IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS

by

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DECLARATION OF OATH

I declare that this thesis entitled, **"IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS",** is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. All sources that have been used or quoted derived from published or unpublished work of others have been indicated and acknowledged by means of complete references.

Signature _____ Date _____

(Molyn Mpofu)

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DEDICATION

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ABSTRACT:

College students in Zimbabwe were facing many challenges in adopting proper dietary patterns which promote learning. This study sought to establish the impact of Socio-Economic factors and dietary patterns in particular on the academic performance of college students in Zimbabwe. The study established challenges that were faced by college students in making choices of dietary patterns that promote learning. Factors that influence choice of dietary patterns for college students were established in this study. The case study was Joshua Mqabuko Nkomo Polytechnic College in Zimbabwe with a population of 206 students and a sample of 102 participants was purposively selected. A mixed-methods research, using quantitative and qualitative approaches was employed and questionnaires, interviews, observation and document analysis were used to collect data. Findings are presented from both questionnaire and interview data in combination, with interview data playing the role of supplementing quantitative findings and probing detailed information. Quantitative data was analysed using the IBM SPSS Version 23.0 while qualitative data was coded into themes and synthesised into quantitative data to support or refute quantitative data. Research indicates that diet quality and overall health status of college students are among the prominent factors which contribute to poor student academic performance worldwide. The experiences and perceptions held by the college students and cooks were investigated. The main study findings showed that if students follow proper dietary patterns they may perform well in their studies since relationship between nutrition and academic work lies on the notion that a healthy body is able to maintain a healthy mind, which suggests that certain risk factors for a physically ill-health are also risk factors for cognitive impairment. This study made recommendations for dietary patterns that promote learning in academic domains. It also developed a model valuable for dietary patterns.

Keywords: college students, dietary patterns, food consumption patterns, nutrition, nutrients, academic performance

ACRONYMS

B.M.I	Body Mass Index
G.P.A	Grade Point Average
H.E	Home Economics
IPM	Information Processing Model
JMN POLY	Joshua Mqabuko Nkomo Polytechnic
MoHTESTD	Ministry of Higher and Tertiary Education, Science and Technology Development
U.N	United Nations
U.S.A	United States of America
WHO	World Health Organization

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CHAPTER 1: ORIENTATION AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION

The advent of independence in African countries and Zimbabwe in particular, ushered in an era of massive expansion at all levels of education in an effort to redress the colonial imbalances that favoured the white minority (Zvobgo, 1999:76). The expansion rates at primary and secondary school levels had ripple effects on the demand for higher and tertiary education trainees. Following the expansion drive for Higher and Tertiary education, the government of Zimbabwe expanded opportunities for university students, teachers' training and technical education (Zvobgo, 1999:86). The Report of the Presidential Commission of Inquiry into Education and Training (1999:35), commonly known as The Commission, states that the enrolment at teachers' colleges rose from 2829 in 1980 to 19 000 in 1998, while technical colleges which had 3 082 students from 2 colleges ballooned to 18 000 from 11 colleges. In general, this growing demand has exceeded the rate of growth of available resources.

The importance of nutrition and health in college students has been fully recognised and the surveys on actual nutritional conditions in college students and dietary habits have been performed actively in many countries such as Korea since 1920 (Parker, 1989:264). Observation of the daily routine of students has shown that some students tend to buy fast foods from different food outlets around the college while others eat from the college cafeteria due to busy class schedules. It is clear that most students have diverted from home cooked meals to college cafeterias.

Willett, Sampson, Stampfer, Rosner, Bain and Witschi (2010:51) state that the diet of college students has been modified by the influence of technology, fast food and social conditions. Manwa (2013:65) also reports that due to western influence on the Zimbabwean population especially in colleges, students have developed a tendency to practice wrong eating habits such as fast foods. However, this kind of food has no value to the students' nutrition. In these food outlets, the same type kind of food is prepared daily. Therefore, students tend to consume the same diet repeatedly, denying them of variety in the process. Fast foods have had some undesirable effects

on health status (Barker, 2002:186) and mismanagement of dietary patterns leads to nutritional disorders. Proper dietary patterns maintain the health of body and mind, prevent diseases, help normal development of the body, and also take important roles in maintaining mental and emotional stability (Barker, 2002:185). The United Nations (UN) report on Urban Livelihood and Food and Nutrition indicates that about two billion people, the world over are affected by malnutrition in one form or the other. This means that continuous investigation on dietary patterns and assessment of nutritional status of vulnerable groups such as students at universities and colleges would help to solve some societal problems particularly those of under and over-nutrition which, in turn affect academic performance.

Akbaraly, Singh-Manoux, Marmot and Brunner (2009:147) purport that some students skip meals in order to achieve and maintain their desired body size. In these circumstances, these routines can have an impact on nutritional status since one cannot tell whether students are well-nourished and healthy or not from merely looking at them. Students' dietary patterns and influence on their learning is a cause for concern. The researcher's experience as a college lecturer is that, when students get into colleges for the first time orientation is given to all other aspects considered necessary for the students to know. However, no one has ever bothered to talk about diet. Students are not advised on how to ensure a balanced nutrition despite its obvious impact on learning.

Dietary patterns which take a greater part in the maintenance of human health are determined by various social, cultural, and economic lifestyles (Helwig, 2009:75). Proper dietary patterns maintain the health of body and mind, prevent diseases, help normal development of the body, and also take important roles in maintaining mental and emotional stability (Barker, 2002:185). Health is influenced by social, physical, and mental aspects, in particular, and is greatly influenced by dietary habits (Barker, 2002:187). Most college students are adolescents moving towards adulthood and also in the period of active physical and mental growth, in which the nutritional condition greatly influences their health over a lifetime (Astorg et al., 2004:527). However, college students have had higher frequency of eating out (Barker, 2002:46) and irregular dietary patterns due to rapid changes of their daily lives (Manwa, 2013:197). College students generally, have little interest in health and do not

establish proper values on the importance of dietary life (Sofi, Cesari, Abbate, Gensini & Casini, 2008:337), as a result, they are showing many health related problems such as increased meal skipping rates and snack-eating, increased drinking and smoking, and improper weight reduction (Akbaraly, Singh-Manoux, Marmot & Brunner, 2009:147).

Zvobgo (1999:23) identifies accommodation, nutrition, transport services, good health, to name a few; as fundamental to attainment of professional and academic qualifications by students. This implies that the quality of living conditions of students constitutes fundamental human and social needs which directly contribute to the institutional goals of professional and human resource development. The fact that college students are eating anything that comes their way has become a reality in Zimbabwe regardless of the nutritive value of the food (Manwa, 2013:191). As earlier reflected in the introduction, at independence, the Zimbabwean government embarked on a reform course designed to eliminate the racial imbalances and inequalities that existed in the education and the training sector during the colonial era (Mohamedbhai, 2008:255; Zvobgo, 1999:86). Subsequently, the country experienced phenomenal expansion in higher education and increase in student enrolment. Zvobgo (1999:15) argues that there was inadequate consideration of issues pertaining to the economic environment and its capability to support the educational expansion. This led to the enrolment of students outpacing infrastructure development which remained the same (Mohamedbhai, 2008:19).

Prior to independence, Zimbabwe experienced an education system which was bottle-necked with very few Black students reaching college or university level (Nziramasanga, 1999:8; Chikombah et al., 1986:61). Coupled with the economic difficulties of the 90s and food insecurity, which have continued to the present, limited funds remain the major constraint for all institutions to develop their physical infrastructure. This saw many students having to stay off campus and being unable to afford food. According to Manwa (2010:35), the effects of poor nutrition go far beyond the risk of mental illness. Tavelli et al., (1998:78) also point out that it is important to attend to students' dietary patterns not simply because it can be life threatening but because wellbeing predicts academic performance and attrition rates.

Despite the importance of nutrition on learning, studies have shown no clearly designed dietary patterns for college students in Zimbabwe. It is therefore, necessary to assess and evaluate factors that influence students' dietary habits so as to establish if they are getting balanced diets to meet their daily nutrient requirements. It is behind this background that this study on college students' dietary patterns is being undertaken.

1.2 STATEMENT OF THE PROBLEM

A study carried out by Mpofu (2009:88), on living conditions of college students in Zimbabwe established that Zimbabwean college students did not have access to balanced diet let alone a decent meal, which negatively affected their level of academic work which requires well-managed dietary patterns. Zimbabwean college students, like other students elsewhere, have dietary patterns which are aggravated by the socio-economic and political situation which is unstable (Mohamedbhai, 2008:195; Zvobgo, 1999:86). This instability led to the lack of adequate resources for higher institutions of learning and many other sectors. Currently, students have to cope with overcrowded lecture rooms, unavailability or insufficiency of food and academic facilities including accommodation, reading materials, research equipment and computers which leads to a miserable and stressful life resulting in poor feeding behaviours (Mwiria & Ng'ethe, 2002 in Mohamedbhai, 2008:95). Because of the economic downturn of the 90s to 2009, limited funds remain the major constraint for all the institutions to develop their physical infrastructure and let alone to provide food to college students (Manwa, 2013:191); as a result most students face incalculable challenges hence the need to study their food consumption patterns and how this affects their studies.

The researcher observed that lack of access to well-managed diet had serious impact on the health of the students and that the pass rate had gone down as compared to previous years when the government used to provide accommodation, food and financial aid to the students. While much work has been done on the influence of factors such as college type, location, parental involvement, family structure and sex on academic performance of college students in Zimbabwe (Mpofu, 2009:88; Zvobgo, 1999:6 & Manwa, 2013:56), the researcher could not lay hold on any study that

considered the effects of dietary patterns on the learning process and outcomes among college students in Zimbabwe. Helland et al., (2003:6) point out that the technologies that allow scientists to monitor energy metabolism in the brain have provided detailed information about brain activities in various cognitive processes and established that humans with insufficient glucose supply or nutrient deficits had compromised cognitive potential. This, prompted the researcher to conduct this study on how college students are experiencing and managing their dietary needs, taking into account Maslow's hierarchy of needs which places food as a basic physiological need that must be satisfied before progress to the next level can occur (Bauris, 2001:24).

1.3 AIM AND OBJECTIVES OF THE STUDY

The primary aim of this study was to explore students' dietary patterns and how these impact on their academic performance.

The objectives of this study were to:

- explore food consumption patterns followed by college students
- examine factors that influence the choice of food consumption patterns by college students
- explore how students' food consumption patterns affect their academic performance
- design a suitable model for students' dietary patterns

1.4 MAIN RESEARCH QUESTION

The main research question of this study is:
What are the food consumption patterns of Zimbabwe college students and the effects on their academic performance?

The following are the sub-research questions which guided this study to unveil the impact of dietary patterns on academic performance of college students.

- What are the food consumption patterns that are followed by college students?
- What are the factors that influence college students' choice of food consumption patterns?
- How do students' food consumption patterns affect their academic performance?
- What is the suitable model for students' dietary patterns?

1.5 DEFINITION OF KEY CONCEPTS

1.5.1 College students: According to Mohamedbhai (2008:56), a college student is somebody who studies at a school, college or university. (Manwa, 2013:7) defines college students as those people undertaking studies as part of the training for a job or profession. For the purpose of this study, college students referred to resident students at Joshua Mqabuko Nkomo Polytechnic College who are 18 years and above who can consent for themselves to participate in the study.

1.5.2 Dietary patterns: Dietary patterns are frameworks that people tend to follow when making choices about what to eat (Yach, McKee, Lopez & Novotmy, 2006:35). Willet et al. (2010:52) define dietary patterns as food habits based on types and amounts of foods eaten, the number of meals taken and when the food is eaten. In this context, it referred to the eating patterns, food preferences, food portion sizes and food variety of students at Joshua Mqabuko Nkomo Polytechnic College during the period of study.

1.5.3 Food consumption patterns: Yach (2006:898) refers to food consumption patterns as what, how and why people eat the foods they eat and with whom they eat. Rodgers (2001:56) sees it as the overall pattern of food that a person eats. In this study it referred to the number of meals taken by students per day and the intervals at which the meals were taken.

1.5.4 Nutrition: Nutrition is the process of taking in food and using it for growth, metabolism and repair of body tissues (Wardlow, 2011:65). Yach (2006:900)

views nutrition as the process of nourishing or specifically the sum of the processes by which an animal or plant takes in and utilises food substances. For the purpose of this study it meant the study of nutrients and the way the student's body processes and utilises them.

1.5.5 Nutrients: Nutrients are referred to as food or other substances that provide energy or building materials for the survival and growth of a living organism (Santrock, 2002:86). According to Trockel et al. (2000:76), nutrients are substances that provide nourishment for growth and metabolism. In this study nutrients were referred to as substances that provide nourishment essential for the maintenance of life and cognitive development for the college students during the period of study**.**

1.5.6 Nutritional status: According to Barker (2002:55), nutritional status is a measurement of the extent to which the individual's physiological need for nutrients is being met. Singh-Manoux et al. (2005:106) define nutritional status as the relationship of weight and height in determining one's health. This study referred to nutritional status as the health status of a student 18 years and above based on underweight, overweight, normal weight or obese during the period of study using BMI.

1.5.7 Academic performance: Manwa (2013:37) defines academic performance as the outcome of education or the extent to which students achieve their educational goals. According to Zvodgo (2010:46), academic performance refers to how students deal with their studies and how they cope and accomplish different tasks given to them. For the purpose of this study, academic performance meant college students' learning processes and outcomes.

1.6 RESEARCH DESIGN AND METHODOLOGY

This section highlights the research design and methodology that was used in this case study.

1.6.1 Research design

This case study used the mixed methods research approach, that is, both quantitative and qualitative approaches in order to triangulate data. Mixed methods research offers the best of both worlds: the in-depth, contextualised, and natural but more time-consuming insights of qualitative research coupled with the more-efficient but less rich or compelling predictive power of quantitative research (Stange, Crabtree & Miller, 2002:293). Creswell and Plano (2011:79) contend that mixed-methods research helps answer questions that cannot be answered by qualitative or quantitative approaches alone. (See more detail in chapter 3).

1.6.2 Research methodology

Methodology in research can be considered to be the theory of correct scientific decisions (Marais & Mouton, 2004:16). In this study, the following methodology was followed:

1.6.2.1 Population

Landreneau (2012:164) defines a population as any target group of individuals that has one or more characteristics in common that is of interest to the researcher for purposes of drawing conclusions. The population of this study was 206 college students at Joshua Mqabuko Nkomo Polytechnic College from the Department of Teacher Education and the kitchen staff. The population was identified so that the researcher could gather as much information as needed concerning dietary patterns for college students from different categories that deal with students' diet. (See more detail in Chapter 3).

1.6.2.2 Sampling strategies

Sampling for this study was done in two phases. The first phase used purposive sampling to select 100 participants consisting of 50 males and 50 females. The sample was used to collect quantitative data. According to Lincoln and Guba

(1985:174), purposive sampling aims at capturing and describing the principal outcomes that cut across a great deal of participant variation. The second phase used purposive sampling procedure to select a sample of 16 participants from students and kitchen staff for qualitative data. (See more detail in chapter 3).

1.6.2.3 Instruments

The study used the questionnaire, 24-hour dietary recall, food frequency questionnaire and observations to collect data. (See more detail in chapter 3).

1.6.2.4 Data collection procedures

In this study the researcher collected data in two phases. Phase 1 collected using quantitative data while Phase 2 collected qualitative data. (Details are in chapter 3).

1.6.2.5 Data analysis

Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains (Creswell, 2010:432). Quantitative data analysis for this study was done using the IBM Statistical Package for Social Sciences (SPSS) version 23.0. and qualitative data were analysed by coding and themes. (See more detail in chapter 3).

1.7 SIGNIFICANCE OF THE STUDY

This study intended to fill this knowledge gap on the broad educational field of the study of diet and relationship to diet. This study will be useful in providing insights for educational administrations and policy makers to draw up strategies for managing students' dietary patterns from an informed position, based on students' own experiences and perceptions. (See more detail in chapter 3).

1.8 DELIMITATION OF THE STUDY

Due to the intensity of the study, the researcher selected a sample of 100 students and two cooks from Joshua Mqabuko Nkomo Polytechnic College using purposive sampling. The research was confined to Joshua Mqabuko Nkomo Polytechnic College only, for easy access to the participants because that is where the researcher lived and worked.

1.9 ETHICAL CONSIDERATION

Ethical clearance was sought from the University of Venda and from the Ministry of Higher and Tertiary Education, Science and Technology Development in Zimbabwe. The clearance was approved by both institutions. Two key ethical issues put across by Welman, Kruger and Mitchell (2012:181) that should be considered in any project are consent and confidentiality. (See more detail in chapter 3).

1.10 THE RESEARCH STRUCTURE

The format of the research structure is as follows:

Chapter 1: Background to the research problem

This chapter looked at the background of the study, statement of the problem, purpose of the study, research questions, and objectives of the study, assumptions of the study, the justification of the study, limitations, and delimitations of the study, as well as the definition of terms.

Chapter 2: Review of Related Literature

This chapter reviewed literature related to the study on impact of dietary patterns of college students on academic performance. This chapter also highlighted the theoretical framework that guides the study.

Chapter 3: Research Design and Methodology

The chapter highlighted the methodology adopted and the research design used in this study. The population and the research instruments were also highlighted in this chapter.

Chapter 4: Data Presentation and Analysis

The data collected was presented, analysed and discussed in this chapter. r.

Chapter 6: Summary, Limitations, Conclusions and Recommendations

This chapter summarised the findings of the study, limitations of the study, concluding remarks and recommendations for improvement and illustrated the developed model.

CHAPTER 2: REVIEW OF LITERATURE

2.1 INTRODUCTION

In this chapter previous research on students' dietary patterns at tertiary institutions is reviewed in order to establish the knowledge gap the current study attempted to bridge. Literature related to the key questions this study sought to address, is spelt out. In exploring the literature sources, the content is organised around themes based on the study objectives for further analysis. The existing literature in these areas guides the research and enhances a better understanding of college students' eating habits, what they are consuming as well as their eating disorders and consequently the impact on academic performance. The literature explains diet and nutrition, dietary guidelines, factors that affect nutritional requirements of students, factors that affect students' food consumption patterns, considerations when making food choices, nutrition disorders, relationship of nutrition and brain function and effects of diet quality on academic performance. The theoretical framework below guided this study.

2.2 THEORETICAL FRAMEWORK

The researcher's interest to explore college students' experiences of dietary patterns available to them and how they manage their nutritional requirements was guided by the socio-cultural-economic lens, which constitutes the theoretical framework for the study. Through this lens, the researcher emphasises the central notion that it is essential for educational administrators and the students themselves to ensure the provision of well-managed dietary patterns that promote, not only general health, but also enhance educational engagements. Whatever nutritional requirements students meet can best be explored and understood through the application of a socio-cultural-economic theoretical framework. In the context of this study, this framework posits that students access the dietary patterns that they experience on the basis of the social, cultural and economic circumstances in which these students are embedded.

The study of nutrition requires an understanding of biological processes as well as a consideration of socio-cultural economic factors (Wardlow & Smith, 2011:342). The

study of nutrition and its impact on academic performance, therefore, requires a mixed approach in explaining the link between students' dietary patterns and their academic performance. More specifically, Abraham Maslow's (1970) Human Needs Theory, Lev Vygotsky's (1978) sociocultural Needs for Achievement Theory and Miller's (2011) Information Processing Model (IPM) constitute the philosophical grounding of this study. Thus the analysis and description of theoretical issues are guided by the three theoretical lenses. This study advances the argument that Maslow and Vygotsky provide a context for physiological and cultural approaches to understanding students' dietary patterns. On the other hand, the IPM theory deals with the biological basis of development which examines the network of brain activity during cognition and the nutritional needs of the brain to carry out the neurological functions. Information-processing theorists generally agree that knowledge is represented by patterns of activation across units in the brain (Miller, 2011:298). Maslow's theory posits that one of the basic deficiency needs that motivate human behaviour is the physiological need of hunger satisfaction. By implication, the human needs theory suggests that the human body needs energy from food to engage in any form of work while at same time regulating neurological functioning (IPM) of the brain (Miller, 2011:328) and the foods selected for consumption among other factors cannot be explained in a vacuum, but in the context of particular socio-cultural demands and standards and economic conditions (Vygotsky, 1978:49).

2.2.1 Human needs theory

Maslow's (1943) hierarchy of needs is represented as a pyramid with the more basic needs at the bottom. The hierarchy is predetermined in order of importance. It is depicted as a pyramid consisting of five levels: the lowest level is associated with physiological needs, while the uppermost level is associated with self-actualisation needs, particularly those related to identity and achievement. Maslow (1970:23) theorises that the emergence of a new need usually depends on the prior satisfaction of a more basic or potent one. The satisfaction of a more basic need then sets up conditions for higher level needs to emerge. Conversely, the deprivation of a basic need causes a person to seek satisfaction of that need before seeking to satisfy higher level needs.

