normal weight	156	53.8
	Overweight	68	23.5
	Obese	45	15.5
WC	Normal	243	83.8
	Abdominal obesity	47	16.2

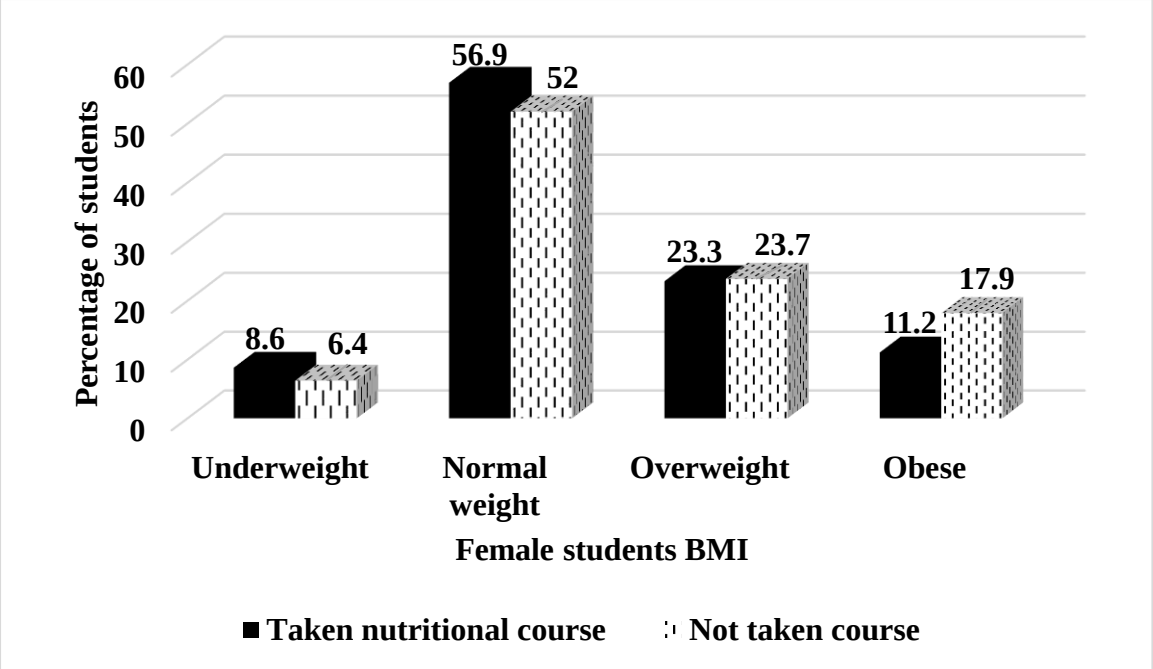

Figure 2. Body mass categories based on course taken

4.3. The level of nutritional knowledge of the female students in the three tertiary institutions

Table 4 shows the proportions of students and nutritional knowledge attained. The mean knowledge score was 66.32% ±17.014, with minimum and maximum scores of 32% and 80%, respectively. The overall percentage score indicated that 72.3% (n=209) students had the nutritional knowledge and 27.7% (n=80) did not have nutritional knowledge. Among the students who had taken a course in nutrition, 41.1% (n= 86) were knowledgeable and 62.5% (n=50) who had not taken a course in nutrition were not knowledgeable. Internet provided most students with nutritional information 55% (n= 159), followed by television 50% (n= 145); and leaflets/flyers 3.8% (n=11) were the least used source of knowledge. There was no significant association between nutritional knowledge and students' age, their institution of learning, the field of study and course taken in nutrition, $p > 0.05$.

Table 4. proportions of students and nutritional knowledge attained

Students proportion of nutritional knowledge N = 290

	Taken nutrition course	**Not taken a nutrition course**	**Total**
Knowledgeable	41.1% (n = 86)	58.9% (n = 123)	72.3% (n = 209)
Not knowledgeable	37.5% (n = 30)	62.5% (n = 50)	27.7% (n = 80)
Students' scores for nutritional knowledge			
Excellent 80 & above	21.8% (n = 63)	27.7% (n = 80)	59.9% (n = 143)
Very good 79 - 70	1.4% (n = 4)	1.4% (n = 4)	2.8% (n = 08)
Good 69- 60	-	-	-
Satisfactory 59 - 50	-	-	-
Regular 49 - 40	10.4% (n = 30)	17.3% (n = 50)	27.7% (n = 80)
Poor 39 - 0	6.6% (n = 19)	13.5% (n = 39)	20.1% (n = 58)
Mean score ± SD	66.32± 17.014		

4.4. Dietary practices of students

4.4.1. Food choices of students

Figure 3 shows the class of food students prefer to eat. Results indicated that 82.2% (n=120) of students consumed the class A foods. About 37.1%(n=43) had taken a course in nutrition while

44.3% (n=77) had not taken a course. Students who did not take a course in nutrition who consumed class B were 37.6%(n=31) .

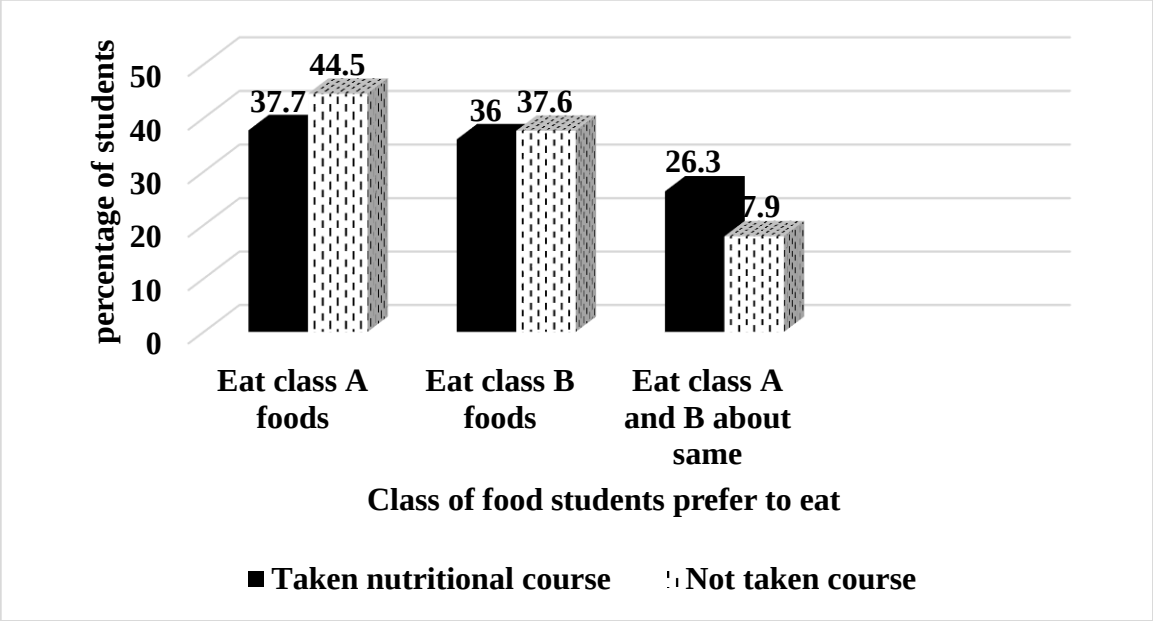

Figure 3. Class of food most preferred by students

To assess the association between the class of food which students preferred to eat and their food monthly expenditure, a course in nutrition and learning institution, Pearson Chi-Square was used. There was no statistical associationdifference between the class of food preferred with their monthly food expenditure and course taken in nutrition, $p > 0.05$. A significant association was observed between the classes of food preferred with the institution of learning. Respondents from the National Institute of Public Administration consumed more class A foods than the other two institutions, X^2 (8) = 15.941, p = 0.043.