Deficiency needs must be met first. Once these are met, seeking to satisfy growth needs drives personal growth. The higher needs in this hierarchy only come into focus when the lower needs in the pyramid are met. Once an individual has moved upwards to the next level, needs in the lower level will no longer be prioritised but if a lower set of needs is no longer being met, the individual will temporarily re-prioritise those needs by focusing attention on the unfulfilled needs, but will not permanently regress to the lower level (Santrock, 2002:85).

2.2.2 Vygotsky's socio-cultural need for achievement theory

Vygotsky and the socio-culturalists argue that culture defines what knowledge and skills children need to acquire and that values and processes differ among different races, social classes, dual-career versus one-career families, rural versus urban communities, single-parent versus two-parent families, and so on (Vygotsky, 1978:47). They explain these phenomena by saying that a person's context shapes his or her behaviour, such as by influencing eating habits and determining priorities in learning. Distinct differences in nutrient consumption appear both internationally and among population subcultures because of food availability, preference, and social norms. These dietary trends are especially prominent when socio-economic status and ethnicity are compared. Correspondingly, academic performance varies greatly among cultures and subcultures. It is possible in this study to enhance the understanding of college students' food consumption patterns through exploring the ways in which socio-cultural factors play out on their access to nutrition and learning.

2.2.3 Information-Processing Model (IPM)

As alluded to earlier, the study of nutrition requires an understanding of biological processes. Information-processing theorists developed the Information Processing Model (IPM) and generally agree that knowledge is represented by patterns of activation across units in the brain (Miller, 2011:298). Information-processing examines the network of brain activity during cognition (Miller, 2011:328). The nutritional needs of the brain to carry out the neurological functions described by information-processing theorists is a major focus of this study and was carefully

considered when the study of nutrition, brain and behaviour (Nutritional Neuroscience) is examined.

2.3 Explaining diet and nutrition

Waugh, Grant and Ross, (2010:266) define diet as the selection of foods eaten by an individual which contains a number of nutrients. Where a nutrient is defined as any substance that is digested, absorbed and used to promote body function and these are; carbohydrates, proteins, fats, vitamins, mineral salts, trace elements and water. Therefore, diet in this context, is simply any form of eating which can be healthy or unhealthy.

2.3.1 Healthy diet

A healthy diet is one which includes a variety of foods that contain the quality and proportions of nutrients needed to maintain good health and to sustain life (Satalic, Baric & Keser 2007**:**410). Savige, Ball, Worsley and Crawford (2007**:**740), concur that a healthy diet is one that does not have too much of just one food. For instance, too many refined processed carbohydrates like rice, pasta, potatoes, bread, and corn, in one meal do not constitute a healthy diet because it has too many sugars/starches/carbohydrates and not enough protein, fibre or fat.

To maintain life, all diets must supply the essential amounts of nutrients such as carbohydrates, proteins, vitamins, essential fatty acids and minerals (Kamphuis, 2006:87) and these needs can be met by a wide variety of foods, each of which will be sufficient for growth, survival, and reproduction. Although some nutrients are known to be more important in the functions of certain parts of the body, even these nutrients are totally dependent on the presence of other nutrients for their best effects. No single substance will maintain vibrant health (Galal & Hulett, 2003:11). Humans do not eat single nutrients but foods. These foods provide complex mixtures of nutrients which may have additive or synergistic effects on health (Helwig, 2009:87). This means that the combination of the different foods produce a common benefit. Barker (2002:56), states that nutrients also tend to correlate with each other,

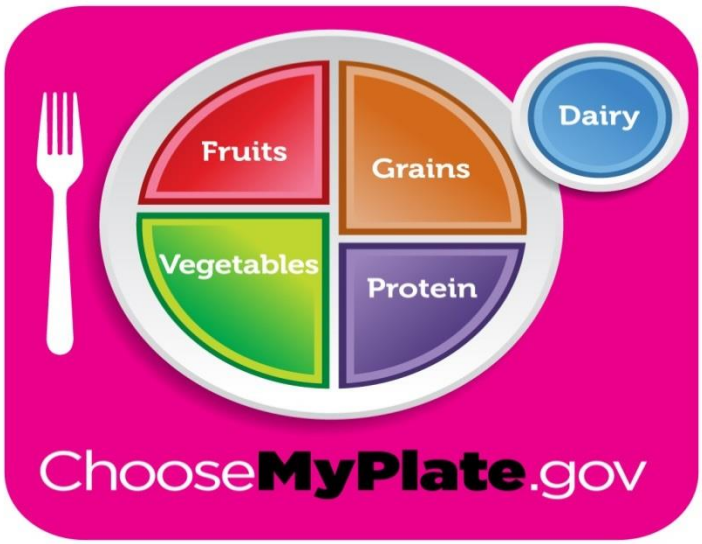
for example cocoa contains hundreds of different nutrients in small quantities but when served with other foods the nutritive value then becomes greater.

The requirements for a healthy diet can be met by a variety of plant-based and animal-based foods (Kamphuis, Geerlings, Grobbee & Kromhout, 2008:945). A healthy diet supports energy needs and provides nutrition to humans without exposure to toxicity or excessive weight gain from consuming excessive amounts. Where lack of calories is not an issue, a balanced diet in addition to exercise is also thought to be important for lowering health risks, such as cancer. Cardio vascular diseases type 2 diabetes and hypertension (Smith, et al., 2011:53).

Murakami, Mizoue, Sasaki, Ohta, Sato and Matsushita (2008:67) found that cells in the human body, including neurons and brain cells, derive energy from food calories in the form of macronutrients: carbohydrates, proteins, and fats. Willis (1994:116) states that people are what they eat; thus their physical, mental and emotional capabilities are determined by the food we eat. It is quite apparent that a healthy body helps sustain a healthy brain (Rogers & Pilgrim, 2003, in Mental Health Foundation, 2011:654). Many vitamins, minerals and amino acids are vital to cognitive functioning and affect the production of chemicals in the brain. The notion of good food behaviour is essential because good nutrition contributes to good health which indirectly results in producing good academic performance.

2.3.2 Dietary guidelines

Myplate is used as the guide to food intake after it replaced the food guide pyramid.



Adapted from USDA (2010:415)

Figure 2.1: Myplate food guide

To essentially achieve a well-rounded healthy diet, consumption of the daily requirements of carbohydrates, proteins, fats, and other nutrients is recommended.

2.3.3 Considerations of dietary guidelines

When making food guidelines for individuals, the following are considered; age, sex, body mass index and physical activity**.**

2.3.3.1 Age

Nutritional requirements change as a person gets older, because the elderly use a lot of medication their absorption, excretion and utilization of nutrients can be affected (Selhub, Bagley, Miller & Rosenberg, 2000:617). Growing children have different nutritional needs to that of adults. For example, a growing infant requires a higher intake of essential fatty acids than that of an adult. In the same way there are different nutrition requirements for young and old there are also very different requirements between the sexes (Shi, Lien, Kumar & Holmboe-Ottesen 2005**:**1448). For example, a woman's nutritional requirements can vary throughout her menstrual cycle, also a woman who is pregnant or breastfeeding has different nutritional

requirement to that of one who is not. Nutritional requirements vary depending on whether someone is healthy or ill (Rampersaud, Pereira, Girard, et al., 2005:753).

Previous studies established that, most college students are adolescents moving towards adulthood and also in the period of active physical and mental growth, in which the nutritional condition greatly influences the health of lifetime (Astorg et al., 2004:527). The college policy intake allows only those who are aged 18 years and above. Young adults still have an active lifestyle of which the diet should provide sufficient energy while keeping to the dietary goals of reduced saturated fats and increased carbohydrate foods (Tull, 1996:61).

2.3.3.2 Physical activity

Exercise has been proven to have an effect on dietary choices and academic performance. The number one reason for not exercising in college is lack of time. In order to fit this necessary activity into one's day, exercise should be scheduled in their calendar, just as you would classes and other events. This does not always have to mean lifting weights or going on a run one can try a fun fitness class at college gym or join a club sport. Although longitudinal data are limited, there is evidence of dramatic changes in lifestyle characteristics during college period. Cohort data from Adolescent to Adult Health (2008:225) indicate that although most adolescents fail to meet national guidelines for physical activity (33%) even fewer meet these guidelines as young adults (12%). In addition, findings from Project EAT (Eating Among Teens), a 5-year longitudinal cohort study of Minnesota adolescents, confirm such adverse changes in activity patterns during the transition from high school to young adulthood and its effects on food consumption patterns (Pate, Heath, Dowada & Trost, 1996:1580).

According to a research study by Crosnoe (2007:251), findings showed longitudinal changes in moderate to vigorous physical activity, particularly among girls (decreasing from 5 to 3 hours per week aged from 16 to 20 years), and leisure time computer use, particularly among boys (increasing from 10 to 14 hours per week aged from 16 to 20 years). Overall, many changes in physical activity patterns began during the transition from junior to senior high school and continued during the

transition from high school to post high school. One notable exception is moderate to vigorous physical activity among boys, which only began to decline during the transition after high school.

Furthermore, a recent analysis of the National Health Interview survey data (Kant, 2000:936) indicated that age-related declines in physical activity are particularly pronounced between 15 and 18 years of age and continue through age 21. Physical activity has been shown to decline even further with specific life events typically following emerging adulthood (such as moving into a live-in relationship, getting married, and becoming a parent), but generally do not appear to continue to decline with age after mid-adulthood (30–64 years) (Gordon-Larsen, Adair, Nelson & Popkin, 2004:570).Thus health-promotion efforts to increase activity during emerging adulthood may be particularly important. Research suggests that declines in overall-diet quality may accompany these unfavourable shifts in activity patterns during the transition to adulthood (Niemeier, Raynor, Lloyd-Richardson, Rogers & Wing, 2006:849). Thus setting a "trajectory" for beneficial health behaviour patterns and dietary intake during this time may be an important step toward initiating lasting healthy behaviours.

Furthermore, a growing number of individuals are now becoming obese during adolescence and are exposed to a wide array of precursors to poor-diet quality and inactivity before the emerging adult years. For example, secular trends suggest declining rates of family meals and home food preparation (Rubina et al., 2009:654), potentially leaving young adults without the skills to prepare foods and plan healthful meals on their own. Thus, challenges lie in reversing the effects of adverse adolescent exposures during the emerging adult years and promoting healthful long-term behaviour patterns in all segments of the population.

2.4 Food groups and their functions

Simply choosing foods that fuel the brain can have a significant effect on academic performance. Eating certain foods can improve ability to focus, retain information, and remain mentally alert in order to get through the most gruelling of study sessions. The

following are foods that not only fill the belly, but feed the brain as well, enabling better grades.

2.4.1 Starchy foods (Cereals, breads and grains)

Starchy foods provide carbohydrates which are necessary for healthy food intake (Epel, 2007:223). Complex carbohydrates are considered to be the "good" ones. They convert into energy and keep one going all day without fatigue. Simple carbohydrates usually consist of some type of sugar hence they give instant bursts of energy (Westover & Marangel, 2002:37). However, when these quickly dissipate, energy levels drastically drop. Choosing complex carbohydrates such as whole grains for most of the diet and small quantities of simple ones is encouraged.

However, several research studies established that too much intake of unhealthy carbohydrates leads to obesity and cardiovascular diseases. A dense meal of carbohydrates can leave one feeling sluggish and tired as it increases the levels of tryptophan in the brain. According to Parker (1989:415), eating lots of refined carbohydrates like white bread and white pasta is not only bad for physical health, but it also leads to sleepiness, lethargy and mental dullness. However, whole grains tend to have the opposite effect and can lead to enhanced memory function and even better grades. Whole grain breads, wheat bran and brown pasta provide a quick energy boost while studying (Devine, Lloyd & Gray, 2006:267). They release glucose slowly into the blood stream keeping one mentally alert throughout the day.

2.4.2 Meat, fish, eggs and nuts

Meat, fish, eggs and nuts provide the body with proteins which are essential for muscle growth. They are found in all human cells, so they are extremely important to have in meals (Astorg et al., 2004:1186). Adequate amounts of protein are easy to meet by regularly eating any type of meat and can also be found in lentils and beans, as well as soy products. It is recommended that people eat minimal amounts of meat and supplement them with plant proteins, which are usually easier to digest (Devine, Lloyd & Gray, 2006:267).

2.4.2.1 Beef

Red meat like grass-fed beef is a source of protein and also an excellent source of vitamin B12, which is vital for healthy brain function. Smith, Egorova, Blacker et al., (2011:98) in their study report that people with high levels of markers for vitamin B12 deficiency are more likely to score lower on cognitive tests, as well as have a smaller total brain volume, which suggests a lack of the vitamin may lead to brain shrinkage. Protein should be taken in the right proportion since it is a vital part of brain growth during early development. Neurons, though mostly fat and fueled by glucose, they use proteins to communicate with one another and control what happens throughout the body.

The enzymes, neurotransmitters and hormones that carry signals and help accomplish the tasks the brain dictates are made from protein. Protein however, has unique abilities to bend, twist and shape itself into the structures that allow enzymes to work and are vital to brain health (Barker, 2002:455). They aid digestion so that the brain gets the nutrients it needs, but they also work inside the brain too, breaking down plaque, creating neurotransmitters and much more. According to (Smith, Egorova, Blacker et al., 2011:95) too much animal protein can put some strain on the kidneys and deliver much more fat than one needs. However, plants are not devoid of protein. Nuts, seeds, legumes, lentils, beans and some whole grains are good sources of healthy proteins. Protein deficiencies slow down development and lower cognitive function. A lack of proteins depletes the chemicals in the brain that control mood, appetite and energy levels (Barker, 2002:455), thus compromising on academic performance.

2.4.2.2 Chicken

According to Azhar, Zubaidah, Norjan, Zhuang and Tsang (2013:121) besides chicken and eggs being sources of protein, they have been found to provide high levels of choline naturally in addition to many other nutrients. They went on to say that choline is a macronutrient that's important for liver function, normal brain development, nerve function, muscle movement, supporting energy levels and maintaining a healthy metabolism. Nutrition experts recommend getting

higher levels of choline in order to boost brain function and to retain memory. Choline deficiency is associated with low energy levels, fatigue, memory loss, cognitive decline, learning disabilities, muscle aches, nerve damage and mood changes disorders.

2.4.2.3 Fish

Murakami et al., (2008:24) contend that eating fish leads to better grades, the facts lye in the high concentrations of Omega-3 fatty acids found in most fish. These fatty acids are essential to proper neural function. The greater part of the brain is made up of fatty tissue, so it makes sense that eating fish and other foods high in fatty acids would help us focus more and learn how to study more efficiently. According to the several studies reported in the American Journal of Clinical Nutrition, eating fish regularly can also reduce the risk of dementia as one gets older, another indication of its impact is on brain health (Murakami et al., (2008:24).

2.4.2.4 Beans

Tiemeier et al., (2003:14) assert that legumes such as beans, chickpeas, kidney beans and lentils contain substantial amounts of protein which power the brain and make studying a breeze. Willet et al., (2010:59) reiterate that beans are under-recognised yet they are economical. Beans stabilise glucose (blood sugar) levels. Since the brain is dependent on glucose for fuel and cannot store the glucose, it relies on steady stream of energy, which beans can provide, hence the need for students to consume at least half cup of beans per day. In addition, legumes of all varieties contain high concentrations of folic acid which improves ability to recall information.

2.4.2.5 Nuts

Like fish, many types of nuts such as almonds and walnuts contain high levels of essential fatty acids that help the brain to perform optimally (Meyers, Sampson & Weitzman,1991:1123). As an added benefit, Prinz, Roberts and Hantman (2013:48), posit that nuts contain a good amount of iron and also provide oxygen to the brain

which increases mental alertness and ability to retain information. A minimum of 20grams of nuts per day is recommended for optimal brain health. Since nuts are high in unsaturated fat (good-fat) and calories, they make great sources of energy as well.

2.4.3 Fats, oils and sweets

Fats provide essential fatty acids, which are not made by the body and must be obtained from food. The essential fatty acids are linoleic and linolenic acid, important for controlling inflammation, blood clotting, and brain development. While fats and oils are essential for the proper functioning of the body and brain development it is imperative that they be taken sparingly and not in large quantities as they cause weight gain resulting in obesity (Niemeier, et al., 2006:847). Butter and oils are examples of fats. Healthy sources of fat can be found in fish, nuts, and certain fruits and vegetables, such as avocados (Wardlow & Smith, 2011:786). Eating fish leads to better grades, the facts lye in the high concentrations of Omega-3 fatty acids found in most fish (Murakami et al., 2008:24). These fatty acids are essential to proper neural function. The greater part of the brain is made up of fatty tissue, so it makes sense that eating fish and other foods high in fatty acids would help students focus more and to study more efficiently. According to several studies as reported in the American Journal of Clinical Nutrition, eating fish regularly can also reduce the risk of dementia as one gets older, another indication of its impact on brain health (Murakami et al, 2008:24). Overweight and obesity are risk factors for hypertension which is also a risk factor for the decline in cognitive abilities aggravated by a tendency of feeling weak and tired more often thereby losing concentration resulting in poor academic performance.

2.4.4 Milk and milk products

Yoghurt, as well as cheese consumption, has been shown to aid cognitive function in both younger adults and the elderly. Emerging evidence suggests that milk products may play a beneficial role in improving cognitive function and thus aid in thought processing and mental ability (Lawrence & Worsley 2007:235). Previous research has established that a high-dairy diet improves working memory performance while

lower consumption of milk and milk products has been associated with poorer cognitive function and an increased risk for vascular dementia (Crichton et al., 2010:356). Increased serotonin level from milk has beneficial effects on mood and cognitive function, including information processing (De-Haan, 2007:511). It can be deduced that milk products may be beneficial for the prevention of cognitive decline.

2.4.5 Fruits

Apparently, an apple a day does not only keep the doctor away, but can also help one improve study habits and academic performance as well, (Akbaraly, Singh-Manoux, Marmot & Brunner, 2009:300). Pallesen et al., (2009:1067 point out that the peel of the apple includes a powerful antioxidant called quercetin that enhances memory function. The avocado is a fatty fruit, a mono-unsaturated fat, which contributes to cardiovascular health and healthy blood flow. Every organ in the body is dependent on blood flow (Dabas et al., 2013:6137). This suggests that promoting cardiovascular health is promoting good flow of blood to the organ system, which includes the brain and healthy blood flow means a healthy brain (Taras, 2005:76). Avocados lower blood pressure and a lower blood pressure promotes brain health (Dabas et al., 2013:6137).

Colourful berries such as blueberries, cherries, black currants, raspberries, cranberries, blackberries, gooseberries and even grapes have significant health effects directly related to brain function (Butler, Black, Blue & Gretebeck, 2004:28). Not only do these flavourful snacks reduce the level of toxins in the bloodstream, but they also contain phytonutrients and antioxidants that improve blood flow to the brain and enhance neural activity as well (Rogers, 2001:1132)

2.4.6 Vegetables

Green leafy vegetables are one of the best food sources of magnesium and magnesium citrate benefits brain cell receptors to speed the transmission of messages, while also relaxing blood vessels, which allows more blood flow to the brain (Selkowitz, 2000:252), Getting adequate vegetables, especially cruciferous ones which include broccoli, cauliflower, cabbage and dark leafy greens, may help

improve memory (Torres & Nowson, 2007:23). According to a study conducted by Harvard Medical School, these type vegetables had the most positive effect on memory retention, meaning they are the most likely to help achieve better grades (Anding, Jenna, Richard & Linda, 2000:321). Eating these vegetables raw is the best way to get the optimal nutritional benefit, since cooking them often cooks out the nutrients the body and the brain need most (Taras, 2005:75).

Spinach definitely does not top the list of popular vegetables, but it does make the cut when it comes to foods proven to boost brain power, and that could mean better grades. Spinach is full of folic acid and has even been shown to reverse memory loss (Astorg et al., 2004:39).

2.5 Factors that influence students' food consumption patterns

College is a time of excitement and growth in knowledge, social life and possibly even body size. Changes in lifestyle habits, such as diet and physical activity, are risk factors for college weight gain. Instead of turning to crash diets that are often more detrimental than beneficial, following certain dietary behaviours to reach or maintain a healthy weight can lead to long-lasting and positive results. In order to establish dietary patterns of a particular population there is a need for a greater understanding of the determinants that affect food choice. According to Bautista et al., (2002:35) the key driver for eating is hunger, but what one chooses to eat is not determined exclusively by physiological or nutritional needs. Some of the other factors that influence food choice include:

- Biological influences such as hunger, appetite, and taste
- Economic influences such as cost, income, availability
- Physical influences such as access, education, skills (e.g. cooking) and time
- Social influences such as culture, family, peers and meal patterns
- Psychological influences such as mood, stress and guilt; and
- Attitudes, beliefs and knowledge of food.