4.4.2. Sources of protein eaten

Figure 4 shows the proportions of students who consumed protein from various sources. Results indicated that 85.7% (n= 121) of the sudents consumed animal protein. These students had not taken a course in nutrition and consumed protein only were 40.1% (n =69). Students who had taken a course in nutrition and consumed vegetable proteins were 3.5 % (n=4). The valid responses were 287

There was no statistically significant in the association between the sources of protein and their monthly food expenditure and also with a course taken in nutrition, $p > 0.05$.

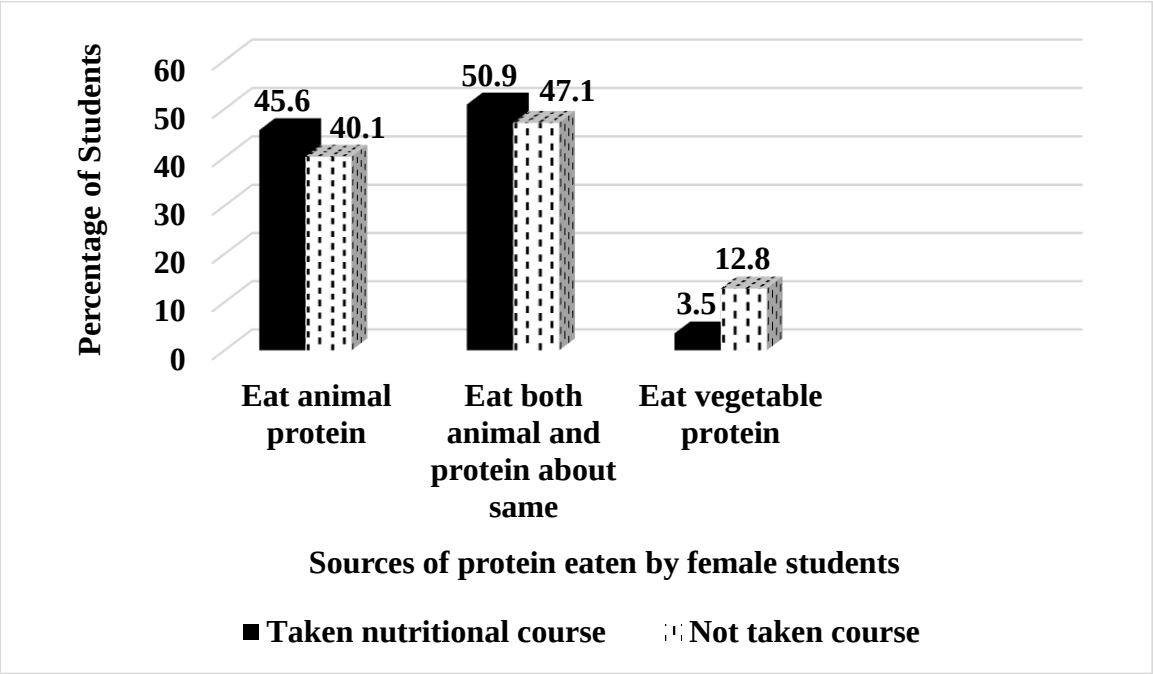

Figure 4. Sources of Protein Eaten by female students

4.4.3. Eating patterns of students

The frequency of meal patterns among female students was assessed between two time periods; before and during tertiary school based on breakfast, lunch and evening meals. Table 5 indicates a significant difference in the proportions of students who consumed breakfast consumption before and during tertiary school; lunch consumption before and during tertiary school and; dinner consumption before and during tertiary school, $p < 0.05$. Figure 5 shows the reasons students' skipped meals. Seventy percent 70 %, (n=203) of the students indicatedthey lacked time for preparing meals, and 2.8 % (n=8) of the students indicated that they were on a diet. The sample size was 290.

Table 5. Meal patterns of students before and during tertiary school

Meal pattern		Before tertiary Frequency % (n=290)	During tertiary	P - value
Breakfast	Daily	63.8 (n=185)	22.4 (n=65)	**0.000**
	Sometimes	89 (n=30.7)	66.6 (n=193)	
	Never	4.8 (n=14)	10.7 (n=31)	
Lunch	Daily	52.2 (n=189)	24.1 (n=70)	**0.003**
	Sometimes	31.4 (n=91)	67.6 (n=193)	
	Never	2.8 (n=8)	7.2 (n=21)	
Diner	Daily	83.1 (n=241)	73.1 (n=212)	**0.000**
	Sometimes	14.5 (n=42)	26.6 (n=77)	
	Never	1.7 (n=5)	.3 (n=1)	

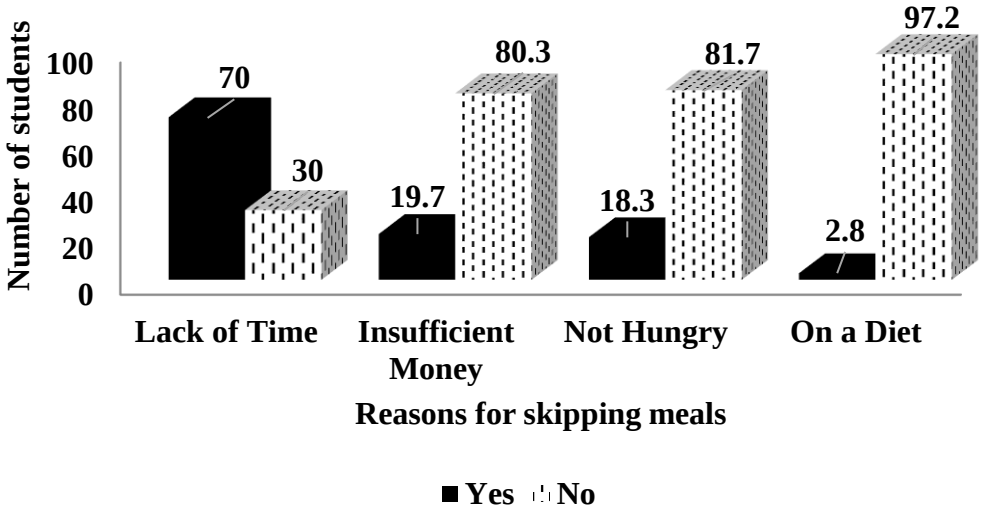

Figure 5. Reasons for Skipping Meal

4.4.4 Snacking patterns of students

Results indicated that 91.4 % (n = 265) of the students snacked and 8.6% (n=25) did not snack. Figure 5 shows the snacking patterns of students. About 65.9 %, (n=191) of students snacked daily

between breakfast and lunch, 51.7% (n=150) of the students reported to engage in snacking between lunch and diner and 39.7 % (n=107) of them never snacked after dinner.