The complexity of food choice is evident from the list above, which is in itself not exhaustive. Food choice factors also vary according to life stage and the power of

one factor will vary from one individual or group of people to the next (Kamphuis, 2006:2116). Thus, one type of intervention to modify food choice behaviour will not suit all population groups. Rather, interventions need to be geared towards different groups of the population with consideration to the many factors influencing their decisions on food choice.

2.5.1 Biological factors that influence food consumption patterns

The following explain the biological factors that influence consumption of food;

2.5.1.1 Hunger and satiety

Maslow (1943:84) states that physiological needs provide the basic determinants of food choice. Humans need energy and nutrients in order to survive and will respond to the feelings of hunger and satiety (satisfaction of appetite, state of no hunger between two eating occasions). According to Cooley and Toray (2001:49) the central nervous system is involved in controlling the balance between hunger, appetite stimulation and food intake (Taras, 2005:75). The macro-nutrients, which are carbohydrates, proteins and fats, generate satiety signals of varying strength (Walter & Meir, 2003:54). The balance of evidence in Torres and Nowson's (2004:56) study suggests that fat has the lowest satiating power, carbohydrates have an intermediate effect and protein has been found to be the most satiating. The energy density of diets has been shown to exert potent effects on satiety while low energy density diets generate greater satiety than high energy density diets. The high energy density of high-fat or high-sugar foods can also lead to 'passive overconsumption', where excess energy is ingested unintentionally and without the consumption of additional bulk. An important satiety signal may be the volume of food or portion size consumed. Many people are unaware of what constitutes appropriate portion sizes and thus inadvertently consume excess energy.

2.5.1.2 Palatability

Palatability is proportional to the pleasure someone experiences when eating a particular food (Grantham-McGregor, Chang & Walker, 1998:67). It is dependent on

the sensory properties of the food such as taste, smell, texture and appearance. Sweet and high-fat foods have an undeniable sensory appeal (Barker, 2012:118) and it is for that reason then, that food is not solely regarded as a source of nourishment but is often consumed for the pleasure value it imparts. The influence of palatability on appetite and food intake in humans has been investigated in several studies (Sorensen et al., 2003:265). There is an increase in food intake as palatability increases, but the effect of palatability on appetite in the period following consumption is unclear (Driskell, Kim & Goebel, 2005:105). Increasing food variety can also increase food and energy intake and in the short term alter energy balance (Sorensen et al., 2003:266). However, effects of unpalatability are low food intake and loss of appetite.

2.5.1.3 Taste

Taste is consistently reported as a major influence on food behaviour. In reality 'taste' is the sum of all sensory stimulation that is produced by the ingestion of a food. This includes not only taste *per se* but also smell, appearance and texture of food. These sensory aspects are thought to influence, in particular, spontaneous food choice. Clarke (1998:113) notes that taste preferences and food aversions develop through experiences and are influenced by attitudes, beliefs and expectations. Thus, from an early age, taste and familiarity influence behaviour towards food. A liking for sweetness and a dislike for bitterness are considered innate human traits, present from birth (Bingham et al., 1997:139).

2.5.2 Economic influences

Economic influences can be at national or individual family level.

2.5.2.1 Family monthly income and cost of food

It is reasonable to argue that for individuals to choose or have access to what they eat there is need for them to have the monetary and related economic means to procure food (Mazur, Marquis & Jensen, 2003:1120). The cost of food is a primary determinant of food choice. Whether cost is prohibitive depends fundamentally on a

person's income and socio-economic status. It is expected that high-income and middle-income families generally have a much greater opportunity to purchase healthy foods than a low-income family (Mokdad et al., 1999:1519). Low-income groups find it difficult to achieve a balanced healthy diet and are often referred to as experiencing food poverty or food insecurity (Dibsdall, Lambert, Bobbin & Frewer, 2003:76). Low-income groups have a greater tendency to consume unbalanced diets and in particular have low intakes of fruit and vegetables (De Irala-Estevez et al., 2000:78). However, access to more money does not automatically equate to a better quality diet but the range of foods from which one can choose should increase

2.5.2.2 National food security

Research points to the fact that in affluent societies, most people seem to have more than enough food to eat as they have the money to buy the food (Luthar et al., 2005:207). Food production also features as an important variable that plays out on the amount of food individual members of a given society get. There is evidence that attests to the ability to produce more than enough food as demonstrated by people in developed countries (Serra-Majem, Ribas, Perez-Rodrigo, Garcia-Closas, Pena-Quintana & Aranceta, 2002:35), in striking contrast to a grave situation of the underproduction of food in most Third World nations .

As for the people who live in situations of overproduction and excess of food provision, a number of adverse effects of such affluence have been documented in the literature. According to (Luthar et al., 2005:207), for those richer sectors of society where diseases of affluence are taking an increasing toll, nutrition education should be directed to proper food selection, consumption and lifestyle. The point that the researcher makes is that it appears that through ignorance most people make wrong choices of nutrition, with the result that even if they may procure adequate food quantities they end up malnourished (Wothington-Roberts & Williams, 2000:325; Willis, 1994:36).

2.5.3 Physical influences

Physical influences include accessibility and education-awareness of nutritional requirements.

2.5.3.1 Accessibility

Accessibility to shops is another important physical factor influencing food choice, which is dependent on resources such as transport and geographical location. Healthy food tends to be more expensive when available within towns and cities compared to supermarkets on the outskirts (Donkin et al., 2000:356). However, improving access alone does not increase purchase of additional fruit and vegetables, which are still regarded as prohibitively expensive (Dibsdall et al., 2003:25) but the knowledge of what to buy.

2.5.3.2 Education-Awareness of nutritional requirements

A study completed by Cambridge University found that education was a factor in the choice of diet with 59 percent of middle-aged, educated individuals who ate a healthy diet, while only 47 percent of older, less-educated individuals ate healthily (Veugelers & Fitzgerald, 2005:95). Education, especially when it comes to education of health sciences and food choices, is an important way to learn about healthy diets and caring for one's body.

Studies indicate that the level of education can influence food consumption patterns during adulthood (Kerkadi, 2003:45). In contrast, nutrition knowledge and good dietary habits are not strongly correlated. This is because knowledge about health does not lead to direct action when individuals are unsure how to apply their knowledge. Furthermore, information disseminated on nutrition comes from a variety of sources and is viewed as conflicting or is mistrusted, which discourages motivation to change (Kerkadi, 2003:46). Thus, it is important to convey accurate and consistent messages through various media, on food packages and of course via health professionals. The Food and Nutrition Bulletin (2004) states that most students make wrong choices of food consumption due to lack of knowledge and understanding of

dietary requirements, poor meal planning as well as likes and dislikes and this impacts on health and academic performance.

Gerber (200:3052) classifies food consumption problems into two categories, i.e. those resulting from insufficient intake relative to nutritional needs and those resulting from excessive and unbalanced intake of food or a particular dietary component. The main problems in Africa and elsewhere in developing countries pertain to the first group (Singh-Manoux, Hillsdon, Brunner & Marmot, 2005:50). One of the principal aims of nutrition education must therefore be to provide people in rural and urban areas with adequate information, skills and motivation to procure and to consume appropriate diets. Such education should cover improvement of family food supplies and more efficient utilisation of available food and economic resources to provide nutritious diets and better care for the most vulnerable groups. For those richer sectors of society where diseases of affluence are taking an increasing toll, nutrition education should be directed to proper food selection, consumption and lifestyle.

Research indicates that improving the awareness of nutritious meal choices holds the promise of enabling students to make correct choices of foods that may support proper cognitive functioning. Conversely, the provision of information to students that results in their ability to long-term habits of healthy eating has in the long run, a positive effect on cognitive and spatial memory capacity, potentially increasing a student's potential to process and retain academic information (Singh-Manoux, Hillsdon, Brunner & Marmot, 2005:22).

The importance of nutrition education is to reinforce specific nutrition-related practices or behaviours to change habits that contribute to poor health; this is done by creating a motivation for change among students, to establish desirable food and nutrition behaviour for promotion and protection of good health (Sandstead et al., 2008:475). Students should be given help to learn new information about nutrition and to develop the attitudes; skills and confidence that they need to improve their nutrition practices. In terms of Vygotsky's (1978:43) cultural needs theory it then becomes imperative that in different cultural settings, students be sufficiently appraised of those foods that promote the nurturing of both a healthy body and a healthy mind. It is within the cultural setting in which students are embedded that

relevant information on the choices of food that supports effective learning can be availed to them, some foods of which have been known in their culture for time immemorial, and other foods that are currently in supply in the present cultural set up.

Nutrition education provides students with correct information on the proper food consumption patterns nutritional value of foods, food quality and safety, methods of preservation, processing and handling, food preparation and eating to help them make the best choice of foods for an adequate diet (Walker, Grantham-McGregor, Himes, Williams & Duff, 1998: 122). However, the provision of correct information is not in itself a sufficient objective to improve nutrition. Successful nutrition education goes beyond the simple accumulation of knowledge but towards positive action. A change in behaviour leading to desirable food consumption practices could include, for example, beginning to grow and eat dark-green, orange and yellow fruits and vegetables to protect the body from infectious diseases, or learning how to store maize or other food more safely to reduce nutrient losses and thereby increase household food reserves (Walker et al., 2004:135). Nutrition education is concerned not only with imparting knowledge, but also with finding ways to work with individuals, groups or colleges in a systematic manner that will stimulate their participation in and commitment to the learning process (Walker et al.,1998:29 and120). Nutrition education undertaken in this spirit is interactive, encourages an exchange of information between the educator and the student and empowers students to make appropriate choices using both scientific and local knowledge. It also leads to the adoption of improved behaviour and contributes to lasting effects and changes.

Successful nutrition education often entails the active participation of the people, their awareness of their nutrition problems and their willingness to change. To be effective, a comprehensive nutrition education programme also requires inter-sectorial collaboration among different professionals (in agriculture, education, health and communication) and should be based on a well-planned communication strategy, often using a multimedia approach (Alaimo, Olson & Frongillo, 2001:53). It has been shown that in addition to technical assistance, contributing factors to the success of a programme include strong political and government support, external funding and the strengthening of local managerial and community capacities (Gerber, 2001:3054).

Colleges provide a special medium for nutrition education and for intervention to improve college students' health and nutritional status (Rockett, Wolf & Condit, 2005:336). The basic aim is to help students acquire nutrition knowledge and to develop and encourage desirable eating habits and food choices. Students can also help change the eating habits of their families by demanding desirable food, and when they themselves become parents in the future, they can impart good dietary habits to their children.

Veugelers and Fitzgerald (2005;96:2216) postulate that in the Eastern Province of Sierra Leone, an innovative approach to nutrition education was adopted through restructuring of the teacher training programme of the Bunumbu Teachers' Training College, with the cooperation of the Ministry of Education and the assistance of the United Nations Educational, Scientific and Cultural Organization (UNESCO). The objective was to train a new type of primary schoolteacher, who would be able to also assist the local communities in identification, analysis and improvement of their own nutritional situation, in addition to providing a more relevant and appropriate curriculum for Home Economics teaching at the primary school level. School programmes have greater impact and can be sustained longer if they are tied to community activities. A school gardening programme provides an excellent opportunity for community involvement where water availability does not pose a constraint, and agricultural extension can support the programme by providing the necessary inputs and advice. This type of programme helps gradually to replace nutrition education by the promotion of a nutritional environment, which involves everyone from the educational authorities to the community. Such programmes are therefore not only to transmit knowledge to children, but also to improve the quality of school and village life.

Schools and colleges provide a long-term perspective for change in social communication in nutrition (Veugelers et al., 2005:214). The messages disseminated at social centres, dispensaries and elsewhere will find a fertile ground with the future adults of the society if the schools undertake their training in nutrition now when they are young.

According to McArthure, Grady, Rosenberg and Howard (2000:56) students need more learning opportunities about current dietary recommendations. This was discovered after a one McArthur assessed the knowledge of college students regarding three topics: food composition, healthful eating and the relationship between diet and health. College students comprise a group whose dietary practices and nutritional status are of concern to nutrition professionals (Marietta, Walshimer & Anderson, 1999:244; Binger, 1999 in McArthur et al., 2000:554). Research has been done and has proven that college students' diets are low in many different key nutrients, such as vitamins and minerals. This can also be compared to Otero, Aguirre, Porcayo and Fernandez (1999:113) in the sense that college students could benefit from multidimensional approaches to knowing about dietary patterns in order to help increase the awareness of key nutrients that need to be consumed. Handricks and Herbold, 1998 in McArthur (2006:323) conducted a research and reported that, college students often skip meals, eat a lot of fast food and alcohol, snack on high calorie foods, avoid certain nutritious foods, and have bad weight loss techniques. Many of these poor dietary practices of college students have become a concern to health professionals because they may lead to long term health effects (Nelson, Kocos, Lytle & Perry, 2008:22) which in turn impact negatively on academic performance.

Little research has been done to assess the awareness of key nutritional issues, such as food composition, healthful eating, and the relationship between diet, health and learning (Nelson, Story, Larson, Neumark-Sztainer & Lytle, 2008:16). Attention has been drawn to the interdisciplinary nature of nutritional problems and also to the advantages in looking at the entire food chain from producer to consumer in planning interventions (Department of Health, 2006:245). Accordingly, the implementation of a social communication programme in nutrition requires the collaboration of specialists in different sectors, including agriculture, education, communication, nutrition and health, and each must have a clear understanding of his or her role as a team member.

Most professionals, apart from health personnel and nutritionists, lack even basic knowledge about human nutrition (Otero, Aguirre, Porcayo, Fernandez, 1999:115). To participate effectively in nutrition education activities, such professionals require

some basic training in nutrition. It is important that the training also incorporate training in participatory problem assessment as well as participation in multidisciplinary activities. Enabling project staff to involve community members in a genuine dialogue about their food and nutrition concerns and to coordinate nutrition programme activities among different sectors and levels is crucial for programme success (Schoenthaler, Bier, Young, Nichols & Jansenns, 2000:29).

Nutrition-related action is a delicate undertaking that requires an integrated approach involving the health, agricultural, educational and social sectors at all levels (Currie, 2005:119). Nutritional communication has an essential role in social mobilisation and encourages the behavioural changes needed to improve students' food consumption patterns and consequently nutritional status (Currie, 2005:117). Communication is an important feature of daily life involving the sharing of knowledge, ideas and techniques. With this in mind, Food and Agriculture Organisation implemented a regional communication support programme entitled "Communication Support for Sahelian Programmes against Malnutrition and Vitamin A Deficiency". Multi-sectorial teams were formed in Burkina Faso, Chad, Mali, Mauritania and the Niger to support the implementation of social, educational and institutional communication campaigns. The emphasis was on radio programmes, audio-visual aids and video, the final objective being to involve the communities as the leading players in the process of enhancing household nutritional status (Schoenthaler, Bier, Young, Nichols, Jansenns, 2000:29).

The contrary to the above assertions is that in the third world countries, although some awareness may be raised of the need to have a balanced diet, the practical application of such an awareness is hard to come by. While it is common knowledge that students are conscientised of the need for a healthy, balanced diet, the problem of practically applying the notion is often mainly hamstrung by the non-availability of food. This affects food consumption patterns. Additionally, in terms of Vygotsky's principle of the zone of proximal development (ZPD), a cultural environment that adopts a systemic approach to building up a comprehensive knowledge system among members of any given cultural community, where inter-sectoral communication and practical activities for food production are valued would go some

way to constitute a useful level of awareness among students of the appropriate dietary patterns (Vygotsky, 1978:48).

This study has, as one of its interest, an interrogation of college students in order to understand much about their food composition, healthful eating, and relationship between diet and health in order to target areas that need nutrition education intervention.

2.5.4 Socio-cultural influences

Social-cultural factors influence students' academic performance and are explained in this chapter.

2.5.4.1 Culture

What people eat is formed and constrained by circumstances that are essentially social and cultural. Population studies show there are clear differences in social classes with regard to food and nutrient intakes. Poor diets can result in under-(micronutrients deficiency) and over-nutrition (energy over consumption resulting in overweight and obesity); problems that face different sectors of society, requiring different levels of expertise and methods of intervention (Crichton, Bryan, Murphy & Buckley, 2010:103).

Nutrition and academic performance are affected by an array of socio-cultural factors (Crichton, 2002:46). Studies have shown that the culture shared by a society has a bearing on what and how people select their food and drink (Beattie, Gott, Jones & Sidell, 1993:229). Similarly, scholarly documentation of the eating habits of different cultural groups as being the product of their economic and financial capabilities is not new, for example, Simmons, Kramer and Carder (2012:1478) highlight the fact that those families and communities living in economic affluence have access to a wide array of well-managed diets that take into account the provision of a balanced, sound nutrition and maintain a positive sense of well-being. A study on dietary patterns among the Remba community of Mberengwa in Zimbabwe (Chikomba, 1986:85) revealed that financial capability was not necessarily the only key factor explaining

people's choice of food, but also the entrenched traditional preferences of food and drink.

Dietary habits are the habitual decisions an individual or culture makes when choosing what foods to eat (Kim et al., 2003:12). Each culture holds some food preferences and some food taboos hence it shapes food consumption patterns for its followers. Cultural influences lead to the difference in the habitual consumption of certain foods and in traditions of preparation, and in certain cases can lead to restrictions such as exclusion of meat and milk from the diet. Cultural influences are, however, amenable to change, and when moving to a new country or location, individuals often adopt particular food habits of the local culture.

Dietary habits and choices play a significant role in maintaining health and mortality, and can also define cultures and play a role in religious circles (Janssen et al., 2005:123). It is therefore, the idea of a healthy diet to provide all of the calories and nutrients needed by the body for optimal performance, and at the same time ensuring that neither nutritional deficiencies nor excesses occur. Evidence shows that in most African countries people have so wide a range of food choices determined by different cultural groups' preferences that it may be difficult to prescribe well-patterned diets on a particular institution (Huang et al., 2003:52). Pertaining to economic circumstances, (Janssen et al., 2005:126) observe that in most Third World countries, poor people may have to take any food available to them on the basis of affordability, despite its nutritional value. Conversely, students in many Zimbabwean institutions have had to make do with any food availed to them, owing to their financial limitations (Chikomba, 1986:122).

This observation seems to suggest that regardless of how much money a person may have, choice of food may be explained in terms of yet more complex factors beyond culture and the economic variables. In as far as dietary patterns of college students are concerned, it can be argued that the interplay of the social cultural and economic factors poses some complication in explaining what and how students eat, both inside and outside residence. However, the kind of food and drink people consume in a given community can be characterised as part of the material culture of a particular cultural community, researchers do not seem to realise the link that exists

between people's choice and adoption of dietary patterns and their whole way of life (Pearlin, 1989:30).

According to the cultural needs achievement theory postulated by Vygotsky (1978), it can be argued that people's choices of what to eat and drink or what not to eat and drink is contingent upon the norms, values, belief practices and attitudes of their cultural community. For example in the African culture, it is taboo to eat dog meat, while in China, it is normal practice. Similarly, in the Indian culture, it is forbidden for the members of the Hindu ethnic group to eat beef as their cultural-religious beliefs forbid that. It is, therefore, on the basis of what society sanctions as food worth consuming among its members that people may be provided with particular types of diets regardless of the degree of the nutritional value of these diets.

According to (Willis, 1994:38; Worthington-Roberts & Williams, 2000:325), it is against the background of what people, as a distinct cultural group collectively define as food that people access and consume certain types of food. Furthermore, these cultural definitions seem to be consistent with the social status of the members of a particular society. In the African culture for example, it is prestigious for the chiefs or political leaders to eat (pangolin) meat which is in no way accessible to the general populace. This means that within the confines of this culture, the belief that runs is that pangolin meat is a preserve of the powerful and the wealthy. Hence, it can be inferred that the choice and access of a particular diet is a socially constructed phenomenon. Cultural definitions on the perceived food worth taking seem to regulate people's dietary patterns. When such socially-constructed perceptions ignore the intrinsic value of the foods people eat in terms of nutritional value, there appears to be a situation whereby certain people can be deprived of foods that may be important to the proper functioning of their bodies and minds. In the context of this study, the students make choices of certain foods within the context spaces that define diets. Granted the dynamism that characterises culture, the rigid beliefs some people hold can be outgrown by accepting the fact that the world is in a constant state of flux, implying that perceptions about food choices can be altered.