Table 6. Snacking patterns of students

Snacking patterns of student	**N = 290**		
	Snack between breakfast and lunch	**Snack between lunch and dinner**	**Snack after dinner**
Daily	65.9% (n=191)	29.3% (n=85)	13.8% (n=40)
Rarely	14.5% (n=43)	51.7% (n=150)	49.0% (n=142)
Never	19.3% (n=56)	18.3% (n=53)	39.7% (n=107)

4.4.5 Snacks consumed by students

Figure 6 shows the types of snacks consumed by students. Results indicate that students snack on fatty foods which are high on empty calories. Students who consumed popcorn were 57.6% (n=167), followed by potato chips 48.3% (n=140) and 47.2% (n=137) snacked on fruit. Fritters were the least consumed snack 1.7% (n= 5).

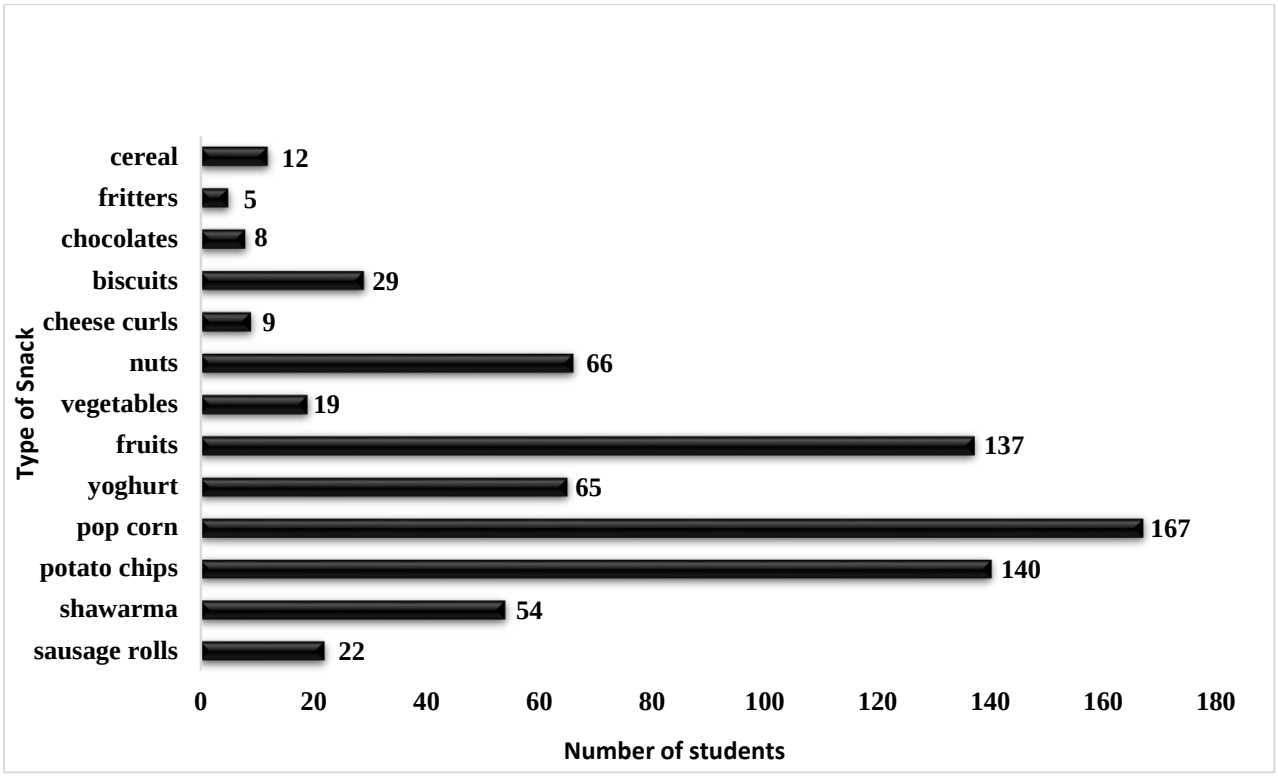

Figure 6. Types of snacks consumed by students

4.4.6 Frequency of food consumption

Table 7 shows the frequency of consumption of a variety of foods by students. Among the staple foods, more than half of the students 51.7% (n=150) consumed *Nshima* everyday, followed by bread 23.4 % (n=68) and cereal 20.3% (n=59). A high proportion consumed oils (73.1%,n-212) and fruit juice (80%,n=27.9). Vegetables were consumed by 35.2 % (n=162) of the students. Students who consumed fruits, fish, milk and soft drinks 1-2 times per week were 44.8% (n=130), 44.8% (n=130), 41% (n=119) and 44.5% (n=129), respectively.

Table 7. Food types/groups and consumption proportions by students

Type of Food	*Measure: Frequency (%) N=290				
	Everyday	1 -2 times/ week	3- 6 times/ week	rarely consumed	never consumed
Carbohydrates					
Bread/buns/rolls	68(23.4)	117(40.3)	59(20.3)	6(2.1)	17(5.9)
Cereals	59(20.3)	110(37.9)	62(21.4)	9(3.1	38(13.1)
Potato	26(90)	16055.2)	59(20.3)	17(5.9)	23(7.9)
Nshima	150(51.7	59(20.2)	59(20.3)	7(2.4)	9(3.1)
Beans, lentils	12(4.1)	127(43.8)	40(13.8)	34(11.7)	68(23.4)
Vitamins and Minerals					
Vegetables	162(35.2)	77(26.6)	60(20.7)	13(4.5)	31(10.7)
Fresh fruit	57(19.7)	130(44.8)	73(25.2)	11(3.8)	15(5.2)
Fruit juice	81(27.9)	95(32.8)	61(21.0)	18(6.2)	29(10.0)
Proteins					
Full cream milk	60(20.7)	119(41.0)	59(20.3)	14(4.8)	35(12.1)
Red meat	59(20.3)	101(34.8)	76(26.2)	11(3.8)	38(13.1)
Chicken	41(14.1)	118(40.7)	87(30.0)	10(3.4)	29(10.0)
Fish	16(5.5)	130(44.8)	44(15.2)	33(11.4)	59(20.30
Eggs	67(23.1)	117(40.3)	62(21.4)	10(3.4)	25(8.5)
Fats					
Soft margarine	23(7.9)	81(27.9)	36(12.4)	25(8.6)	113(39.0)
Oils	212(73.1)	20(6.9)	42(14.5)	4(1.40	8(2.8)
Mayonnaise	60(20.7)	109(37.6)	70(24.1)	13(4.5)	29(10,0)
Beverages					
Alcoholic beverages	10(3.4)	63(21.7)	24(8.3)	14(4.8)	176(60.7)
Soft drinks	38(13.1)	129(44.5)	60(20.7)	22(7.6)	34(11.7)

*Number of students. Numbers in bracks are percentages

4.4.7 Students' dietary practices

The overall rating for dietary practices exhibited was based on whether students had or not taken a course in nutritional. Table 8 shows that 36.7% (n=106) students who had not taken a course in nutrition had poor dietary practices. Students with good dietary practices were 14.5% (n=42) had taken a course in nutrition and those who had not taken a course with good dietary practices were 23.2% (n=67).

Table 8. The overall rating for students' dietary practices based on FAO guidelines

		Taken Nutritional Course	**N=290**	
		Yes	**No**	**Total**
Dietary practices	Poor	74	106	180
	Good	42	67	109
	Total	116	173	289

4.5. Association of nutritional knowledge, dietary practices and nutritional status of female students.

Nutritional knowledge scores and BMI were not statistically correlated; $r = 0.03$, $p > 0.05$. Nutritional knowledge scores and WC were also not statistically correlated; $r = 0.08$, $p > 0.05$. There was no association between dietary practices and BMI, $p = > 0.05$. Likewise, no association between dietary practices and WC was established, $P = > 0.05$.

CHAPTER FIVE: DISCUSSION

The purpose of this study was to assess the association between nutritional knowledge, dietary practices and nutritional status among female students aged 20-35 years in three selected tertiary institutions of Lusaka.

5.1. Nutritional status of female students

The first specific objective of this study was to measure the nutritional status of female students in the selected three tertiary institutions. In the study population, overweight and obesity were more prevalent than underweight. These findings are consistent with those presented by the Zambian Demographic Health Surveys (2013-14) that overweight and obesity were increasing and underweight was decreasing in Zambia among females aged 15- 49 since 2001-2002; overweight and obesity increased from 12% to 32% and underweight decreased the urban areas. Similar findings have been established in other African universities (Awotidebe, 2014; Nmor, 2014). The possible reason for this could be the ongoing nutritional and epidemiological transitions. The nutrition transition has been characterized by changing diets from the traditional foods which included whole grain cereals, vegetables and fruits. Further, consumption of foods rich in fats, sugar, refined and processed foods are linked to excessive weight gain and development of non-communicable diseases such as diabetes, hypertension, some types of cancers and cardiovascular diseases, physical inactivity exacerbate these conditions and genetical factors also play a role in some cases (Awotidebe, 2014; Nnyepi et al., 2015).

An interesting observation made in the present study was that students who had not taken a course in nutrition before tertiary school and those in non-health-related field of study were more overweight/obese than those who had taken a course in nutrition and studying health science or related course. From the results, it is clear that nutrition education may play an important role in one's nutritional status. In comparison to a study conducted by (Kinyua, 2013), the results are similar to the present study. Students who were in health sciences had better nutritional status than from social sciences.

In most African countries, women who are obese or overweight are viewed as beautiful and as a sign of wealth (Awotidebe, 2014; Nnyepi et al., 2015). Exposure to nutritional information places these students at an advantage and it may help to remove misconceptions about body image and cultural beliefs. Overweight/ obesity in the reproduction age can result in poor maternal health outcomes and is associated with gestational diabetes, pre-eclampsia and increases childbirth complications such as giving birth to overweight babies and through caesarean section (Dunneram

and Jeewon, 2015; Guelinckx et al., 2008). Obesity and its associated comorbidities contribute to low productivity and increase the nation's health burden. Poor maternal health outcomes can perpetuate generational malnutrition and further burden the nation's health system and socioeconomic structure.

5.2. Students level of nutritional knowledge

When people (students) are empowered with nutritional knowledge, they have the necessary skills to make healthier choices. In the present study, it was established that students had the nutritional knowledge and therefore are expected to make healthier food and lifestyle choices. Other studies have shown that students are slightly aware of nutritional issues and may not possess the high level of nutritional knowledge despite being educated (Barzegari et al., 2011; Elhassan et al., 2013). However, greater nutritional knowledge could lower the likelihood of developing malnutrition. Further findings in the current study unveiled that, students who had not taken a course in nutrition scored slightly better than those who had taken a course in nutrition before. These results could firstly be attributed to the fact that the two groups were not evenly distributed; the study population had more students who had not taken a course in nutrition than those who had taken, hence these results may seem to contradict other studies which have established that exposure to nutritional information places student at an advantage (Ha and Caine-Bish, 2009) and secondly; it is possible that students who had not taken a course in nutrition may have been exposed to this knowledge from different sources.

In the present study, the major source of nutritional information was the internet, followed by television. These findings are in line with other studies where media was most relied upon by the students for nutritional information. This could be linked to the fact that media is increasingly influencing young people and there is a rising demand for information that is easily accessible at any time (Awotidebe, 2014; Nmor, 2014 ; Elhassan et al., 2013). However, the question of whether or not this information obtained on media is authentic could be asked because some of the information that such platforms provide, especially the internet, may not be reliable. Nevertheless, in this study students who had never taken a course before could have been exposed to the right information hence to a certain extent, sources like the internet could be used in disseminating the much-needed information to help students improve their food choices and eating patterns for improved health and maternal outcomes. Despite the increased use of media, evidenced in this study and other studies, institutions of learning still remain vital in imparting nutritional knowledge to improve the health and wellness of students (Barzegari et al., 2011).

5.3. Common dietary practices of female students in the selected tertiary institutions

Adequate nutrient store during reproductive years for a healthy pregnancy and an appropriate nutritional status to maintain skeletal health during the postmenopausal period is essential, to optimize both the mother and her offspring's health (Branca et al., 2015; Obanewa and Newell, 2017). Therefore, female students need to make good food choices and maintain regular eating patterns that promote good nutritional status.