2.5.4.2 Family factors

Since parents provide food for their household, they have a huge influence on their child's diet and eating habits. If parents stock the pantry with chips, cookies, candy and sugary sweets, children become accustomed to these foods. However, if the refrigerator is stocked with fresh fruits, vegetables and healthy foods, children get used to these foods instead. It should, however, be kept in mind that a parent's eating habits also influence their child's diet. A parent cannot simply feed healthy foods to her daughter and then eat unhealthy foods in front of her. Over time, the child may begin to demand or request the foods the parents eat.

The family is widely recognised as being significant in food decisions. Research shows the shaping of food choices takes place in the home (Luthar, Latendresse, 2005:17). Since family and friends can be a source of encouragement in making and sustaining dietary change, adopting dietary strategies which are acceptable to them may benefit the individual whilst also having an effect on the eating habits of others (Anderson et al., 1998:69).

2.5.4.3 Peers

Even at a young age, peers and friends significantly affect a child's diet. When children spend time with peers at home, school or daycare, they pay close attention to what their friends eat (Lewis et al., 2000:151). A study carried out by Mpofu (2009:88), found that students reported peer influence as a reason for not eating fruit, juice and vegetables and low-fat foods."

Even if one would not fall prey to peer pressure, one’s social circle has a large effect on what one eats. Support from friends, family and coworkers have a beneficial effect on food choices and dietary change, while resistance may lead to poor food choices. According to research published in “Health Education and Behavior” in 1998, those who received dietary support from their household and coworkers ate more fruits and vegetables than those without support.

If parents always cooked fatty meals, there is a high chance that those are the foods that one would love and comfortable with (Nicklas & Johnson, 2004:27). Parents and family life are a leading factor in diet choices, as some of the food preferences were likely formed when one was a small child. Preferences are then passed on to children, which is why it is so important to choose healthy foods to perpetuate a cycle of healthy eating.

2.5.4.4 Meal patterns

A meal is usually defined as the consumption of two or more foods in a structured setting at a set time (Gough & Conner, 2006:1153). Snacks consist of a small amount of food or beverage eaten between meals. A common eating pattern is three meals (breakfast, lunch, and dinner) per day, with snacks between meals. The components of a meal vary across cultures, but generally include grains, such as rice or noodles; meat or a meat substitute, such as fish, beans, or tofu; and accompaniments, such as vegetables. Various food guides provide suggestions on foods to eat, portion sizes, and daily intake (Nelson, Lust, Story & Ehlinger, 2008:407). However, personal preferences, habits, family customs, and social setting largely determine what a person consumes.

Gough and Conner (2006:1153), claim that the type of meal served or eaten at any given time varies by custom and location thereby defining their food consumption patterns. In most modern cultures, three main meals are eaten: in the morning, early afternoon, and evening. Further, the names of meals are often interchangeable by custom as some will serve dinner as the main meal at midday, with some having supper as the late afternoon/early evening meal; while others may call their midday meal as lunch and their early evening meal supper (Rogers, 2001:143). Except for "breakfast", these names can vary from region to region or from family to family. People have many different eating occasions daily, the motivations for which will differ from one occasion to the next. Most studies investigate the factors that influence habitual food choice but it may be useful to investigate what influences food choice at different eating occasions.

The effects of snacking on health have been debated widely. Evidence shows that snacking can have effects on energy and nutrient intakes but not necessarily on body mass index (Rafidah et al., 2009:22). However, normal weight and overweight individuals may differ in their coping strategies when snack foods are freely available and also in their compensatory mechanisms at subsequent meals. Moreover, snack composition may be an important aspect in the ability of individuals to adjust intake to meet energy needs.

Helping young adults to choose healthy snack choices poses a challenge to many health professionals. In the home, rather than forbidding unhealthy snacks, a more positive approach may be the introduction of healthy snack options over time (Anuar & Ghazali, 2011**:**60). Moreover, healthy food choices outside the home also need to be made more readily available.

Skipping meals and eating at odd times of the day is a recipe for overeating or unhealthy eating. It could also raise one's risk for heart disease. Experts from the USDA Agricultural Research Service report (2015:23) claim that people who consume most of their calories between 4 and 8 p.m. have higher blood pressure, cholesterol and blood sugar levels than people who consume three meals spread throughout the day with the same number of calories. Eating habits have been a major concern among university students as a determinant of health status.

2.5.4.5 Meal planning

Just as it is important to plan workouts, it is also important to plan meals (Kamphuis, 2006:939). If students know that they will be in class all day with no breaks, they should make sure to pack a lunch or snacks to get through the day. Kamphuis *(*2006:939) also suggests that the resident apartment should be stocked with non-perishable foods, such as oatmeal, almonds, beans, and rice, in case the cafeteria closes before return from class. College is a busy time, but students should not let their health suffer. They should make time for themselves and enjoy the freedom of being healthy individuals. Some say that cooking has become a dying art. People are too pressed for time or do not have the skills or the facilities to prepare meals at home. On the other hand, there are countless hobby chefs who have discovered the

joy of creating tasty meals, sometimes even late in life. It is a fact that if one wants to eat healthily, they must know a thing or two about cooking their meals from scratch (Trockel et al., 2000:115). Shopping for fresh ingredients and inventing better ways to prepare them can be a lot of fun, and it certainly has its benefits.

2.5.4.6 Social setting

Although the majority of food is eaten in the home, an increasing proportion is eaten outside the home, e.g. in schools, at work and in restaurants. The venue in which food is eaten can affect food choice, particularly in terms of what foods are on offer. The availability of healthy food at home and 'away from home' increases the consumption of such foods (Paeratakul, Ferdinand, Champagne, Ryan & Bray, 2003:103). However, access to healthy food options is limited in many work/school environments. This is particularly true for those with irregular hours or with particular requirements, for example, vegetarian (Devine, et al., 2006:113). With the majority of adult women and men in employment, the influence of work on health behaviours such as food choices is an important area of investigation (Devine, et al., 2006:113).

Social influences on food intake refer to the impact that one or more persons have on the eating behaviour of others, either direct (buying food) or indirect (learn from peer's behaviour), either conscious (transfer of beliefs) or subconscious. Even when eating alone, food choice is influenced by social factors because attitudes and habits develop through the interaction with others. However, quantifying the social influences on food intake is difficult because the influences that people have on the eating behaviour of others are not limited to one type and people are not necessarily aware of the social influences that are exerted on their eating behaviour (Kvaavik, Andersen & Klepp, 2005:89).

Social support can have a beneficial effect on food choices and healthful dietary change (Kozyrskyj et al., 2002:93). Social support from within the household and from co-workers was positively associated with improvements in fruit and vegetable consumption (Sorensen et al., 1998a) and with the preparative stage of improving eating habits, respectively (Sorensen et al., 1998b). Social support may enhance

health promotion through fostering a sense of group belonging and helping people to be more competent and self-efficacious (Berkman, 1995:56).

2.5.5 PSYCHOLOGICAL INFLUENCES

The study looked at the psychological influences of food consumption patterns as follows:

2.5.5.1 Stress and role overload

Stress appears to alter overall food intake in two ways, resulting in under- or overeating, which may be influenced by stressor severity. Chronic life stress seems to be associated with a greater preference for energy- and nutrient-dense foods, namely those that are high in sugar and fat (Rafidah, Azizah, Norzaidi, Chong, Salwani, & Norraini, 2009:22). Evidence from longitudinal studies suggests that chronic life stress may be causally linked to weight gain. Stress-induced eating may be one factor contributing to the development of obesity. Future studies are necessary to measure biological markers of stress and assist in the understanding of the physiologic mechanism underlying the stress-eating relation and how stress might be linked to neurotransmitters and hormones that control appetite.

College students are in the stage of adolescence moving towards adulthood and also in the period of active physical and mental growth, in which the nutritional condition greatly influences the health of lifetime (Splette & Story, 1997; Choi, 2002:87). It is not an exaggeration to claim that college students are confronted by a multitude of stressors. Different stressors such as time management, financial problems, sleep deprivation, social activities, and for some students even having children, can all pose their own threat to a student's academic performance (Ivanovic, Vasquez, Aguayo, Ballester, Marambio & Zacarias, 2010:42). Thus, college students have many obstacles to overcome in order to achieve their optimal academic performance. It takes a lot more than just studying to achieve a successful college career.

Eating is thought to be suppressed during stress, due to anorectic effects of corticotrophin releasing hormone, and increased during recovery from stress, due to

appetite stimulating effects of residual cortisol (Rogers & Pilgrim, 2003 cited in Mental Health Foundation, 2011). Sungthong, Mo-suwan, Chongsuvivatwong, (2002:117) concur by stating that one of the main issues with stress is that it can cause unhealthy eating habits. Dietary antioxidants present in fruits and vegetables may improve cognitive function (Lopez, Andraca, Perales, Heresi, Castillo & Colombo 2007:533). It may, therefore, be concluded that the establishment of functional foods that correctly regulate stress response must be firmly based upon scientific knowledge and legal regulation.

College students' stress and dietary patterns and their impact on academic performance have been studied separately in many studies from psychological or psychosocial perspectives (Rafidah, Azizah, Norzaidi, Chong, Salwani & Noraini 2009:243; Safree et al., 2011:155). Torres and Nowson (2007:890) also state that high stress levels influence food habits and lead to poor academic performance. This applies also to people who are always on the go and lead a busy lifestyle. People that fall into this category often endure large amounts of stress and have no time to fit a balanced nutrition around their busy schedule. Additionally, stress makes the body crave foods that are high in fats and sugars ((Ivanovic, Vasquez, Aguayo, Ballester, Marambio & Zacarias, 2010:17). However, college students have had higher frequency of eating out and irregular dietary life due to rapid changes of daily life (Trockel et al., 2000:127). This flaw in eating, in time will inflict a greater stress on the body, plus other problems that pose a threat to one's physical and mental health. Stress is one of the multitudes of psychosocial factors that contribute to a person's eating patterns and is reflected by their food choices. It is quite apparent that a healthy body helps sustain a healthy brain (Rogers & Pilgrim, 2011:175).

Stress and individual food behaviour occur against a background of past experience, social relationships and knowledge within a cultural, political and economic environment characteristic of a society concerned (Beattie, Gott, Jones & Sidell, 1993:229). Students' lives are embedded in the nature of the college (infrastructure, accommodation, learning facilities, food provision). These structural sociological arrangements in which college students are established may be very fertile ground for stress. Considerable studies perceive college students' stress as emanating from a wide range of stressful events such as leaving home for the first time, developing of

entirely new social contacts, being responsible for their own needs, academic work and many others (Rafidah et al., 2009:14; Ryan, 2004:245). Hence, the many stressors may affect the students' food behaviours and consequently their academic performance.

Currently, Zimbabwean college students have to cope with overcrowded lecture rooms, unavailability or insufficiency of food and academic facilities including accommodation, reading materials, research equipment and computers which has led to a miserable and stressful life resulting in poor feeding behaviours (Mwiria & Ng'ethe, 2002 in Mohamedbhai, 2008:99; Agolla & Ongori, 2009:65). Due to the economic recession of the 90s, limited funds remain the major constraint for all the institutions in Zimbabwe, to develop their physical infrastructure, as a result most students face a lot of challenges.

Studies have revealed that college students are rarely exposed to one severe stressor (Rogers, 2001:139). More often, they are engulfed in constellations of multiple stressors which may affect all the three domains at once, which are the affective, physical and emotional (Worthington-Roberts & Williams, 2000:326). Pearlin (1996:20) affirms that these constellations of stressors may form because the conditions that underlie exposure to one set of stressors may also bring about exposure to others. For example, some students develop immoral behaviours (Pearlin, 1996:20), so that they get food resulting in bad food behaviours, stress due to illnesses and lack of concentration on college work. In terms of Maslow's theory, the students have to first look for food to satisfy the biological deficiency of food needs before they can set themselves to any meaningful academic undertaking. If they have to satisfy this deficiency need through immoral means, it means further multiplication of stressors as culturally, the immoral behaviour is censured by the community.

Considine and Zappala (2002:129) state that college students are four times more likely to be anxious and depressed than other people of their age. In most cases, college students feel anxious and pressured under academic work. At times, when one is under stress, one becomes too busy or overwhelmed to think about food, thereby leading to poor food habits. A lot of college students have to deal with, having

children and families to care for. Today more and more people are deciding to return to college after being out in the work force. Coming back to college puts high demands on older people, who sometimes have family already. Continued pressure can drain the body of essential proteins and B complex vitamins especially at examination time when the last thing any student would want to worry about is a balanced diet (Abou-Zeid, Abdel-Fattah, Al-Shehri, Hifnawy & Al-Hassan, 2014:89). As a result, the body loses its nutritional balance and one feels tense, moody, exhausted, less confident and even depressed. All these are signs of a vitamin B complex deficiency (Rogers, 2001:139). The notion of good food behaviour is essential because good nutrition contributes to good health which indirectly results in producing good academic performance.

Perceived stress has become a reality of college life. It is the physical or mental overexertion of the complex human body reacting to pressures of life. When one is affected by stress, the affective domain is the first one to be greatly affected since one quickly shows anger, irritability, anxiety, depression, restlessness and lack or increase in appetite which may lead to bad food behaviour (Galler & Ramsey, 2009:254). This is a true reflection of how deep the emotions are hurt (Worthington-Roberts & Williams, 2000:325).

The cognitive domain reflects the impact of stress on the emotional domain by lack of concentration, loss of memory or forgetfulness and making incorrect judgements which may have effect on academic achievement. There are some effects of stress, where the physical body experiences pain in the muscles, head and fatigue with some people having high blood pressure and high blood cholesterol which may be detrimental to health (Wothington-Roberts & Williams, 2000:325). When most people experience fatigue, they find it difficult to follow good eating patterns leading to anorexia or bulimia. Insomnia (lack of sleep) will be a clear indication that all the three domains are failing to withstand the pressure. Night eating syndrome has been found to occur during periods of stress and is associated with poor results at attempts to lose weight and disturbances in the hypothalamic-pituitary adrenal axis (Considine & Zappala, 2002:129). It is at this stage that stress is taking its toll and when not properly handled can worsen and become fatal. Thus the effects of stress go far beyond the increased risk of mental illness (Considine & Zappala, 2002:129).

Students have to accomplish many tasks, meet deadlines and prepare for examinations in the limited time available. They have many challenges to overcome in order to achieve their optimal academic performance. Among these challenges are juggling academic work with other social commitments especially those who have families (Agolla & Ongori, 2009:64). Relationship between stress and nutrition on academic work lies on the notion put forward by Rogers (2001:135) that a healthy body is able to maintain a healthy mind, meaning that certain risk factors for a physically ill health are also risk factors for depression and cognitive impairment. The body and mind are so interrelated such that psychological stress is related to physical health and vice versa (Ryan, 2004:202). Kaplan and Sadock (2000) in Rafidah et al., (2009:14) state that too much stress can cause physical and mental health problems. Although an optimal level of stress can boost learning ability, performance in academic life demands all aspects of wellbeing, those that include physical, social, emotional, spiritual and psychosocial wellbeing (Safree et al., 2011:169).

A study by Agolla and Ongori (2009:45) which focused on academic stress among University of Botswana undergraduate students concluded that academic workload, inadequate resources, low motivation and overcrowded lecture halls lead to stress and poor eating habits. The literature cited above points to the fact that the multiplicity of stressors to which college students are exposed, negatively impact on students food consumption patterns, leading to an unhealthy body, stressed and usually exhausted mind. When viewed through the lens of Maslow's needs hierarchy, it means that even if the students were to successfully obtain food by any means possible, their consumption would be hindered by mental stress and instability, granted the myriad of social and academic responsibilities they have to contend with. For instance if a student got food through immoral means in order to pursue the higher order need of self-esteem through learning a profession, there could loom large a spiral cycle of stress emanating from such things as rejection and punishment by society for such devious means of satisfying a physiological need.

Psychological stress is a common feature of modern life and can modify behaviours that affect health, such as physical activity, smoking or food choice (Wardle et al., 2000:1115). The influence of stress on food choice is complex not least because of the various types of stress one can experience. The effect of stress on food intake

depends on the individual, the stressor and the circumstances. In general, some people eat more and some eat less than normal when experiencing stress (Oliver & Wardle 1999:47). The proposed mechanisms for stress induced changes in eating and food choice are motivational differences (reduced concern about weight control), physiological (reduced appetite caused by the processes associated with stress) and practical changes in eating opportunities, food availability and meal preparation (Pearlin, Lieberman, Maneghan & Mullan, 1981:22).Some previous studies on stress also suggest that if work stress is prolonged or frequent, then adverse dietary changes could result, increasing the possibility of weight gain and consequently cardiovascular risk (Wardle et al., 2000:1115).

Many college students perceive increased levels of stress, originating from a variety of sources, such as having to adapt to new environments, the broadening sense of independence and self-reliance, and a wide array of social and other demands (Miller, Ogletree & Welshimer, 2002:323). Though stress has been associated with poor diets, inactivity and a range of adverse health behaviours among college youth (Agolla & Ongori, 2009:70), the mechanisms through which these relationships operate are not clear. In addition, college students are also susceptible to risk factors, such as sleep loss and depression, which are linked with excess weight gain and obesity (Voelker, 2004: 2177). In 2000, 71% of college students reported sleep-related problems, a nearly threefold increase from 1978 (Hicks, Fernandez & Pellegrini, 2001:660.) and more than twice the percent of adults in the general population reporting sleep-related problems (Pallesen et al., 2009:1079).

Therefore, college students are at particularly high risk for adverse effects of sleep loss/problems, including disorders in eating patterns, weight gain and declines in emotional and mental well-being which compromises on academic attainment. Once observational research is available to characterise post-secondary campus food environments, existing school-based strategies to improve healthy food availability, pricing and labelling might be successfully adapted to fit intervention strategies in these settings.

However, although school-based environmental interventions have gained much scientific attention in recent years, important individual-level factors specific to this

age group should not be overlooked. Emerging adults and college youth experience many new barriers to healthy lifestyle characteristics (e.g., high stress, poor sleep, challenges targeting individual-level skill building and coping strategies in these areas) may be highly effective in obesity prevention efforts, particularly when used in combination with environmental approaches.

2.5.5.2 Mood

Hippocrates was the first to suggest the healing power of food; however, it was not until the Middle Ages that food was considered a tool to modify temperament and mood. Today, it is recognised that food influences one's mood and that mood has a strong influence over choice of food.

Interestingly, it appears that the influence of food on mood is related in part to attitudes towards particular foods. The ambivalent relationship with food-wanting to enjoy it but conscious of weight gain is a struggle experienced by many. Dieters, people with high restraint and some women report feeling guilty because of not eating what they think they should (Dewberry & Ussher, 2004:16). Moreover, attempts to restrict intake of certain foods can increase the desire for these particular foods, leading to what are described as food cravings. Women more commonly report food cravings than do men. Depressed mood appears to influence the severity of these cravings. Reports of food cravings are also more common in the premenstrual phase, a time when total food intake increases and a parallel change in basal metabolic rate occurs (Dye & Blundell, 2007:37).

Thus, mood and stress can influence food choice behaviour and possibly short and long term responses to dietary intervention. College life can bring on many emotions, but food should not be used to comfort stress, anxiety, homesickness or loneliness. Eating when not truly physically hungry can cause significant weight gain if it happens on a regular basis. When hunger strikes determine if it is really hunger or it is just to soothe an uncomfortable emotion. Instead of eating polish nails, call a friend, play a computer game or take a shower.

2.5.5.3 Influence of environment on college students' food consumption patterns.

College students report poor dietary practices that are likely to play an important role in unhealthy weight change during this period. ACHA-NCHA data indicated that only 6% of students consume ≥5 daily servings of fruits/vegetables, a finding which has been consistent in smaller, regional studies (Dowda, Ainsworth, Addy, Saunders & Riner, 2001**:**717). The majority of students have little variety in intake, eating "the same foods day after day" (Driskell, Kim & Goebel, 2005:800). Although diet quality may decrease when students begin their freshman year, there appears to be little improvement in dietary intake throughout the college years (Bang, 2009:55). Levitsky et al., (2006:103) found that 47% of the variation in first-semester weight gain was attributable to basic measures of eating in "all- you-can-eat" dining halls, snacking patterns, and eating high-fat "junk food."

2.5.5.4 Importance of good nutrition for college students

College life is considered a very busy period for students. In order to make the body work as efficiently as possible, it is important that busy and stressed students are properly fueled and food functions as this essential fuel. Unfortunately, the crazy schedule of student life often leads students to eat whatever they can easily grab on the run, skip meals or over-eat when dealing with stress. These are totally understandable scenarios, but in order to make your body function optimally under the most pressured situations, it is important to fuel-up with the right kinds of foods. Nutritional awareness is especially important for college students given the prevalence of vegetarian/vegan diets and special needs diets (that is, considering athletic needs, food allergies, etc). It can be tricky for students to navigate the dining hall to accommodate for their needs while getting all of their essential nutrients; in order to maintain the busy college lifestyle, it is important that students are armed with knowledge on how to use the dining hall as a tool to meet their nutritional needs.

Good nutrition is important for living a healthy life now and in the future. Even if weight is not a concern, overall poor nutrition habits are linked to negative future health conditions such as cardiovascular disease, hypertension, diabetes,

osteoporosis, iron deficiency anemia, and certain cancers. Poor nutrition can greatly impact daily well-being in terms of feeling best physically and mentally. Without proper nutrition, the body does not run efficiently and more prone to feeling lethargic, depressed and physically ill, thereby affecting brain functioning**.**

2.5.5.5 Nutrition for the College Student

College is a unique time of life-changing moments, identifying purpose in life, and learning how to take care of oneself. However, this milestone comes with added stress, an irregular schedule, and a sedentary lifestyle which in turn affects dietary patterns. Exceptional health helps one to excel during the time as a student and, more importantly, practicing good dietary habits early enough can impact the way one eats for life and improving learning and retention capacity. LaFountaine (2012:215) suggests the following as tips that can be used to help navigate the college lifestyle on the path to health.

2.6 CONSIDERATIONS WHEN MAKING FOOD CHOICES

There are several factors that are considered when making food choices, and they are explained in this section.

2.6.1 Cost of food

The cost of food and the ability or non-ability to afford certain foods is a primary factor that affects diet. According to a study, those with lower incomes tend to consume fewer fruits and vegetables, and have a more unbalanced diet than those of a higher socioeconomic status. When deciding on a diet, make sure it is one that you can afford. When one is on a tight budget, they should stay away from packaged foods and meal-delivery systems, which can be costly because of convenience. Instead, they should shop at bulk stores and buy inexpensive lean meats, frozen fruits and vegetables, and whole grains in bulk.

2.6.2 Food availability

The availability of foods in an area and home play a significant role in diet. Food availability depends heavily on geographical location and income. A high-income family generally has a much greater opportunity to purchase healthy foods than a low-income family. If a family is on a tight budget, using a dollar toward a double cheeseburger is significantly more appealing than using a dollar for a bunch of broccoli (Mokdad et al., 1999:1522). Similarly, a family that lives in or near a big city will likely have a variety of healthy retail options, particularly compared to a family that lives in a country setting.

2.7 Nutrition disorders

Nutritional disorders include malnutrition, weight gain and obesity, as discussed in the section that follows:

2.7.1 Malnutrition

While caloric deficits have negative consequences on cognitive function and academic performance as described above, research indicates that an excess of calories is also correlated with effects of relevant harm (Paeratakul, Ferdinand, Champagne, Ryan & Bray, 2003:554). Specifically, regular caloric surpluses can reduce synaptic plasticity and increase the vulnerability of cells to damage by causing free radical formation (Gomez-Pinilla, 2010:76). Over-nutrition usually leads to obesity. Taras and Potts-Datema (2005:234) reviewed nine scholarly articles to examine the possible link between obesity and school attendance, academic achievement, and cognitive ability among school children aged 5-18; each of the nine studies found significant associations between obesity and reduced attendance, poor academic achievement, or impaired cognitive skills.

According to Johns Hopkins Children's Center cited in Dowda, Ainsworth, Addy, Saunders and Riner (2001:443), more American children suffer chronic malnutrition from eating too much of the wrong kinds of food, called over nutrition, than from food

deprivation. The sugary, fatty, processed foods and beverages often sold or served in schools actually undermine a child's ability to learn, (Public School Review). The body needs carbohydrates to convert into glucose, but when the system is flooded with too much at the same time, energy is diverted from brain functions to help process the overload. The resulting "crash" leaves one jittery, irritable and tired, impairing their ability to concentrate. About a third of American school children are estimated to be overweight (Halterman, Kaczorowski, Aligne, Auinger & Szilagyi, 2001:17).

Recent longitudinal research studied the effects of an obesity prevention intervention consisting of nutritional and exercise components on academic performance, and found the intervention group participants had significantly higher math scores than the control group, regardless of ethnic background and other potentially confounding variables (Helland et al., 2003:653). It is unknown whether obesity is a cause or a symptom of poor academic performance.

2.7.2 Weight gain and obesity

Research from national surveys and longitudinal cohorts has identified the transition between adolescence and adulthood as a period of increased risk for excess weight gain. College aged women are at high risk for body dissatisfaction and unhealthy weight control practices (Hoffman et al, 2006:44). Recent evidence has suggested that dieting frequency and unhealthy weight control may be associated with weight gain (Cole et al., 2000:11) and poor-diet quality (Ebbeling, Pawlak & Ludwig, 2002:482). Nationally representative cross-sectional survey data from the Behavioral Risk Factor Surveillance System indicated that from 1991 to 1998, the greatest magnitude of increase in obesity prevalence was among 18–29-year olds (increasing from 7.1 to 12.1%) (Goodman & 2002:504). The prevalence of obesity among young adults more than doubled in the past 30 years. The most recent National Health and Nutrition Examination Survey (NHANES) data indicate that the prevalence has continued to increase since 1999 (Kant, 2000:929). Currently, 28.5% of 20–39-year olds are obese and 57.1% are overweight or obese (Singh-Manoux et al., 2005: 2252).

Nationally representative longitudinal cohort data from the National Longitudinal Study of Adolescent Health (Add Health) (Kramer, Allen & Gergen, 1995:85 and 312), assessing 9,795 adolescents (baseline age: 13–20 years in 1996), found that the 5-year incidence of obesity was nearly 13% (follow-up age: 19–26 years in 2001), whereas only 1.6% shifted from being obese to non-obese. In comparison to NHANES (1971–1974), the Add Health cohort showed substantial secular changes in the BMI distribution over time, particularly among individuals aged 19–26 years (13). In addition, findings from the CARDIA (Coronary Artery Risk Development in Young Adults) (Burke, Bild, Hilner et al., 1996: 333) longitudinal cohort illustrate both 5-10year increases in weight among individuals 18–30 years of age at baseline (1985). Five-year weight gain was greater for men aged 18–24 years compared to men aged 25–30 years (Janssen, et al., 2005:127). Furthermore, the largest 10-year weight gains were seen among those in their early- to mid-twenties, as compared to those in their thirties (Nelson, Story , Larson, Neumark-Sztainer & Lytle, 2008:2209).

2.7.3 Nutrition deficiencies

Table 2:1 Physical signs of malnutrition

Body part or body system	Symptoms and signs	Possible Deficiency
Hair	Lack of lustre, thinness, sparseness, dryness, dyspigmentation, easy pluckability, texture change	Protein, protein calories, zinc, copper, biotin
Face	Paleness, moon face, (swollen), greasy, scaling around nostrils	Riboflavin, niacin, pyridoxine, iron
Eyes	Pale white of eye and eye lid lining (pale conjunctivae), redness and fissuring of eyelid corners dullness and dryness	Iron, vitamin A, C and B12, riboflavin, pyridoxine
Mouth	Angular redness, lesions or scars at corners of mouth (stomatitis), swelling and redness of lips	Riboflavin, niacin, pyridoxine, iron

	and mouth	
Tongue	Swelling, slickness, redness, pain (glossitis), swollen magenta colour.	Niacin, pyridoxine, iron, riboflavin, vitamin B12, folate
Gums	Swelling, sponginess, bleeding, receding	Vitamin C
Skin	Dryness, scaling, lightening of skin colour often centrally on the face (diffuse pigmentation), rough, "goose-flesh" skin, small skin haemorrhages, excessive bruising, oedema, delayed wound healing	Vitamin A, C and K, zinc, essential fat acids, protein, niacin
Nails	Spoon shaped, pale, brittle, ridged	Iron
Glands	Enlarged thyroid and parotid	Protein, iodine

Adopted from Manual of Clinical Dietetics (1992)

2.8 Relationship of dietary patterns and learning (Nutrition and brain function)

The study and understanding of nutrition, brain has not been given much attention in relation to human learning in the sub-Saharan Africa (Helwig, 2009:87). Information Processing Model as one of the theoretical lenses through which the researcher appraises issues in this study in order to understand the coordinated functioning of the transmission of neural impulses that take place in the brain cells during the processing of information. It is the researcher's contention that for the proper information to occur in a student while involved in learning, the brain cells must be well nourished. This means that in conjunction with the physiological explanation of motivated behaviour through satisfaction of food that Maslow offers the proper functioning of the neurological system has a bearing on one's physiological arousal such as the motivation to learn or lack of it. Thus, in a bid to satisfy the higher order level of human self-actualisation, the human organism must have an active neural system as a result of food intake.

According to Barker (2002:65), the brain is mainly made up of nerve cells known as neurons and glial cells that support the neurons. Cognition occurs through activity

within the brain's structure. Brain development starts three weeks after conception, when neurons begin to form and to multiply (Healy, 2004:78). Neurons develop rapidly from the second trimester of pregnancy through the first year of life so that by age one, a baby has about 100 billion neurons and will maintain roughly the same amount through adulthood (Healy, 2004:79; Paus, 2010:38).

Though stable in number, these neurons continue to grow and to change dramatically based on the unique activities they are stimulated to undertake (Lopez-Garcia et al., 2004:103). In order for any human action to occur, neurons must communicate with each other. Neurotransmission, which is the communication between neurons, happens when one neuron's axon sends information out of its cell and another neuron's dendrite picks up the information. The links between axons and dendrites (synapses*),* and this neural network make up the white matter of the brain (Paus, 2010:34). The number of synapses varies greatly by individual and throughout development (Gopnick et al., 1999:66). The number of synapses decreases as connections become more efficient and networks of connections become more permanently established. During cognition, each activated synapse fires about 200 times per second (Kagan, 2009:85) and this is clear that cognition is an energy-expensive activity.

The brain consumes a huge amount of energy in comparison to the rest of the body. According to Gustafson (2010:49), the human brain accounts for only about 2% of a person's body weight, but consumes between 20-30% of the body's available energy and oxygen. This is because active neurons burn fuel to function. Therefore, mechanisms involved in the transfer of energy from foods to neurons are likely to be fundamental to the control of the brain function.

Murakami et al., (2008:46) assert that all cells in the human body, including neurons and glial cells, derive energy from food calories in the form of macronutrients: carbohydrates, proteins, and fats. Before cells can gain energy from food, it must be converted into simple sugars, especially in the form of glucose, a simple sugar that is the primary source of fuel for the brain, nervous system, and red blood cells, and a preferred energy source for all other bodily cells and tissues (Davis & Melina, 2010:43; Graham, 2006:534). Carbohydrates provide the most efficient source of

energy for the body because they easily break down into simple sugars and are quickly converted to glucose in the liver.

The World Health Organization (WHO) recommends 55-75% of humans' calories come from carbohydrate; however, the recommendation for carbohydrate intake based on the Dietary Guidelines for Americans, of at 45-65%, is slightly lower (WHO Expert Consultation, 2004**:**156.). Likewise, U.S. dietary guidelines recommend a higher ratio of calories coming from fat (25-35%) and protein (10-30%) than those of the WHO (U.S. Department of Health and Human Services [USDHH] and U.S. Department of Agriculture [USDA], (2005). Using either protein or fat for energy requires extra work during conversion to glucose, produces toxic by-products, and depletes the body of protein and fat needed for other bodily functions (Davis & Melina, 2010; Graham, 2006). Therefore, to minimise exertion of extra work on the already overloaded brain, it would seem more reasonable to adopt the WHO recommendations for carbohydrate as the major source of energy which is less expensive to convert into glucose.

The minimum carbohydrate intake required for fundamental brain function is 130 grams (roughly 520 calories) per day (Davis & Melina, 2010:s76). Food also fortifies the body with micro-nutrients (vitamins and minerals) that are involved with a variety of processes that promote neural survival (Paus, 2010:S30). In addition, micronutrients synthesise brain chemicals called neurotransmitters that are responsible for carrying information across synapses, and support efficient transmission along these pathways (Gomes-Pinilla, 2008:233). According to Gustafson

> Neurotransmitters influence mood, sleep patterns and thinking. Deficiencies or excesses of certain vitamins or minerals can damage nerves in the brain, causing changes in memory, limiting problem-solving ability and impairing brain function (2010:351).

As an energy-expensive organ, the brain, therefore, requires adequate energy in the form of glucose and sufficient nutrients to function properly (Davis & Melina, 2010:54; Graham, 2006:77). The brain's energy needs are elevated throughout childhood,

which suggests a more crucial need for suitable nutrition during development. The technologies that allow scientists to monitor energy metabolism in the brain provide detailed information about brain activity in various cognitive processes. In relation to academic achievement, some studies imply that students with an insufficient glucose supply or nutrient deficits will have compromised cognitive potential (Helland, et al., 2003:107; Schmitt, 2010:1386).

Adequate and sufficient healthy intake of food is essential for the appropriate functioning of the brain (Bloom, 2009:334; Dauncey, 2009:122; Kazal, 2002:43; Shariff, Bond & Johnson, 2000:118). Moreover, maximising brain function is a prime factor in seizing appropriate cognitive capability for example, ability to focus, comprehension, evaluation and application in learning (Kretchmer, Beard & Carlson, 1996:211; Schmitt, 2010:63). The literature thus illustrates the fact that there seems to exist a direct relationship between the intake of food as a basic, physiological need that Maslow emphasises and the functioning of the mind as a means of attaining the growth need of academic achievement. It seems reasonable to argue that without adequate food, the brain lacks the necessary nutrients that enhance its ability to carry out the so much energy-consuming intellectual activities such as comprehension, evaluation and application which students must demonstrate when they are learning. If the students are exposed to deficiency in protein, the malnourished brain cells may inhibit cognitive functioning.

In view of the above literature, the researcher is of the contention that although Maslow did not attempt to explain the neurological function of food in the human body, the important assumption is that it is through the provision of adequate food that students will function well in their cognition as they would get the energy to engage with academic tasks. It is through the provision of adequate and well-nourishing food that a student's neurological system may function well enough to facilitate effective information processing during their contact with learning materials. The researcher believes that the nutritional neuroscientific approach to explaining the link between the kind of food one takes and the way the electrochemical transmission of neurons in the brain cells happens, is relevant to Maslow's theory regarding how physiological processes in the body may, ultimately, affect the way a student responds to learning stimuli.

2.9 Availability of systems to cater for students' nutritional needs to support their learning

It is the researcher's contention that the availability or absence of systems for purposes of planned students' access to nutritional needs determines their dietary patterns, their awareness of appropriate diets and their quality and amount of exertion to studies. Eating habits are determined by an individual's knowledge and behaviours as well as their surrounding environment. Children and youth spend up to 50% of their waking hours in school (Rogers, 2014:65) and consume 30%-50% of their daily food intake during this time (Sanchez-Villegas et al., 2007:134), making it an ideal setting to promote and encourage healthy eating habits through education, peer and adult role modelling, environmental changes and supportive systems that enable students to make healthy choices.

The area of dietary patterns that college students adopt has received considerable attention in developed countries such as the United States of America, Britain, Korea (Mikolajczyk, Ansari & Maxwell, 2009**:**31). This should be a learning point even for African countries. Some organizations in the U.S.A. have begun working with teachers, policymakers, and managed food service contractors to mandate improved nutritional content and increased nutritional resources in school cafeterias from primary to university level institutions (American Dietetic Association, 2004:26). In addition, opinions about healthy eating vary greatly among persons, families, communities, and cultures, so promoting specific food choices would likely be controversial. Involving all members of a community facilitates dietary change (Abou-Zeid et al., 2006:869).

By implication the diversity of perceptions among members of a modern community, places constraints on the development of a common perspective. Changing the dietary habits of students may be difficult enough, and virtually impossible without simultaneous parental intervention (Galler & Ramsey, 2009: 254), as students' home environment determines food that is available and shapes eating patterns. Where possible, schools and colleges should implement nutrition reform through families and the communities because food choices are highly personal and somewhat sensitive in nature. Even with data suggesting a correlation between nutrition and

academic performance, schools and colleges may justifiably feel uncomfortable and unqualified to recommend dietary changes.

According to a FAO Nutrition Project

> A village in the Niger organised a recipe competition in which traditional foods rich in micronutrients were used. Men, children, school teachers and community workers were invited to be the judges of the foods produced. The competition was widely promoted, and women were motivated to do their best. Many villagers were surprised to find that they actually enjoyed foods that until that time they would not have eaten. This alone made it easier for them to accept suggestions to change their eating habits. At this point, they were ready to support changes in the family diet (2009:355).

This was a typical case in which the diverse members of a community made efforts to engage in practical activities that fostered collegial approaches to combating ignorance about nutritional issues by practically show-casing their different experiences at a forum where they could raise a common understanding about the matter, where their diverse perceptions could possibly converge to generate a common awareness.

Available evidence on the effectiveness of nutrition education programmes in colleges shows that nutrition knowledge is most effective if there is a supportive environment and if nutrition education is linked with practical food- and nutrition-related activities (Lien, Lytle & Klepp, 2001:226). Lunch feeding, gardening and health programmes in schools offer special opportunities for practical teaching in nutrition (American Dietetic Association 2004). Student participation in school gardening, menu planning, food selection (ideally from locally grown and processed foods) and food preparation offers pupils first-hand experience in learning nourishing and hygienic dietary practices. The lecture room can thus serve as a laboratory where proper eating habits can be demonstrated and reinforced in practice.

The above literature, thus, serves to reinforce the point that a coordinated approach to provide students with a sound knowledge base are quite essential to the choices that students make of their diet hence the following of proper food consumption patterns.

2.10 Students' dietary patterns and the effects of nutrition on their learning

A conceptual analysis strategy for exploring how college students experience, understand and manage their dietary patterns in relation to their studies, takes into account the students' physiological need for food. It places a premium on the mutual link between students' dietary welfare and their learning and posits that for any meaningful and fruitful learning engagement to occur, one of the most basic physiological needs which Abraham Maslow (1970), identifies as food, is essential. Abraham Maslow's (1943) hierarchy of needs organises human needs from basic to sophisticated levels. In order of increasing importance, the clusters of needs included in Maslow's hierarchy are physiological needs, safety needs, belongingness and love needs, esteem needs, and the need for self-actualisation. Maslow (1943:23) describes the body's physiological need for food, especially in terms of maintaining homeostasis of water, salt, macronutrients, vitamins, minerals, and temperature within the bloodstream. He elaborates that

> Undoubtedly these physiological needs are the most pre-potent of all needs…If all the needs are unsatisfied, and the organism is then dominated by the physiological needs, all other needs may become simply non-existent or be pushed into the background…for consciousness is almost completely pre-empted by hunger. For the chronically and extremely hungry man…life itself tends to be defined in terms of eating. Anything else will be defined as unimportant (1943:23).

On the contrary to the directive authority of food, achievement is among the least potent of needs. According to Maslow

> All people in our society…have a need or desire for self-esteem…that is soundly based upon real capacity, achievement, and respect from others (1970:371).

It is important to note Maslow's postulation that once needs on one level are satisfied, needs at higher levels emerge and dominate the organism's thoughts and behaviours. Since food is a lower need, then it has to be satisfied before need for achievement could be thought about. Therefore, according to Maslow's hierarchy, the need or desire for achievement will not drive a person's thoughts and behaviours until needs on the lower levels have been satisfied. As a result, the cognitive processes and behaviours associated with the more sophisticated levels on the hierarchy cannot

be achieved. At a very basic level, humans who have not met their basic nutritional needs cannot attain needs at the higher levels. Meaningful and purposeful learning cannot be expected from students experiencing basic needs deprivation. As much as a businessman at the esteem level who is diagnosed with diabetes will spend a great deal of time concentrating on his health (physiological needs), but will continue to value his work performance (esteem needs) and will likely return to work during periods of cutback. A student who is deprived of a proper diet is more likely to prioritise activities that satisfy the food need at the expense of studies, despite the fact that they value their studies.

While Maslow's hierarchy offers an expository connection between food and learning, not much research-based information from students has been generated regarding the extent to which they are aware of their nutritional requirements, the factors playing out on their dietary patterns and the influence of these variables on their learning (Lieberman, 2007:555S).

Nutrition is more often a problem with college students. Students may have difficulty finding the time to cook adequate meals. Most students are just learning to live on their own, and learning to cook can prove to be a challenge. Finding time to go to the grocery store once every couple of weeks can be a demanding task. Little storage space is available in the average dorm room, and food storage may not be possible at all (Trockel, Mickey, Barnes, Michael, Egget & Dennis, 2000:788).