In the present study, dietary practices of students were assessed based on their choice of food and eating patterns. Students consumed fast foods; these kinds of food increase the chance of NCDs and obesity. Consistent with the current findings, a similar pattern of results was obtained in some studies where the consumption of fast foods was popular among the students (Anderson et al., 2011; El Ansari and Samara, 2018). The trend of consuming fast foods could be as a result of the institutions being located in an obesogenic environment (Giskes et al., 2011). These foods are readily available, ready to eat and affordable (Dalrymple, 2013)

In the current study, students preferred consuming both vegetable protein and animal protein about the same. Also notable; students consumed mostly animal protein and few consumed vegetable protein. It is important to highlight the fact that, people consuming fatty foods compared to people consuming leaner foods, were at a higher risk for obesity and cardiovascular diseases as evidenced by the nutrition transition. Students tend to change their eating patterns when they move away from a family home to school. In the present study, a significant change was noted in all the three main meal patterns, students had decreased consuming breakfast, lunch and evening meals compared to before leaving their family home. The established reason for the change in meal consumption was lack of time for students to prepare meals. These findings are in tandem with other studies that have established a decline in meal consumption for students living away from the family home (Kabir et al., 2018). Nutritionally, it is recommended to eat at least five to six meals per day, to ensure adequate nutrient intake. In this case, it is very difficult to meet daily nutrient needs in one or two meals. Students in the present study skipped meals; skipping breakfast specifically has been associated with lower nutritional status and the risk of cardiovascular disease (Hillemeier et al., 2011). This result ties with results where students who missed meals had actually confirmed clinical tests for micronutrient deficiencies in a Zimbabwean university (Manwa, 2013)

Findings in other studies suggest that moving away from the family home and assuming responsibility for food preparation and purchasing for the first time affect students' dietary habits as they develop unfavourable eating habits than a student living at the family home. In these studies, students were observed to skip meals and had regularly snacked especially between breakfast and

lunch as well as lunch and dinner (Manwa, 2013; Omage and Omuemu O, 2018). Similarly, in the current study, it was established that students snacked daily, especially between breakfast and lunch. Snacking could have attributed to students' skipped meals. Regular consumption of snacks in between meals is an unhealthy eating practice which may lead to skipping meals, and the prevalence of not meeting the recommended daily intakes for most nutrients in individuals who do not eat breakfast is higher than in those who eat breakfast (Leech et al. 2015). Further less adequate breakfast habits and increased snacking on heavy dense energy and fatty foods have also been associated with the development of obesity among women of the reproductive age (Nmor 2014; Mattes and Sze – Yen, 2013). As established in this study, students were snacking on popcorn, fruits and potato chips. Consumption of potato chips may be attributed to the development of obesity.

In another study, students were observed to have increased snacking more on fruits, 48.5% of respondents consumed fruits at least three times per week (Sakamaki et al. 2005). Similarly, this study also found that 48.8% of respondents consumed fruits at least twice per week; contrary to these findings, observed in a Ghanaian university students were noted to have consumed fruits slightly higher up to five times in a week (Kpodo et al., 2015). Literature is consistent that frequent consumption of fruits could lower the risk of diseases in adulthood (Ganasegeran et al., 2012). Therefore, snacking on fruits should be encouraged among this study population.

Other factors that could explain why the students skipped meals could be the lack of sufficient money to spend on quality food. Most students spent less than K1 000 on food expenses monthly. Other studies have equally established from their findings that insufficient finances can contribute to students' failure to buy quality and healthful foods which are low in fat and sugars and rich in dietary fibre (Khoo and Knorr, 2014; Ukegbu et al., 2017).

Relative to the consumption of food from the various food groups; in the current study, it was established that most of the students consumed the staple food - nshima on a daily basis followed by potatoes, bread and cereals being consumed 3 to 6 times per week. Similar findings were also established were women of the reproductive age were found to be consuming carbohydrate based foods at least once a day (Bhandari et al., 2016). In the current study beans and lentils were also eaten at least 1 to 2 times per week.. It is advisable to obtain at least 50 to 60 % of daily caloric energy from carbohydrates. In the present study, it was not established if the students obtained the recommended caloric energy from their daily intake. It is important to note that monotonous diets based on starchy staples lack indispensable micronutrients and can contribute to the problem of malnutrition and micronutrient deficiencies. Therefore, it is advised to consume a diverse diet to avoid this problem (Manwa, 2013)

In a study on the dietary behaviour in a Greek university; students' dietary habits were compared on two different time periods, between 2006 and 2016. The study document a shift towards positive dietary changes between both periods. Students in 2016 presented greater adherence to the national and global dietary recommendations, since 74.8% of the participants' consumed cereals/starchy foods as the key energy suppliers more than five times per day (Kyrkou et al. 2018). Furthermore, in 2016 a higher proportion of the participants followed the guidelines for vegetable and fruit consumption. In this study, 35.2% of the participants consumed vegetables daily and 19.7% consumed fruits. Compared to findings by Kyrkou and colleagues (2018), participants in the present study indicate a need for a nutrition intervention to improve the consumption of vegetables and fruits. According to (WHO, 2018), in order to meet the global dietary recommendation, consuming 400g of fruit and vegetables daily can reduce the possibility of a deficiency in micronutrients.

5.4. Association between nutritional knowledge, dietary practices and nutritional status among female students

The final specific objective was twofold and therefore has been discussed separately. Firstly, the study aimed at determining the association between nutritional knowledge and secondly assessing the association between dietary practices with the nutritional status of female students in selected institutions.

5.4.1 Association between nutritional knowledge and nutritional status

Female students in this study were knowledgeable in nutritional matters, however, there was no association between nutritional knowledge and nutritional status. Nutritional knowledge takes account of two elements; facts of nutrition and practical knowledge, such as planning, purchasing and preparation (Barbosa et al., 2016). Therefore, if declarative knowledge is poor, it is likely that nutritional knowledge would play a big role in the adoption of healthier food habits thereby affecting the nutritional status, however in this case, the declarative knowledge was evident, but students could have failed to put it into practice. Students may also have failed to implement the declarative knowledge due to lack of skills; studies have shown that nutrition information must be coupled with practical skills which should be able to assist in implementing good dietary practices which can translate into good nutritional status (McNulty, 2013).

Kyrkou et al. (2018) highlight that nutritional knowledge is an indicator of poor nutritional practices however, current results demonstrate that having nutritional knowledge does not automatically translate into good dietary practices. Students have the nutritional knowledge, however, observed was poor dietary practices which could have contributed to the high prevalence of overweight/ obesity in the study population.

5.4.2 Association between dietary practices and nutritional status

The study revealed that students exhibited poor dietary practices and no significant association was established between dietary practices and nutritional status. Tanton et al., (2015) observed similar results in the risky eating behaviour cluster. Snacking, convenience and fast food consumption had clearly shown to cluster together among students in this study. The results in the present study could firstly be attributed to the fact that knowledge plays a vital role in modifying dietary practices which have to be implemented in order to affect the nutritional status. However, it remains unclear how long this process can take to yield the desired results and secondly; the financial status plays a significant role in the purchase of food.

Students living on their own may be influenced to buy cheap and convenient food if they are struggling financially irrespective of the knowledge they possessed. To top it all, inability to strike a balance between self-meal preparations and academic stresses may contribute to poor dietary practices among students (Manwa, 2013) In this case, students may not have seen the need to utilize the knowledge they possessed to guide their food choices and eating patterns which may have compromised their nutritional status.

The use of a questionnaire only to obtain information on the students' dietary practices may have also contributed to these findings. Complementary methods of data collection such as direct observations, 24 - hour recall and or focus group discussion could have been used to get a realistic picture of the dietary practices of students with their nutritional status. However, the poor dietary practices observed in the study demonstrates the need for interventions promoting healthy eating behaviour patterns amongst female students at tertiary institutions.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The study has shown that students with normal weight are more common, however, overweight and obesity are prevalent than underweight among the female students in the tertiary institutions; implying that they are at increased risk of metabolic complications. With regards to the nutritional knowledge, female students were knowledgeable and most students obtain this knowledge from the internet and television. There were no significant associations between knowledge and age, a course in nutrition, the field of study and institution of learning.

Dietary practices of female students are suboptimal but not associated with their nutritional status. Students prefer consuming fast foods characterized by skipping meals and tendencies of snacking especially between breakfast and lunch meals. There is no association established between nutritional knowledge, dietary practices and nutritional status among female students in the current study.

6.3 Recommendations

Based on the study findings; there is a need for institutions of higher learning to include nutrition education and behavioural change communication in their curriculum (BCC) which should be aimed at assisting students to voluntarily modify their dietary practices particularly in disciplines where nutrition and health are not directly taught as a course. Owing to the increasing prevalence of overweight and obesity, there is a need for institutions of learning to revamp physical activities. The relevant authorities in the institutions to ensure that indoor physical activity facilities are user-friendly. Further, these nutrition education programs should include aspects of practical skills so that the knowledge acquired can be implemented.

Institutions of learning and the stakeholders to collaborate on promoting dietary intervention studies and physical activities in the study population. This is to necessitate for monitoring and evaluation of NE programs, nutritional status and dietary practices among female students. Further, relevant authorities in the institutions of learning to promote good dietary practices by disseminating information via the internet on a regular basis consistent with dietary recommendations.

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APPENDICES

Appendix 1: Participants' information sheet

INFORMATION FOR PARTICIPANTS FEMALE STUDENTS AGED 20 - 35 YEARS

Title of study

Assessment of Nutritional Knowledge, dietary practices and nutritional status of female students attending tertiary institutions of Lusaka, Zambia

Introduction

I am an MSc Nutrition student at the University of Zambia. I am inviting you to be part of this research because women's health and nutritional status are very important especially the reproductive /childbearing age. The nutrition transition in our country threatens the health and wellness of women. Your participation in this study will assist in providing information on the nutritional status of female students and help formulate policies that women can directly benefit from for enhanced lifestyle and health.

The objective of this study is to assess whether nutritional knowledge and dietary practices have an association with the nutritional status of female students aged 20-35 years in tertiary institutions of Lusaka

Participant Selection

You are being invited to take part in this research because you meet the study criteria and live in the area of interest for the research, and we feel that your responses will assist us to understand issues surrounding nutrition in female students in our Zambian tertiary institutions.

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. The choice that you make will have no consequences on anything related to your life. You are free not to answer some questions that you do not want to answer or that you feel are too personal.

Duration

The research participation will take approximately 30-45 minutes. Please take note that you will not be provided an incentive for taking part in the research.

Confidentiality

The research will get information from you about yourself and we will not share information about you to anyone outside of the research team. The information that we get from this research will be shared with the University of Zambia. Therefore, if you choose to join the study we will ask you to permit us to do the following

1. Answer the questionnaire provided to you and submit as required
2. Take your weight, height and waist-hip measurement. For thi, you will be required to wear minimum clothing and a reasonable hairstyle that will not affect the height measurements.

For queries or clarifications, you may contact:

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Appendix 2: Participants consent form

INFORMED CONSENT FOR PARTICIPANTS IN THE STUDY TITLED

Assessment of Nutritional Knowledge, Dietary Practices and the Nutritional Status of female students' aged 20 -35 in tertiary institutions in Lusaka.

I have been fully informed of the study and I'm aware that should I wish to participate, I should abide by the protocols. I also understand that should I will not be forced to participating in the study and that I can withdraw my participation from the study at any time.

Further, I understand that the research will bring no harm to me and that my responses will be confidential. Furthermore, I understand that by participating in the study, I will not be entitled to any special resources or be given any kind of payment.

This authorization is only valid for this particular study.

If I want to talk to the people in charge of this project I can contact Ms Mahamba Muzeya or if I have complaints or further questions about the research during the study period, I can also call UNZABREC on numbers shown below.

I hereby concert to participate

Name of participant…….

Signature of participant…… Date ……

Signature of researcher…… Date ……

Appendix 3: Data collection tool

Questionnaire number ☐

Institution …….

Dear Student,

This survey is being conducted to assess the association of nutritional knowledge, dietary practices and the Nutritional Status among female students attending tertiary institutions of Lusaka. Providing information for this survey is voluntary however, your cooperation is kindly appreciated. It should take you not more than 30 - 45 minutes to complete this survey. You are also required to answer all questions honestly and truthfully.

Your **responses** will be kept confidential.

Section A – socio-demographic data

1. Indicate your date of birthday……/month ……. /year……
2. Indicate your study field

   Non- health science-based ☐

   Health science-based ☐
3. Indicate your food monthly expenditure

   a) > K1000 ☐

   b) K1000 – K1500 ☐

   c) K1500 – K2000 ☐

   d) < K2000 ☐
4. Have you ever taken any nutrition courses before tertiary school?