A lot of times, students sacrifice their nutrition for other things that feel more pressing at the time, like studying or socializing, or doing laundry or something they might not have been responsible for earlier. While nutritionists make recommendations for people to have at least three balanced meals a day, experts expressed much concern on breakfast as crucial to college students, for many students, the routine is not uncommon: roll out of bed, rush to class and skip breakfast entirely. Nutrition experts warn that skipping breakfast can have negative consequences on weight and academic performance (Willett et al*.,* 2010:48). It is part of the larger problem of college students' questionable nutritional habits (Kamphuis, 2006:939). It is no secret that college students are frequently sleep deprived, so when one has to choose between breakfast and sleep, breakfast often gets pushed to the wayside.

Economos in Willett, Sampson, Stampfer, Rosner and Bain (2010:235) goes on to say that breakfast improves concentration and when people skip breakfast and their blood sugar or blood glucose levels fall overnight and they wake up and try to perform on low blood glucose, they tend to get really tired and irritable because the brain certainly relies on a certain level of circulating blood glucose or blood sugar, and when that starts to dip, one cannot focus or maintain that focus for long periods of time. Anuar & Ghazali, 2011:60 concurs with Economos (2010:235) that students should avoid falling into a pattern of skipping breakfast and at the very least should have something small to eat in the morning, even if they are in a rush. However, gaps exist in the literature examining the long-term effects of breakfast on school performance and how the observed effects of breakfast on cognition are modified by age, sex, and nutritional status (Selkowitz, 2000:465). The single study that was not restricted to breakfast demonstrated a positive association between the consumption of regular meals and school performance (Trockel et al., 2000:567).

According to The Korean Nutrition Society, (2002:259) energy levels, attention span, and academic performance are influenced by food consumption patterns. Whilst those patterns are largely one's responsibility, individuals must choose to build a strong, supportive foundation for their learning on which a career is built. Balanced, sound nutrition is an important part of that foundation since energy level and attention span are influenced by eating habits (Murakami et al., 2008:140). Sanchez-Villegas, Henriquez, Figueiras, Ortuno, Lahortiga and Martinez-Gonzalez (2007:337) state that food provides energy needed for all the body systems including the brain, to function at optimum levels thus every organ and function of the body requires adequate nutrition and energy. Body cells, including those that are part of the brain, need nutrients and energy for their function and repair (Helwig, 2009:234).

What the above literature seems to suggest is that in the majority of situations, the manner in which students consume food is rather haphazard. They do not follow well-planned schedules of food preparation and choice of foods on the basis of nutritional value. It appears as if positive results are dependent on proper patterns while disorganised patterns may negatively impact on students' learning.

2.11 Factors that affect the nutritional requirements of an individual

The factors that affect the nutritional requirements of an individual digestive system in absorbing and utilising eaten food and biochemical availability. Biochemical availability is the optimum range of intake of a person essential nutritional requirement. This nutritional requirement is influenced by age, growth, sex, pregnancy and breastfeeding, illness, psychological and emotional stress, activity level and other factors like smoking and drinking (Mamhute, 2011:445). The quality of food that people eat can vary depending on the soil and growing conditions of that food. Soil that has been overworked and chemicals added and also drugs and antibiotics that have been given to livestock and crops to aid growth are all factors that affect nutrition in food and can affect the biochemistry of one's body (Patterson, Haines & Popkin, 1994:58). Nutritional quality of our food can be affected by the manufacturing process, storage and preparation of our food.

The quantity of food also influences nutritional status. In developing countries malnutrition is a huge problem but in developed countries under nutrition can occur due to dependency on heavy refined processed foods (Satalic, Baric & Keser, 2007**:**410). The efficiency of one's digestive system affects nutritional status. Bad condition of intestines will reduce the absorption of digested foods into the blood stream. Metabolic faults, sensitivity to certain food and the presence of substances like tea and coffee can affect the absorption rate of certain nutrients.

The same applies to psychological and emotional stress. When people are affected by stress their appetite is affected, this result in less intake of food which in turn results in less nutrients being absorbed. A person's activity level will affect their nutritional requirement. An athlete will need a different nutritional requirement to that of an office worker. Exercise improves metabolic efficiency in some people and increases nutrient requirement (Haberman & Luffey, 1998:190). People may find that certain nutritional requirements increase within their family. Genetics can play a part in an extra need for certain nutrients. Other factors such as using recreational drugs, smoking and drinking can affect nutrient requirements. Even beverages like tea and coffee can affect nutrient requirements; they both inhibit the absorption of Iron and Zinc.

2.12 CONCLUSION

The above literature suggests that in the majority of situations, the manner in which students consume food is rather haphazard as, they do not follow well-planned schedules of food preparation and choice of foods on the basis of nutritional value. It appears as if positive results are dependent on proper patterns while disorganised patterns may negatively impact on students' learning.

A review of the issues of interest in this study has been attempted in the context of the theoretical framework comprising Maslow's need theory, Vygotsky's sociocultural theory and the Information processing model. It has been established that this multi-perspectival explanation of the dietary patterns individuals adopt demonstrates the complex nature of what people eat and drink. It has also been established in this review that for most college students, dietary patterns are not well organised and that consequently, the haphazard patterns have been reported to negatively affect student learning.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The previous chapter discussed literature related to the study that answered the research questions. This chapter presents the research design and methodology, population, sampling procedures, sample size, data collection instruments, data collection procedures, data analysis, ethical considerations and pilot testing that were used in this study. The figure below describes the research process used for this study.

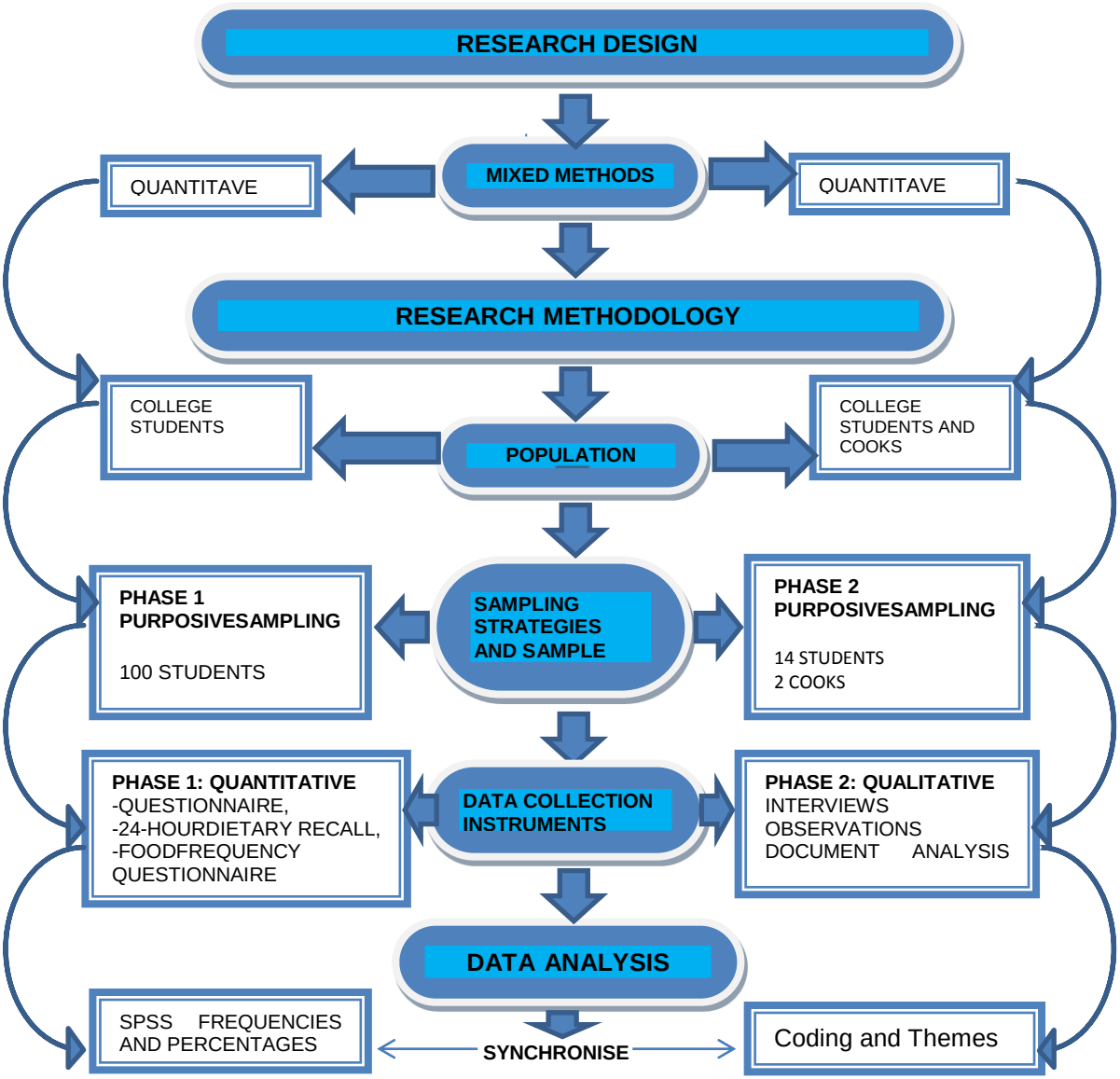


Figure 3.1 Research design and methodology

3.2 RESEARCH DESIGN

A research design is a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings (Cronbach, 2013:195). A research design according to McMillan and Schumacher (2010:102) refers to a plan for selecting subjects, research sites and data collection procedures to answer the research questions. This case study used mixed methods comprising of the quantitative and qualitative approaches in order to triangulate data. Mixed methods approach is a procedure for collecting and analysing data through both quantitative and qualitative research methods in a single study. Castro, Kellison, Boyd and Kopak, (2010:343) point out that mixed methods help to understand a given research problem and tackle it from any relevant angle when one methodology does not provide all the information required. Mixed methods research offers the best of both worlds: the in-depth, contextualised, and natural but more time-consuming insights of qualitative research coupled with the more-efficient but less rich or compelling predictive power of quantitative research (Stange, Crabtree & Miller, 2002:293). Creswell and Plano (2007:39) contend that mixed methods research helps answer questions that cannot be answered by qualitative or quantitative approaches alone.

Cronbach (2013:545) views qualitative and quantitative data as intimately related to each other and believes that quantitative data is based on qualitative judgments; and qualitative data can be described and manipulated numerically. The view of Creswell and Clark is echoed by McMillan and Schumacher (2006:401) as well by noting that, using both approaches allows the researcher to incorporate the strengths of each method. The research design shows which individuals will be studied and when, where and under which circumstances they will be studied. This was a case study of Joshua Mqabuko Nkomo Polytechnic College (JMN) Gwanda, Matabeleland South Province in Zimbabwe which used mixed method approach.

3.3 Research methodology

Research methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge (Ratele, 2006:553). Typically, it

encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques. According to Polit and Hungler (2004:233), methodology refers to ways of obtaining, organising and analysing data. Methodology in research can be considered to be the theory of correct scientific decisions (Marais & Mouton, 2004:16). In this study the following methodology was followed:

3.3.1 Population

Landreneau (2012:164) defines a population as any target group of individuals that has one or more characteristics in common that was of interest to the researcher for purposes of drawing conclusions. Landreneau defines population as:

> Any target group of individuals that has one or more characteristics in common that is of interest to the researcher for purposes of drawing conclusions (2012:185).

The population of this study consisted of 206 students who included resident and non-resident students from Joshua Mqabuko Nkomo Polytechnic College and cooks from the Faculty of Teacher Education kitchen. The population for this study was the same for phase 1 and phase 2. Data were collected in two phases: Phase 1 collected data using quantitative methods while Phase 2 used qualitative methods. These procedures are discussed in detail below:

3.3.2 PHASE 1: QUANTITAVE RESEARCH METHOD

Quantitative approach uses an object-related approach with the aim to explain cause-effect relationships by testing hypothesis and theories with empirical data produced by measuring, counting, scaling (Bryman & Bell, 2005:154). It is deductive with a linear, very much standardised and structured process. The researcher used purposive sampling was neutral and detached to evade personal biases to contaminate the results which could easily be generalised (Schifferdecker & Reed, 2009:640). Apart from the possible discovery of causal relations, quantitative approach was very much statistical, which reduced personal implication of the researcher to a negligible minimum. Its understandable methods, logical structure and replicability gave it a high degree of confidence.

The purpose of using quantitative methods in this study was to describe, explain and predict the phenomenon of dietary patterns by establishing food consumption patterns. Quantitative research was based on pre-determined variables and research questions, which the researcher investigated independently. In this study, variables included dependent variables and independent variables. Data collected through quantitative research is objective which ensured a high degree of reliability of the results.

3.3.2.1 Sampling strategies and sample

According to Taylor and Wallace (2007:112), sampling strategies should always be determined by the purpose of the research. Sampling for this study was done using purposive sampling techniques to collect. Purposive sampling was used to select 100 100 students (50%), for quantitative data, from Joshua Mqabuko Nkomo Polytechnic who were 18 years old and above who could consent for themselves since the legal age of majority in Zimbabwe is 18 years. To ensure that this sample was credible, and covered the main groups the researcher was interested in, the maximum variation sample strategy was used. This involved selecting key demographic variables that were likely to have an impact on participants' view of the topic. The researcher created a sampling 'grid' to recruit participants that reflected various combinations of variables such as male/female; resident/nonresident low income/high income; rural/urban background (Miller, 1997:46). The maximum variation was used in this study as a useful strategy which aimed at capturing and describing the central themes and principal outcomes that cut across participants (Miller, 1997:46). The sample comprised of non-resident students while making a balance in gender for male and female representation. This consisted of 50 female students 25 resident and 25 non-resident, and 50 male students 25 resident and 25 non-resident students from the Faculty of Teacher Education and 2 kitchen.

Table 3.1 Sampling frame for quantitative data

Number of cites	Description of respondents	Number of respondents	Total number of respondents
Female students	Resident	25	50
	Non resident	25	
Male students	Resident	25	50
	Non resident	25	
Grand Total		100	100

3.3.2.2 Quantitative Data Collection procedures

Questionnaires, food frequency questionnaires and 24 hour dietary recall records were used to collect quantitative data for this study as indicated in figure 3.2.

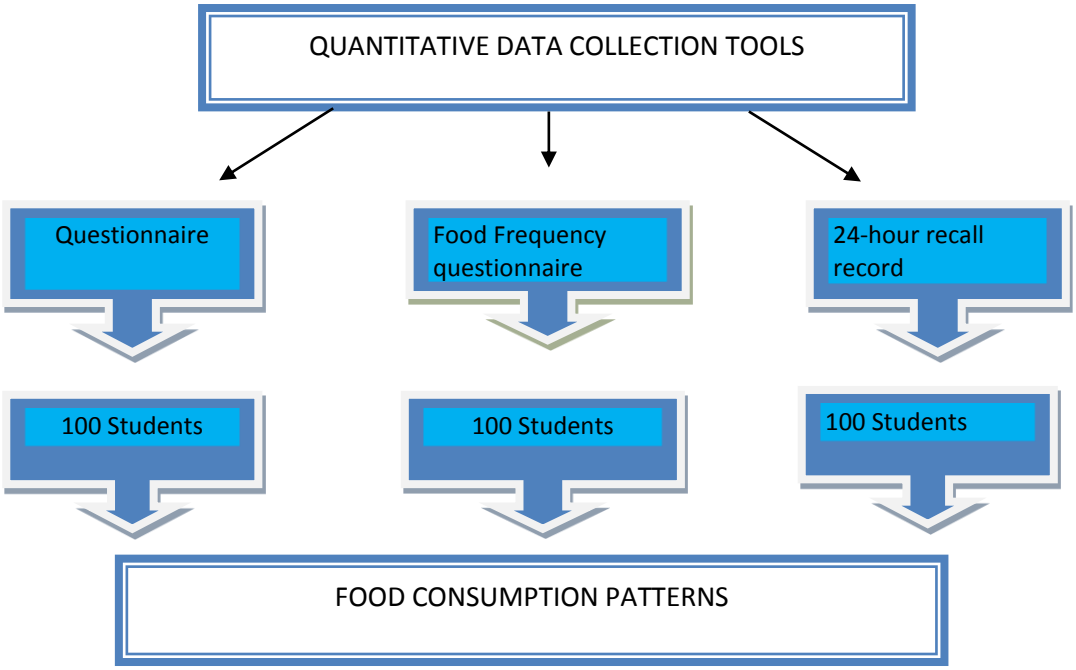


Figure 3.2: Quantitative data collection tools

Questionnaire

According to Cohen et al., (2007:317) a questionnaire is a widely used and useful instrument for collecting survey information, providing structured, often numerical data, being able to be administered without the presence of the researcher, and being comparatively straightforward to analyse. McMillan and Schumacher (2006:194) concur by pointing out that a questionnaire is the most widely used technique for obtaining information from subjects and is relatively economical and can ensure anonymity.

Participants were asked to first consent voluntarily before questionnaires were issued out. A self-administered questionnaire was provided in English without translation because the participants were believed to have good understanding of English language. The questionnaires were formulated based on the study theoretical framework. The questionnaire comprised of four sections, namely: demography and components of food consumption patterns which included the anthropometric data, eating patterns and considerations of choice of foods. Questionnaires with both closed-ended and open-ended items were used. To gather data on food consumption patterns and nutrient intake for each student, a food frequency questionnaire (FFQ) was used. The participants were requested to tick the foods that they ate from the given list in the food items. The questions on food frequency were designed in likert scale showing once per day, once per week, once per month, sometimes and never. Each student had to indicate what applies to them by marking in the appropriate boxes. The completed questionnaires were then collected on the same day.

Anthropometric data for nutritional status of students using Body Mass Index (BMI) was taken on their first week at college and on their last week of the term for comparative purposes and recorded in the spaces provided in the questionnaires. This involved taking their weight and height for further calculation using a BMI calculator. Students' weight in kilograms and height in metres were measured and calculated by dividing the square of the height into the weight measure and the result was the BMI in kilograms per square metre. Inference of nutritional status based on BMI (Kg/m^2) is; Normal weight is BMI =18.5-24.9; Underweight BMI <18.4 and Overweight is BMI >25. The formula for BMI is as follows;

Body Mass Index Formula

$$BMI = \frac{Weight}{Height^2}$$

Pre-testing the questionnaire

The questionnaire was pre-tested with 10 students who were selected randomly in order to establish the strengths and the weaknesses of the instrument. The identified gaps were addressed. The students who participated in the pre-test were not part of the study research sample. Though pre-testing does not guarantee success in the main study, it does increase the likelihood. However, some problems may not become obvious after piloting until the larger scale study is conducted.

This was then followed by the 24-hour dietary recall as described below;

The 24-hour dietary recall record

The 24-hour dietary recall is a form of a questionnaire that collects detailed information on all foods and beverages consumed by a participant in the past 24 hours. The 24-hour dietary recall forms were given to the participants, to fill in their daily food intakes in order to establish their daily nutrient intake. The students were asked to record everything they consumed every day including water. The 24-hour dietary recalls were done for seven consecutive days but were collected every day. The results of each student were placed together and computed on a spread sheet. The accuracy of the recall was highly dependent upon participant memory and the communication skills of both the participant and the researcher.

Quantitative data analysis

Data analysis was analysed using the IBM Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive statistics was used to summarise data. Correlation was also employed to verify the relationship between the social biographic factors and the participants' knowledge, attitudes and practices, responses on food

consumption patterns and academic performance. The data were presented in the form of frequency tables using frequencies and percentages to summarise the findings. According to McMillan & Schumacher (2006:150), statistics transform a set of numbers or observations into tables that describe or characterise data.

3.3.3 PHASE 2: QUALITATIVE RESEARCH METHOD

The inclusion of qualitative approach in this study was meant to understand the dietary patterns of college students through interviews, document analysis and participatory observation. Strauss and Corbin (1998:45) state that qualitative methods can be used to understand any phenomenon about which little is known. The qualitative approach probed on students' lives, lived experiences, behaviours, emotions, and feelings as well as social movements and organisational functioning. This allowed the researcher to gain new perspectives on things about which much was already known and to gain in-depth information that might have been difficult to get quantitatively. Lincoln and Guba (1985:120) mention that in qualitative approach research, problems tend to be framed as open-ended questions that will support discovery of new information. Similarly questions for this approach in the study were open-ended so that new ideas would be spelt out by the participants without the researcher bias.

Merrian (1998:2) points out that qualitative techniques increase the researcher's understanding of the phenomenon under investigation. The researcher was involved in the data collection process by way of face-to-face interviews and analysis of documents and had the opportunity to ask questions and probe until satisfied with the information from the respondents. Qualitative methods were used in this study to adequately describe or interpret a situation in relation to students' food consumption patterns.