   Yes ☐ No ☐
5. From which source have you obtained / do you obtain most information on matters of nutritional health

a) ☐ Television

b) ☐ Non-specialist publications

c) ☐ Specialist publications

d) ☐ Leaflets / flyers

e) ☐ University/ school/ training courses

f) ☐ Family

g) ☐ Doctors

h) ☐ Internet

6. What is the highest level of education attained

   a) Certificate ☐

   b) Diploma ☐

   c) Advanced diploma ☐

   d) Degree ☐

   e) Master's degree ☐

   f) PhD ☐

7. Do you physically exercise?

   Yes ☐ No ☐

8. If yes to physical exercise indicate the total duration per week in hours

   a) 1 hour ☐

   b) 1- 2hours ☐

   c) 2-3hours ☐

   d) 3 hours and more ☐

9. Anthropometric data (To be completed by the principal investigator)

Measurement	1ST Reading	2nd Reading	Average
a) Weight (kg)			
b) Height (m^2)			
c) Waist circumference			

Section B – Nutritional knowledge statements

Please indicate your level of perception/acceptance to the following statements

Statement	Agree	Disagree	Not sure
10. Excessive consumption of empty caloric foods such as baked product and jam can provide a positive effect on health			
11. Fruits and vegetables in the diet provide minerals, vitamins andfibre			
12. Recommended fats are mainly found in dairy products			
13. Saturated fats should be reduced in consumption			
14. Obesity and diabetes are related to excessive intake of sugars and fats			
15. It is advised to consume at least 3-5 fruits per day			
16. Wholemeal products are healthier alternatives to refined products			
17. Artificial sweeteners are relatively good in the diet			
18. It is healthier to take a glass of milk than a glass of soft drink			
19. As we grow older we should eat fewer vegetables and fruits and increase proteins, carbohydrates and fats to keep healthy			
20. Food containing too much salt can cause some types of cancers and hypertension			
21. Salt added to food after cooking is good for health			
22. The only time it is important to be aware of caloric intake is when you are trying to gain or lose weight.			
23. Fresh, frozen, and canned vegetables all have similar nutrient values.			
24. Obtaining between 50 - 60% of your daily calories from carbohydrate is recommended as part of a healthy diet.			

25. Carotenoids work to prevent the formation of free radicals in the body			
26. Free radicals prevent cancers in our bodies			
27. Alcohol can affect nutrient absorption and utilization			
28. Skipping meals is justifiable if you need to lose weight quickly			
29. Deep frying food is better than steaming and boiling			
30. It is alright to wash vegetables after cutting			
31. Processed meats like polonies and ham are convenient and suitable for consumption at any given time			
32. All food additives/ preservatives in convenience foods are safe for human consumption			
33. Food labels help us identify nutrients in a particular food brand			
34. Most food labels are clear and easy to understand			

Section C –Dietary practices

1. **Food choices**

35. Use the classes of food choices (Class A and Class B examples) below to indicate the kind of foods you usually eat, by choosing one of the answers from "ae" that best represent your behaviour in regard to these food choices.

Class A examples: hamburgers, hot dogs, sharwama, steaks, sour cream, cheese, whole milk, eggs, butter, cake, pastry, ice cream, chocolate, chips, fried chicken and fried fish.

Class B examples: lean meats, skinless poultry, fish, skim milk, low-fat dairy products, fruit desserts, vegetables, pasta, legumes (peas and beans) and, whole grain cereals

a. Eat the Class a foods ☐

b. Eat both Class A and B about the same ☐

e. Eat the Class B foods ☐

36. Listed below are some sources of **protein (Animal Sources and Vegetable Sources),** Indicate the kinds of protein foods you usually eat by choosing one of the answers from "ae" that best represent your behaviour in regard to these protein sources.

Animal Sources: meats, poultry, fish, cheese, eggs

Vegetable Sources: legumes (peas, beans, lentils), soya chunks, nut foods, vegetable burger,

A. Eat animal proteins ☐

C. Eat both animal and vegetable about the same ☐

E. Eat vegetable protein ☐

2 Eating patterns

37. How often did you eat each of the following meals before attending university?

	Daily	Sometimes	Never
a) Breakfast	☐	☐	☐
b) Lunch	☐	☐	☐
c) Evening meal	☐	☐	☐

38. How often do you eat each of the following meals?

	Daily	Sometimes	Never
a) Breakfast	☐	☐	☐
b) Lunch	☐	☐	☐
c) Evening meal	☐	☐	☐

39. Which of the following prevents you from eating breakfast, lunch and evening meal?

(For sometimes and never responses only)

Lack of time ☐

Insufficient money ☐

I am on a diet ☐

Not hungry ☐

40. Do you snack, (to eat in-between main meals)?

Yes ☐ No ☐

41. How often do you eat snacks between each of the following meals?

	Daily	Rarely	Never
a) Between breakfast and Lunch	☐	☐	☐
b) Between lunch and dinner	☐	☐	☐
c) After evening meal	☐	☐	☐

42. What type of snacks do you eat between breakfast, lunch and evening meal? (tick what applies in your case)

Sausage rolls ☐

Sharwama ☐

Potato chip ☐

Pop corn ☐

Yogurt ☐

Fruits ☐

Vegetables ☐

Nuts ☐

Others specify……

FOOD FREQUENCY QUESTIONNAIRE

FOODS	Everyday	1-2 times per week	3-6 times per week	Rarely consumed	Never consumed
STARCHES					
Bread or buns/ rolls					
Breakfast cereals or porridge such as Maize meal porridge, Samp, Cassava, Millet meal porridge, Rice etc.					
Potato: Cooked, Fried					
Nshima: Breakfast meal, Cassava meal, Millet/Sorghum meal					
Legumes e.g. Beans (kablangeti, lentils), soya mince etc.					
VEGETABLES					
Cooked vegetables: any type					
Vegetables: any type prepared with sugar/ fat, carrots, onions, tomatoes					
Vegetable: with peanut sauce (ifisashi)					
FRUIT					
Fresh fruit (any type)					
Fruit juice					
MILK AND CHEESE					
Full cream: milk, sour milk, powdered milk (e.g. Nido, Cowbell,)					
Milk drinks: Milo, Cocoa					
MEAT, FISH, CHICKEN					
Red meat e.g. beef, pork. (Eat meat and visible fat)					
Red meat e.g. beef, pork. (Eat meat, but remove visible fat)					
Red meat e.g. Game meat					
Chicken: with skin					
Chicken: without skin					
Fried fish in any fat or oil					
Fish: tinned sardines					
Sausages: Vienna's, Hungarian					
Cold meat: polonies					
Organ meat e.g. liver, kidney, Offals					
Eggs: boiled					
Eggs: scrambled, fried					
FATS					
Soft margarine (in a tub)					
Butter/hard margarine					

FOODS	Everyday	1-2 times per week	3-6 times per week	Rarely consumed	Never consumed
Cooking oil e.g. ole, Zamanita					
Mayonnaise: normal fat					
FAST FOODS AND TAKEAWAYS					
Pies & Sausage rolls					
Potato chips (French fries)					
Fried Chicken					
OTHER					
Samosas, doughnuts					
Scones, cake					
Cookies: commercial e.g. tennis biscuits, Chicco biscuits etc.					
Tomato sauce					
Peanuts					
Peanut butter					
Jam, honey					
DRINKS					
Alcoholic beverages e.g. Mosi, castle, Windhoek ciders e.g. hunters, Redds, Spin					
Fizzy soft drinks: e.g. Coke, Fanta, sprite, Miranda					
Drinking Yoghurt					

Appendix 4: Approval of masters research proposal

THE UNIVERSITY OF ZAMBIA
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF FOOD SCIENCE AND NUTRITION

P.O. Box 32379
Lusaka
Zambia

Telephone: 0955 222089
Fax: +260-1-292827/295141
Telegram: UNZA LUSAKA

E-mail: thachibamba@unza.zm /twambohachi@yahoo.com

26th March, 2018

The Chairperson
The University of Zambia
Biomedical Research Ethics Committee
Ridgeway campus
P.O Box 50110
Lusaka
Zambia

Dear Sir/Madam,

REF: APPROVAL OF MASTERS RESEARCH PROPOSAL – MAHAMBA VERITY MUZEYA

Reference is made to the above subject matter.