3.3.3.1 Sampling strategies and sample

The second phase used a purposive sampling procedure for qualitative data. Purposive sampling is the most appropriate and dominant strategy in qualitative research (Patton, 2001:169). According to Lincoln and Guba (1985:174), purposive

sampling aims at capturing and describing the central themes or principal outcomes that cut across a great deal of participant variation. The sample selected for the purposes of in-depth qualitative data was 16 participants comprising of 14 students, 7 resident students and 7 non-resident students and 2 cooks.

Table 3.2 Sampling frame for qualitative data

Description of respondents	Number of respondents	Total number of respondents
Cooks	2	2
Resident	7	14
Non resident	7	
Grand total	16	16

3.3.3.2 Qualitative data collection instruments

The uses of the qualitative data instruments are illustrated in figure 3.3.

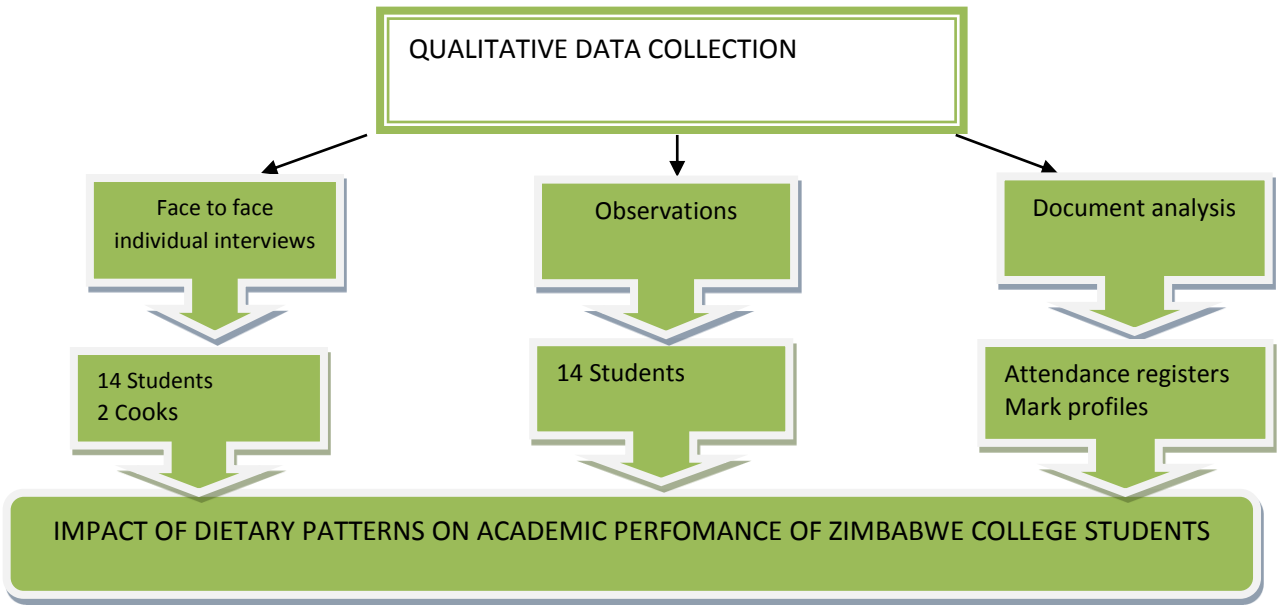


Figure 3.3 Qualitative data collection tools

Interviews

Interviews are preferred for their effectiveness in accessing people's perceptions, meanings, definitions and constructions of reality in their own terms (Cohen, 1978:265). Interviews were used to collect data on students and cooks' views because of their ability to provide data and insights that would otherwise be less accessible without face to face interaction (Gall, Borg & Gall, 1998:233). In this study, the students' experiences and understanding of their food consumption patterns were established through semi-structured interviews. The researcher interviewed sixteen participants which comprised of 14 students and 2 cooks with the help of research assistants. The researcher used semi-structured interviews which allowed the researchers to probe for views and opinions and to ask interviewees to clarify answers on the spot, to illustrate and expand on their initial answers (Gray, 2009:373). The use of the semi-structured interviews provided space for participants to articulate their priorities, opinions and ideas (Denscombe, 2010:192), in relation to the dietary habits of college students.

Interviews were used in this study since the study was set to unearth the perceptions of students on the impact of dietary patterns on academic performance. The researcher visited the college and explained to the students and the cooks, the purpose of the study before the interview days. A close relationship with respondents was created and this allowed the researcher to navigate through the respondents' day-to-day behaviour and encourage them to be free so that they become open and respond honestly to the interview questions. The responses were captured by means of note taking and were also recorded using a voice recorder in order to capture every detail from the interviews. The respondents consented to recording during the interviews.

Note taking during the interviews

According to Holloway and Wheeler (2002:237), note taking is an important activity, but it might disturb the participants. To limit this, I informed the participants that notes would be taken during the interview. One research assistant took notes so that non-verbal behaviour of the participants as well as the researcher's reactions and

comments could be recorded (Holloway & Wheeler, 2002:237). This method of collecting data acted as a back-up of the information obtained on the voice recorder. Note taking was done discreetly to avoid distracting the participants.

Voice-recording the interview

The following factors were considered by the researcher to ensure a successful interview:

- Permission to use the voice recorder was sought before the interview and all the participants voluntarily consented to its use;
- Use of the voice recorder enabled me and the research assistants to maintain eye contact with the participants;
- Preservation of participants' words during data collection was very important, and the following tips contributed to the success of the interview: The voice recorder was positioned close enough between the researcher and participants to record conversation;
- A sign written "do not disturb" was placed by the door to ensure silence and other members of staff would be reminded about the interview in progress;
- The voice recorder was tested prior to the interview to ensure that it was in good working order. The electric sockets in the room were also tested before the interview. Batteries were inserted in the voice recorder in case of electric power failure; and
- The audio tapes were labelled properly for the interview with dates and pseudonyms. This represented the date of the interview, the gender and number of participants interviewed.

Document analysis as another method which was used for data collection is discussed in the following section.

Document analysis

According to Miller (1997:27), document analysis could provide background information to some of the behaviours or actions of the participants which might be

difficult to understand using interviews and observations. McDonald (2001:196) defines documents as stuff that we can read, which relate to some aspects of the social world-official reports and which can also be private or personal such as letters, diaries and photographs which may not have been meant for the public.

In this research study, the attendance registers were used to establish how often students attended lectures and mark profiles to establish how students were performing in different subject areas. Documents that were used in this study were evaluated before use. McNeill and Chapman (2006:156) pointed out that when evaluating documents the following aspects should be checked by the researcher: All the documents that were used had no problems with authenticity since they were accessed from college authorities, attendance registers from the Faculty Deans, mark profiles from the Lecturers in Charge of different departments.

Observation

Observation, as a research technique, is as old as mankind and has served as the bedrock source of human knowledge. Cohen (1978:265) elucidates that it is a core research instrument that captures data in its natural setting. Rossman and Rallies (2003:98) define observation as the act of noting a phenomenon, often with instruments, and recording it for scientific or other purposes.

In this research study, the fourteen students who were interviewed were also observed in their daily college activities and data was recorded on the observation guide designed for the study (Appendix F). The researcher observed the students from 8am when they started their lectures up to 4pm when they dismissed, for the 20 days duration of the study so that they would get used to the researcher and behave in their normal way. The researcher used participant observation whereby students would not know that they were being observed to avoid faking as a way of impressing the researcher.

The researcher established the following ground rules; no use of mobile phones during the interview and to address one another with respect. These rules were necessary for the smooth running of the interview. The researcher put the

participants at ease and introduced the topic to be discussed. Questions were asked inductively, proceeding from general to specific using a semi structured interview guide prepared before the session. Ethical issues, in particular, confidentiality, were addressed. The participants were asked to keep the discussion confidential.

Qualitative data analysis

Qualitative data analysis was done in three stages as follows;

Data analysis in the field

According to Patton (2001:211), while still in the field focus is on deciding on aspects of data collected which are important for the research study and one should pick out and pursue important issues only. The researcher wrote comments on new ideas and insights as they occurred during data collection which were judged important in the light of research questions. These comments about new things became part of the intuitive data analysis (Strauss & Cobin, 1990:86).

Data analysis after collection

Thematic approach was used where data was grouped according to common themes and patterns as well as differences in the participants' responses. Analysis of qualitative data from interviews and observations mainly used categorised strategies, which according to Rossman and Rallies (2003:67); involve the identification of similarities and differences among the data, coding and sorting them according to categories. In this case, categories, issues or themes identified were compared and contrasted in order to interpret the data accordingly.

Data analysis at the presentation stage

At this stage, according to Miller (1997:28), data was analysed as they were presented and this took three forms. In the current study, the presentation and analysis of data was quite a complex process involving inductive analysis of data where critical themes emerged from the data. According to Rossman and Rallies

(2003:67), analysis of qualitative data from interviews and observations mainly uses categorised strategies, which involve the identification of similarities and differences among the data, coding and sorting them according to categories. In this study the analysis and presentation involved organising the data and breaking it into manageable units searching for common patterns. In the process it was easy to discover important ideas and what to report. Thus, a thematic approach was used where data was grouped according to common themes and patterns as well as differences in the participants' responses. There was also need for some creativity on the part of the researcher, since the main challenge was to place the raw data into logical meaningful categories and examining them in a holistic fashion. During this process of analysis of data the researcher started with the identification of main themes emerging from the raw data and recorded these. As the information was broken down into manageable chunks, the researcher then derived an audit trail, which helped to identify data chunks according to their provider and context. Data were synchronised, with the qualitative data playing the role of confirming or refuting quantitative findings and presented analytically as evidence to support or denounce grounding theories of this study.

Final data analysis

This study used sequential mixed approach which according to (Creswell, 2010:119), begins with collecting quantitative survey data from a large sample and after the interpretation of data from the quantitative and qualitative components, a synthesis was drawn which integrated the inferences made from the separate quantitative and qualitative data and findings.

3.4 TRAINING RESEARCH ASSISTANTS

Two Research Assistants with experience in working with college students and had some research experience were selected. The Research Assistants were selected from Matebeleland South Province. Training included explaining to the Research Assistants the purpose of the research and the Research Assistants' ethical responsibilities to the research participants. The ethical guidelines that were discussed during the training included consent, confidentiality, anonymity, harm to

respondents and privacy. Research Assistants were trained on how the sample of the study was going to be selected and how to administer the interviews for the study. After training, the Research Assistants participated in the pilot study to determine whether they had grasped the research skills.

3.5 DATA TRIANGULATION

Triangulation involves using multiple data sources in an investigation to produce understanding (Denzin, 1978:136). Patton (2001:67) reports that, qualitative researchers generally use triangulation to ensure that an account is rich, robust, comprehensive and well-developed rather than seeing this technique as a method for validation or verification. Triangulation of data was possible through the use of the mixed method and more than one data collection technique was used to enhance the validity of the data. Miller (1997:191) views triangulation as one method for increasing validity of findings through deliberately seeking evidence from a wide range of sources and comparing findings from those different sources. There was need to be as rigorous as possible to get the most out of the collected information and for results to be credible. The researcher was the key instrument. Quantitative and qualitative data were collected using questionnaires, food frequency questionnaires, 24-hour dietary recall records, interviews, observations and document analysis.

3.6 TRUSTWORTHINESS OF THE STUDY

According to Thomas (2010:318) trustworthiness is the corresponding term used in qualitative research as a measure of the quality of research. It is the extent to which the data and data analysis are believable and trustworthy. Trustworthiness includes credibility, transferability, dependability and conformability (Seale, 1999:45). Gray (2009:194) points out that some researchers; particularly those from the naturalistic tradition are more concerned about trustworthiness than validity and reliability checks.

3.6.1 Credibility

This study engaged multiple methods of data collection which included questionnaires, interviews, observations and document analysis as a way of triangulation and establishing credibility. In these methods that were used the researcher ensured that all respondents were interviewed on the same themes so that the responses would be compared. There was also a section that needed data from documents; this was done as an effort to triangulate data collected from documentary analysis that is documentation and records used in the study that include: raw data; records of analysis and data reduction; reconstructions and synthesis of data; 'process notes' (on how research and analysis are proceeding); and information concerning the development of instruments for data collection (Gay & Airasian, 2003:182).

The researcher and the research assistants audio-taped all the individual interviews for the research, typed all the transcripts of raw data, kept the tapes and notes based on the study analysis of data. These would be made available to assessors or any other interested readers. In order to qualify for transferability in this research, the population, sample and procedures had already been described in detail, and all the research findings and conclusions were described. By providing such details of the context, process and results as much as possible, those who would want to make use of this study, can therefore, determine for themselves if the results could be transferred and used in another setting.

Dependability also involves member checks (respondent validation) and reflexive journals (Lincoln & Guba, 1985 cited in Cohen et al., 2011:201). In line with this, the researcher had to go back to the participants to conduct a 'member check' audit with the participants as a way of heightening the dependability and conformability of the study.

3.6.2 Conformability

The concept of conformability in qualitative research is a way of ensuring that the study findings are the result of the experiences and ideas of the respondents rather

than the characteristics and preferences of the researcher. Throughout the data gathering process the researcher allowed the participants to listen to the audio-taped text after every interview in order for them to be able to comment and cross-check the accuracy of their captured views.

In this study, findings were confirmed through casual conversations in informal situations taking advantage of the fact that the respondents knew the researcher as a colleague and as their lecturer. As a way of conformability, the researcher had verbatim transcriptions from voice-recorded interviews to written scripts of every interview schedule. This was done in an effort to ensure that the views of the participants were accurately captured.

3.7 DELIMITATION OF THE STUDY

Due to the intensity of the study, the researcher selected a sample of 102 participants from Joshua Mqabuko Nkomo Polytechnic College through purposive sampling. The research was confined to Joshua Mqabuko Nkomo Polytechnic College only, for easy access to the participants because that was where the researcher lived and worked. The researcher was studying in South Africa at the time of conducting this study and having worked in Matabeleland South Province of Zimbabwe as a lecturer at JMN Polytechnic College, thus the college was conveniently chosen for its proximity. The researcher used resident and non-resident students in the college and two cooks from the college kitchen.

3.8 ETHICAL CONSIDERATION

One starting point in considering ethical concerns was to apply to the University of Venda Research Ethics Committee for Ethical Clearance which was granted before proceeding to fieldwork. Yin (2010:154) submits that by getting the backing of an academic institution, a researcher would earn the confidence of participants as this could help to establish rapport and address any reservations people might have about answering questions or sharing their private lives with the researcher. The researcher also sought permission from the Ministry of Higher and Tertiary

Education, Science and Technology in Zimbabwe, to collect data from the college and permission was granted by both the ministry and the college principal.

The researcher obtained a clear and fair, voluntary agreement by respondents to participant, with the leeway that if they so wished to withdraw from the research study they would be free to do so without being asked to give reasons or penalised by anyone. According to Gilbert (2008:150), informed consent is a general principle on ethical behaviour in research, generally taken to mean that those who are researched should have the right to know that they are being researched, and that in some sense they should have given their consent. The researcher informed participants verbally and then asked them to read and sign an informed consent form as a way of guaranteeing their willingness to freely participate in interviews (Frankfort-Nachmias & Nachmias, 1996:183).

On issues of anonymity and confidentiality, participants were informed verbally and in writing that their right to remain anonymous would be fully respected and that pseudonyms would be used in the final research report (Bogdan & Biklen, 1992:49). The researcher fully informed the study participants about the purpose of the study, the methods to be employed, what their participation in the research entailed, and the intended possible uses of the research (Schurink cited in de Vos, 2011:258; Marshall & Rossman, 2011:48). Participants were informed that if they were uncomfortable with any aspects of the research procedures, they were free to seek clarification from the researcher, or even to withdraw from participation.

The basic assumption in this research was the autonomy of the individual within the broader context of human relations. Participants were treated as human beings in the context of their social, political and professional environments. The researcher strictly focused on non-malfeasance which is the absence of harm to the research participants.

3.9 SIGNIFICANCE OF THE STUDY

The need to carry out this research was against the notion that, many research studies carried so far concentrated on diet in relation to health and not much has

been done in relation to academic performance. There was also limited research available that directly links a student's academic performance to their overall nutritional health. Additional substantive data was needed to prove that overall intellectual health is closely linked to a person's diet, rather than just another correlation fallacy. Most literature also suggests the apparent scarcity of research-based knowledge produced by nutritional specialists on how students experience, perceive and manage their diets (Worthington-Roberts & Williams, 2000:245). This dearth of in-depth information occurs against the backdrop of research evidence to the effect that students' nutrition has an essential influence on their academic engagement.

What further challenged the researcher was the fact that the few research studies on students' nutritional requirements are largely descriptive surveys that have tended to provide a general statistical picture of students dietary habits. For that reason, there was not much in-depth investigation undertaken in Zimbabwe's Higher and Tertiary Education Institutions on this issue. Therefore, this case study on dietary habits and nutrient intakes in some college was used to obtain basic data for the nutritional improvement and the proper establishment of dietary habits in college students through the analysis on the influence of dietary habits on nutrient intakes, rather than just the general statistical picture. This study therefore intended to fill this knowledge gap on the broad educational field of the study of Nutritional Education. This study will be useful in providing insights for educational administrators and policy makers to draw up strategies for managing students' dietary patterns from an informed position, based on students' own experiences and perceptions. The results may also be a tool in the fulfillment of the government of Zimbabwe's initiation of health for all by 2020.

3.10 CONCLUSION

This chapter has outlined the research paradigm, design and methodology, the research process, data collection procedures and data analysis procedures. The chapter also highlighted study delimitations and ethical issues. The next chapter focuses on data presentation, analysis and discussion of findings of the study.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

In the previous chapter, the research design, data collection methods and analysis procedures were described. This chapter presents the findings, and analysis of the data generated from the study. The data is presented and analysed guided by the research questions and objectives of the study. For each research objective data findings are presented from questionnaires, interviews and observation data in combination, with interview data playing the role of supplementing quantitative findings. The results are presented following themes that answer the research questions of the study which include the following sections:

- Demographic characteristics
- Food consumption patterns followed by college students
- Factors that influence college students' choice of food consumption patterns
- Effects of students' food consumption patterns on their academic performance

4.2 DEMOGRAPHIC DATA

The demographic characteristics of the respondents are presented in this section. According to The American Heart Association (2014:45), age, sex, weight, height and activity level determine how much one should eat. Analysis was done to determine which demographic variables correlate best with participants' responses to the matters that contribute to impact of dietary patterns on academic performance. The demographic variables in the analysis were age, sex, religion, background, family monthly income, accommodation, body mass index, physical activity and nutrition knowledge. Demographics for the cooks were academic qualifications, job description and religion.

4.2.1 Students' age

The age of respondents affects nutrient requirements and meals should be planned according to age group needs. In order to establish the ages of students under study, the age ranges were investigated and results are presented in Table 4.1.

Table 4.1 presents the age ranges of the participants who took part in the study.

Table 4.1: Students' age (n=100)

Age range	Frequency	Percentage
18-20	60	60%
21-25	24	24%
26-29	11	11%
30-35	3	3%
36 and above	2	2%
Total	**100**	**100%**

Table 4.1 presents results showing that a majority (60%) of the respondents were between the ages of eighteen to twenty (18-20) years and 24% were those between twenty one to twenty five (21-25) years old. The table also shows that eleven percent (11%) was in the twenty-six to twenty nine (26-29) age group followed by 3% of the 30-35 age group. The least (2%) were those above 36 years. It can be deduced that the 18-20 age group had the highest number since the students were just from high school and entering college for the first time. The majority (84 %) of the students were adolescents. Previous studies established that, most college students are adolescents moving towards adulthood and also in the period of active physical and mental growth, in which the nutritional condition greatly influences the health of lifetime (Astorg et al., 2004:527).

The college policy intake allows only those who are aged 18 years and above. These results suggest that the majority of the students were young adults who still had an active lifestyle of which the diet should provide sufficient energy while keeping to the

dietary goals of reduced saturated fats and increased carbohydrate foods (Tull,1996:61). Age groups from 26 and above had 16% which is an indication that some join college later in life and may already have families to look after and this may exert role overload on the students who are parents, thereby compromising on their dietary patterns.

The next question under demographic data required respondents to state their sex.

4.2.2 Sex distribution

Although each person has their own physiological requirements for each nutrient, sex is one of the main factors that influence nutrient requirements and consequently the dietary patterns. Men and women tend to have different dietary requirements due to their masculinity and femininity respectively. According to Tull, (1999:65), men generally need more energy giving foods than women. Women also tend to need more iron than men due to their menstrual cycle and child bearing processes such as pregnancy and breastfeeding (Murakami et al., 2008:24).

Table 4.2 presents sex distribution of the respondents.