The Department of Food Science and Nutrition has approved Mahamba Verity Muzeya's research proposal titled **"Association of Nutritional Knowledge and dietary practices among female students at tertiary institutions in Lusaka, Zambia."** This is in partial fulfilment of the requirements of Masters in Human Nutrition at the University of Zambia. Therefore, the research proposal has been cleared for review and consideration for ethical approval by the Biomedical Research Ethics Committee.

Your consideration will highly be appreciated.

Twambo Hachibamba, PhD
HEAD, FOOD SCIENCE & NUTRITION

Appendix 5: Letter of clearance University of Zambia biomedical ethics committee

THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzarec@unza.zm
Assurance No. FWA00000338
IRB00001131 of IORG0000774

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

31st May, 2018. Ref: **003-04-18.**

Ms. Mahamba V. Muzeya
26 Fyakapale Gardens,
Riverside,
Kitwe.

Dear **Ms. Muzeya**

RE: "ASSOCIATION OF NUTRITIONAL KNOWLEDGE, DIETARY PRACTICES AND NUTRITIONAL STATUS AMONG FEMALE STUDENTS AT TERTIARY INSTITUTIONS IN LUSAKA ZAMBIA" (Ref. No. 003-04-18)

The above-mentioned research proposal was presented to the Biomedical Research Ethics Committee (UNZABREC) on 25th April, 2018. The proposal is approved. The approval is based on the following documents that were submitted for review:

a) **Study proposal**
b) **Questionnaires**
c) **Participant Consent Form**

APPROVAL NUMBER : REF. 003-04-18

This number should be used on all correspondence, consent forms and documents as appropriate.

- **APPROVAL DATE : 31st May 2018**
- TYPE OF APPROVAL : Standard
- **APPROVAL EXPIRATION DATE: 30th May 2019**
  After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the UNZABREC Offices should be submitted one month before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING**: All SAEs and any other serious challenges/problems having to do with participant welfare, participant safety and study integrity must be reported to UNZABREC within 3 working days using standard forms obtainable from UNZABREC.
- **MODIFICATIONS**: Prior UNZABREC approval using standard forms obtainable from the UNZABREC Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the UNZABREC using standard forms obtainable from the UNZABREC Offices.
- **NHRA:** Where appropriate, apply in writing to the National Heath Research Authority for permission before you embark on the study.
- **QUESTIONS**: Please contact the UNZABREC on Telephone No. 256067 or by e-mail on unzarec@unza.zm
- **OTHER:** Please be reminded to send in copies of your research findings/results for our records. You're also required to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.

Yours sincerely,

Dr. S.H Nzala
VICE-CHAIRPERSON

Appendix 6: Letter of authorization University of Zambia

THE UNIVERSITY OF ZAMBIA

OFFICE OF THE DEAN OF STUDENTS

Telephone: 291702/254955
Telegrams: UNZA LUSAKA
TELEX: UNZALU ZA 44370

P O BOX 32379
Lusaka Zambia

23rd May, 2018

Dr. Twambo Hachibamba
C/o University of Zambia
School of Agricultural Sciences
Department of Food Science and Nutrition
UNZA

Dear Dr. Hachibamba

RE: REQUEST TO CONDUCT RESEARCH AT OUR INSTITUTION

I acknowledge receipt of your letter dated 16th May, 2018 on the above captioned subject matter.

This serves to inform you that permission has been granted for Mahamba Verity Muzeya to conduct a research with the female students on the proposed project title ***"Association of Nutritional Knowledge, dietary practices and Nutritional status among female students at tertially institution in Lusaka, Zambia".***

Yours sincerely

L. T. Zgambo
DEAN OF STUDENTS

cc: Deputy Dean of Students

Appendix 7: Letter of authorization Evelyn Hone College

Evelyn Hone College of Applied Arts and Commerce
Management Board

CHURCH ROAD, LUSAKA

All correspondence must be addressed to the Principal

P.O. Box 30029
Telephone: 0211-227240
Tele/Fax: 0211-225127
Lusaka, Zambia
E-mail: info.ehc@evelynhone.edu.zm
www.evelynhone.edu.zm

Your Ref.:.....

Our Ref: **EHC/101/34/11/1**

23rd May 2018

Ms. Mahamba Muzeya

University of Zambia

School of Agricultural Sciences

Department of Food Science and Nutrition

P.O.Box 32379

LUSAKA

Dear Ms. Mahamba Muzeya

REQUEST TO CONDUCT RESEARCH

Reference is made to your letter dated 16th May, 2018 concerning the above subject to be conducted in our premises.

Evelyn Hone is a public training institution and will always support trainees wishing to conduct research in various fields. We therefore have no objection to your request and advise that you proceed with your project as we are aware that this is for academic purposes only as the letter states.

You are free to contact the under signed for guidance and assistance should need arise.

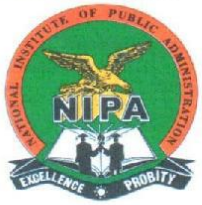
Yours Sincerely

I. NDABALA

VICE PRINCIPAL

Appendix 8: Letter of authorization National Institute of Public Administration

All Official Communication should be Addressed to the Executive Director *And Not to Individual Officers*



NATIONAL INSTITUTE OF PUBLIC ADMINISTRATION

P. O. Box 31990
Plot 4810, Dushanbe Road, Lusaka, Zambia
Tel: +260 211 228803-4, 233643, 222480
Fax: +260 211 227213
E-Mail: executivedirector@nipa.ac.zm
Website: www.nipa.ac.zm

NIPA/101/1/59

5th June, 2018

Ms Mahamba Verity Muzeya
C/O University of Zambia
Department of Food Science and Nutrition
School of Agricultural Sciences
P.O Box 32379
LUSAKA

Dear Ms Muzeya

RE: REQUEST TO CONDUCT - RESEARCH

The above subject matter refers.

This serves to inform you that your request to conduct a Research at the Institute has been granted. For further inquiry contact the Human Resource and Administration Officer of the Institute.

Yours faithfully

E.Hachiita
HUMAN RESOURCE AND ADMINISTRATION OFFICER
For/**EXECUTIVE DIRECTOR**