Table 4.2: Students' sex distribution (n=100)

Sex	**Frequency**	**Percentage**
Female	50	50%
Male	50	50%
Total	**100**	**100%**

There was a balance (50%) in sex representation in this study. The balance of the representation of males and females was due to the fact that the students were selected at the ratio of 50 males and 50 females and the 100% return rate of the questionnaires. The sample was balanced to enable the comparison of dietary patterns by sex. Food choices is an area in which research has revealed consistent behavioural sex differences (Gough & Conner, 2006:1153), therefore the food

consumption patterns of male and female students were established. In agreement with Roos et al., (2001:24) college aged women are at high risk for body dissatisfaction and unhealthy weight control practices. According to Tull (1999:65), men tend to be larger overall in body size than women, so they have a higher metabolic rate and use more energy hence the need to establish the food consumption patterns of students according to sex. Sex is therefore one of the factors that are considered when making food choices.

The next section displays results of students' accommodation, in Table 4.3

4.2.3 Residential accommodation

Previous studies established that the type of accommodation that students live in while in college has great influence on the dietary patterns followed by students (Mpofu, 2009:88), hence the reason for establishing students' accommodation in this study. Table 4.3 shows the residential accommodation for both male and female respondents who participated in the study.

Table: 4.3: Students' residential accommodation (n=100)

Residence	**Frequency**	**Percentage**
Resident	50	50%
Non-Resident	50	50%
Total	**100**	**100%**

The respondents were selected with 50% resident and 50% non-resident students for equal representation in the study. The study established through documents provided by the college that the majority of the student population resides out of campus while only 21% of students were accommodated in college halls of residence. Manwa (2013:45) indicates that accommodating college students in halls of residents would make it easier to control students' dietary patterns to some extent especially with main meals.

According to (Hoffman et al., 2006:45) food consumption patterns may change especially if students are living away from home as lack of cooking facilities in the college hostels increases the need to eat convenience or take-away foods. This scenario has influence on students' dietary patterns and potentially high risk of obesity that compromises on cognition and academic performance.

4.2.4 Religion

It was imperative to establish individual religious affiliation when making food choices since religion has been implicated in defining foods consumed by different religious groups by restricting consumption of certain food products (Murcott, 1998:265). Religious groups prescribe foods according to their beliefs thereby shaping individuals food consumption patterns.

Table 4.4 displays the results that show the students' religious affiliations which now includes two cooks.

Table 4.4: Religion (n=102): students and cooks

Religion	**Frequency**	**Percentage**
Christianity	101	99%
Traditional	1	1%
Total	**102**	**100%**

Results in Table 4.4 show that almost all (99%) were Christians except for one (1%) who was of traditional religion. According to the cultural needs achievement theory postulated by Vygotsky (1978), it can be argued that people's choices of what to eat and drink is contingent upon the norms, values, belief practices and attitudes of their cultural community. This study found that a majority of the participants were affected by religious beliefs thereby limiting their choice of food variety as indicated later in Table 4.10. It is within the cultural setting in which students are embedded that relevant information on the choices of food that supports effective learning can be availed to them, some foods of which have been known in their culture from time

immemorial, and other foods that are currently in supply in the present cultural set up (Wardlow & Insel, 2000:564). Religious and cultural backgrounds play an important role in how people choose to eat food at different occasions.

Results show that some students had limited variety of food due to their religious affiliations such as those who did not take any meat not killed by someone from their religious circles. Studies according to Kinton et al., (2000:277) and Wardlow and Insel, (2000:564) have proved that having limited food choices may lead to lack of some essential nutrients. Some students indicated that they did not eat any form of meat but live on vegetarian diet because they were Seventh Day Adventists(SDAs). Interview data in this study confirm that some students did not take certain types of foods such as pork due to religious beliefs, yet those kinds of food provide the most needed nutrients at low cost. This was confirmed by the observation results which showed that almost all students who were observed had some nutritional related disorders such as physical signs of lack or malnutrition such as cotton mouth, red lips and dry skin (The Manual of Clinic Dietetics, 2012:113).

In order to establish how food environment may influence food choice, reference was made to the students' background.

4.2.5 Students' home background

Generally, dietary patterns of people living in rural areas and those living in urban areas are not the same due to exposure such as technological exposure and availability of foods. The home background information on where the students came from based on rural or urban is presented in table 4.5. The question on home background was directed to the students.

Table 4.5: Home background (n=100)

Background	Frequency	Percentage
Urban	53	53%
Rural	47	47%
Total	**100**	**100%**

The study revealed that 53% of the respondents had an urban background while 47% were from the rural areas. Both the rural and urban setups were fairly represented which can be an indication that the college also has a fair representation of the students. Several researches established that people living in urban areas consumed more unhealthy foods such as fast foods and soft drinks than in rural areas (Mpofu, 2009:85), but this regional difference has not been significant in this study as the same trend of take away foods has mushroomed in rural areas through entrepreneurial empowerment of the rural people. This study established that the majority of the students had fast foods as their favourite meals a trend which has not been familiar with rural background (see Table 4.12). The results of this study suggest that exposure to different types of foods in Zimbabwe has become similar to both rural and urban areas.

This was followed by the establishment of the student family monthly income levels as shown in Table 4.6.

4.2.6 Family monthly income

Family income is one of the most popular determinants of food choices and dietary patterns that can ultimately lead either under or over nutrition termed malnutrition. Table 4.6 highlights the family income brackets of the research respondents.

Table 4.6: Family monthly income (n=100)

Income	Frequency	Percentage
$495 and below	78	78%
$496 - $999	13	13%
$1000 and above	9	9%
Total	**100**	**100%**

Seventy eight percent (78%) of the respondents had monthly incomes of $495 and below comprised the majority, implying that the majority of the students were living below the country's poverty datum line which was pegged at $495 by October 2015, the time at which the study was conducted (Zimbabwe National Statistics Agency, 2015). These are regarded as low class and those with $496 to $1000 per month, which is middle class, were second with 23% while only 9% were of high class. It is expected that high-income and middle-income families generally have a much greater opportunity to purchase healthy foods than a low-income family (Mokdad et al., 1999:282). Low-income groups find it difficult to achieve a balanced healthy diet and are often referred to as experiencing food poverty or food insecurity (Dibsdall, Lambert, Bobbin & Frewer, 2003:76). However, data for this study shows that only 3% of the participants observed proper dietary patterns yet 21% of the students were in middle and high class combined, who if it was the trend the study could be having at least 21% who followed proper dietary patterns.

The relationship does not seem to be strongly confounded by socio-economic status only, although these factors are also related to dietary habits. This observation suggests that regardless of how much money a person may have, choice of food may be explained in terms of yet more complex factors beyond the economic variables, such as nutrition knowledge of which in this study only 3% had nutrition knowledge (see Table 4.9). (Mokdad et al., 1999:1519, reports that access to more money does not automatically equate to a better quality diet but the range of foods from which one can choose should increase.

To establish the nutritional status of the respondents, body mass index was used and explained in the next section.

4.2.7 Students' Body Mass Index (BMI)

BMI is a useful tool to judge if one is at healthy weight, based on the ratio of weight to height expressed in kg/m^2 with underweight from 18.4 and below, normal weight ranging from 18.5 to 24.9kg/m^2, overweight 25 to 29.9kg/m^2 and obese 30kg/m^2 and above.

Table 4.7 shows the number of students in different weight categories.

Table 4.7: Body Mass Index of students (n=100)

Weight	**Frequency**	**Percentage**
Underweight (18.4kg/m^2 and below)	27	27%
Normal weight (18.5 to 24.9kg/m^2)	5	5%
Overweight (25 to 29.9kg/m^2)	37	37%
Obese (30kg/m^2 and above)	31	31%
Total	**100**	**100%**

Table 4.7 shows that only 5% of the respondents were of normal weight while 27% were underweight and those overweight and obese put together comprised the majority with 68%. According to Cole et al., (2000:111) excess weight increases how hard the heart has to work and thus, it also raises blood pressure and blood cholesterol levels and can make a person more likely to develop diabetes, and this condition triggers continuous tiredness and one would lose concentration thereby negatively impacting on academic attainment.

Research from national surveys and longitudinal cohorts has identified the transition between adolescence and adulthood as a period of increased risk for excess weight gain (Worthington-Roberts & Williams, 2000:344). Furthermore, a growing number of

individuals are now becoming obese during adolescence and are exposed to a wide array of precursors to poor-diet quality and inactivity before the emerging adult years. Although sedentary behaviours may also be important determinants of weight status, little is known about these behaviours among college students (Mokdad et al., 1999:1519). Recent evidence has suggested that dieting frequency and unhealthy weight control may be associated with weight gain and poor-diet quality (Ebbeling, Pawlak & Ludwig, 2010:54).

The above results suggest that poor diet quality negatively impacts on academic performance. Normal body weight is associated with increased energy and ability to participate in many activities (Cole et al., 2000:113). The benefits that go with normal weight are associated with good dietary conditions for sound academic attainment and performance. Results of this study suggest that 68% of the students are at high risk of chronic diseases associated with overweight and obesity which consequently affects overall health and educational attainment.

Those who were underweight comprised 27% of the students and by implication, when students are underweight they are not healthy and it is a sign that they are not getting enough nutrients to keep a healthy body. The Zimbabwean population, students inclusive, has suffered food insecurity for the past three decades and has experienced lack of basic food coupled with insufficient monthly income rendering inability to source from neighbouring countries. According to Helwig, (2009:186) for students are usually underweight due to insufficient intake of food either because of lack of food or skipping meals because of pressure of work. When one is underweight, this is associated with tiredness, an overpowering urge to sleep all day and inability to do simple daily tasks. These are unfavourable conditions for sound academic performance since relationship between nutrition and academic work lies on the notion that a healthy body is able to maintain a healthy mind, which suggests that certain risk factors for a physically ill-health are also risk factors for cognitive impairment (Manwa, 2013:195). The next section looks at the number of students involved in physical activity, and results are indicated in table 4.8.

4.2.8 Physical activity

Exercise has been proven to have an effect on dietary choices and academic performance (LaFountaine et al., 2012:217). This implies that exercise keeps the mind alert hence promote academic performance Therefore, the types and amounts of foods that people take among other variables, depends on their recreational or physical activities.

Table 4.8 shows the number of students involved in physical and the number not involved.

Table 4.8: Students' Physical activities (n=100)

Do you do any physical activity	**Frequency**	**Percentage**
Yes	4	4%
No	96	96%
Total	**100**	**100%**

On the level of activity, only 4% of the students were active and the rest who comprised 96% did not participate in any physical activities. Therefore, the majority of the college students did not meet recommendations for physical activity. This research study confirms the assertion by other researchers that, during the transition to college, exercise and fitness levels appear to decrease, and are unlikely to improve as students' age increases, reflecting the potential continued decline in food consumption over time (Hoffman et al., 2006:44). Exercise improves metabolic efficiency in some people and increases nutrient requirement (Haberman & Luffey, 1998:191). An athlete will need a different nutritional requirement to that of an office worker due to the different levels of activity. The study established through interviews that the number one reason for not exercising in college was lack of time. The results suggest that students were at high risk of obesity and overweight due to lack of exercise yet they consumed a lot of energy foods but would not expend the energy. If energy intake in food exceeds the amount of energy expended by an individual, then

the excess is stored in the body as fat which is one of the major causes of obesity, a very negative condition for performance.

The students were also asked if they had nutrition knowledge and the responses were as presented in Table 4.9 in the next section.

4.2.9 Nutrition knowledge

Nutrition knowledge is one of the factors that could influence eating behaviour and plays a pivotal role in the adoption of healthier food habits (Bingham, et al., 1997:139). Therefore the relationship between nutrition knowledge and eating behaviors of college students was examined in this research study.

Table 4.9 shows the number of students and cooks who had and those who had no nutrition knowledge.

Table 4.9: Nutrition knowledge (n=102)

Nutrition knowledge	**Frequency**	**Percentage**
Yes	5	3%
No	97	97%
Total	**100**	**100%**

Findings regarding nutritional knowledge indicated that only 3% of the respondents were knowledgeable with the majority (97%) having no nutrition knowledge. These findings imply that the rest of the students were ignorant of what they should take and when. Austin et al., (2004:255) state that lack of nutrition knowledge is an indicator of poor nutritional practices.

According to a study carried out by (Mahshid, 2001:654), a group of students were asked to answer a questionnaire CANKAP (Comprehensive Assessment of Nutrition Knowledge, Attitudes, and Practices), which measured nutrition knowledge and eating behaviour and the students were not able to identify the food sources of

nutrients or nutrient functions. They could not use the daily food guide to choose foods, although they were aware of the importance of nutrient consumption. This scenario is consistent with the findings in this study in defining the relationship between nutrition knowledge and the eating patterns of students. Results from interviews in this study show that although students knew that they had to consume balanced diets, they did not have knowledge of the sources of food that provide such nutrients. The results suggest that students were having haphazard unbalanced meals which did not promote their learning as their bodies were not well nourished.

4.3 Food consumption patterns followed by college students

The researcher's interest to explore the food consumption patterns of students is addressed by the triangulated data from both quantitative and qualitative data. In addressing this research objective findings are presented from both questionnaire and interview data in combination, with interview data playing the role of supplementing quantitative findings. Food consumption patterns have been investigated through gathering information through quantitative and qualitative data. Data from interviews describes and explains the food consumption patterns adopted by both residential and non-residential students, from the point of the students' perceptions and those of the cooks. Food consumption patterns have been investigated through gathering information on the following sub-themes.

Sub-themes: -nutrient intake;
-food frequency; and
-eating patterns.

4.3.1. Nutrient Intake

To establish students' nutrient intake the students were asked to tick the foods from food groups they consumed in their daily diet. The results are indicated in Table 4.10.

Table 4.10: Students' frequency of daily nutrient intake (n=100)

Food groups	Response	Frequency	Percentage
Cereals and cereal products	Yes	100	100%
	No	0	0%
	Total	**100**	**100%**
Meat and substitutes (legumes)	Yes	63	63%
	No	37	37%
	Total	**100**	**100%**
Fruits and vegetables	Yes	12	12%
	No	88	88%
	Total	**100**	**100%**
Dairy and dairy products	Yes	31	31%
	No	69	69%
	Total	**100**	**100%**
Fizzy drinks	Yes	88	88%
	No	12	12%
	Total	**100**	**100%**
Fats and oils	Yes	100	100%
	No	0	0%
	Total	**100**	**100%**

The results on Table 4.10 indicate that all the participants, (100%) were taking carbohydrates and fats and oils in their meals, on daily basis, followed by fizzy drinks which were taken by 88%, while 63% included proteins, 31% took dairy and dairy products and lastly fruits and vegetables were consumed by only 12%. Results suggest that participants had no variety in their nutrients as they were consuming same type of foods limiting variety in their food intake. The results indicate that students lacked some nutrients such as vitamins as their diets had limited variety of fruits and vegetables and took too much of one nutrient which is carbohydrate. Taking too much of one nutrient leads to malnutrition and in this case taking too much of carbohydrates leads to obesity. According to Satalic, Baric and Keser (2007**:**410),

a healthy diet is one which includes a variety of foods that contain the quality and proportions of nutrients needed to maintain good health and to sustain life. The notion of food variety is essential because good nutrition contributes to good health which indirectly results in producing good academic performance.

In order to establish the particular types of foods that students consumed, a food frequency questionnaire was administered and yielded results shown in Table 4.11

4.3.2 Food Frequency

Food frequency questionnaire was used to establish how often students consumed particular foods.

4.3.2.1 Consumption of fats, oils and sweets

Table 4.11 shows the particular fats, oils and sweets consumed by the students.

Table 4.11: Frequency of consumption of fats, oils and sweets (n=100)

Food variety	Never	%	Sometimes	%	Once per month	%	Once per week	%	Once per day	%
Oils	0	0%	0	0%	0	0%	0	0%	100	100%
Sugars	6	6%	13	13%	4	4%	2	2%	75	75%
Sweets	5	5%	10	10%	13	13%	12	12%	60	60%
Soft drinks	13	13%	43	43%	15	15%	9	9%	35	35%
Candies	60	60%	11	11%	4	4%	2	2%	30	30%
Margarine	16	16%	74	74%	3	3%	4	4%	1	1%
Cakes	99	99%	1	1%	0	0%	0	0%	0	0%
Butter	80	80%	19	19%	1	1%	0	0%	0	0%
Sweet desserts	65	65%	24	24%	11	11%	0	0%	0	0%

Results in Table 4.11 indicate that much of the fats and oils are consumed through the intake of fast foods which include fried foods. Fats provide essential fatty acids, which are not made by the body and must be obtained from food. The essential fatty acids are linoleic and linolenic acid, important for controlling inflammation, blood clotting, and brain development. While fats and oils are essential for the proper functioning of the body and brain development it is imperative that they be taken sparingly and not in large quantities as they cause weight gain resulting in obesity (Niemeier et al., 2006:84). Butter and oils are examples of fats. Healthy sources of fat can be found in fish, nuts, and certain fruits and vegetables, such as avocados (Wardlow & Smith, 2011:786). Eating fish leads to better grades, the facts lie in the high concentrations of Omega-3 fatty acids found in most fish (Murakami et al., 2008:24). These fatty acids are essential to proper neural function.

The greater part of the brain is made up of fatty tissue, so it makes sense that eating fish and other foods high in fatty acids would help students focus more and to study more efficiently. According to Murakami et al., (2008:24) eating fish regularly can also reduce the risk of dementia as one gets older, another indication of its impact on brain health. Results shown in Table 4.11 reflect that only 3% ate fish once a week and the rest did not take fish at all while in college. Results of this study suggest that a greater percentage of students were taking unhealthy fats and oils in large quantities, and this may be the reason why 64% of the study participants are overweight. Overweight and obesity are risk factors for hypertension which is also a risk factor for the decline in cognitive abilities aggravated by a tendency of feeling weak and tired more often thereby losing concentration resulting in poor academic performance. These findings mean that students were taking too much fats and oils more than the recommended amounts as per “myplate” food guide.

4.3.2.2 Consumption of starchy foods (Cereals, breads and grains)

To establish how often students consumed starchy foods, the students were asked to indicate number of times they ate the foods indicated in Table 4.12. Starchy foods provide carbohydrates needed by the body for energy. Whole wheat, brown bread and cereals provide complex carbohydrates and are considered to be the good ones because they convert into energy and keep one going all day without fatigue. “*Sadza”*

(pap) and white bread are regarded as simple carbohydrates which usually consist of some type of sugar hence they give instant bursts of energy and when these quickly dissipate, energy levels drastically drop (Westover & Marangel, 2002:37). However, white bread gives iron which is needed for academic performance.

Table 4.12 shows the students' frequency of consumption of starchy foods (Cereals, breads and grains.

Table 4.12: Frequency (n=100) of consumption of starchy foods (Cereals, breads and grains)

Food variety	Never	%	Sometimes	%	Once per month	%	Once per week	%	Once per day	%
Sadza	0	0%	0	0%	0	0%	0	0%	100	100%
White bread	3	3%	0	0%	1	1%	3	3%	93	93%
Polished rice	6	6%	9	9%	3	3%	8	8%	74	74%
Brown bread	64	64%	22	22%	7	7%	0	0%	7	7%
Cornflakes	64	64%	30	30%	0	0%	0	0%	6	6%
Cerevita	87	87%	9	9%	0	0%	2	2%	2	2%
Whole wheat bread	81	81%	16	16%	2	2%	0	0%	1	1%
Oatmeal	99	99%	0	0%	0	0%	1	1%	0	0%
Mealie meal porridge	96	96%	3	3%	0	0%	3	3%	0	0%
Brown rice	84	84%	16	16%	0	0%	0	0%	0	0%

The next highest consumed were carbohydrates with "*sadza"* having the highest number of 100% followed by the consumption of white bread with 83%, polished rice with 54%. Brown bread, cornflakes, cerevita and whole wheat bread were taken with 7%, 6%, 2% and 1% respectively.

Data from the interviews concur with this pattern as illustrated by one of the cooks that:

> The students are just getting more of carbohydrates and proteins. No vitamins and other nutrients. And remember each meal should supply these nutrients but there is not a single meal that we serve them that provides all nutrients.

Students also echoed the same sentiments arguing that they are getting the same kind of food from the college dining which was more of carbohydrate and proteins.

Several research studies established that too much intake of unhealthy carbohydrates leads to obesity and cardiovascular diseases. A dense meal of carbohydrates can leave one feeling sluggish and tired as it increases the levels of tryptophan in the brain. According to Parker (1989:415), eating lots of refined carbohydrates like refined mealie-meal porridge, white bread and white pasta is not only bad for physical health, but it also leads to sleepiness, lethargy and mental dullness. However, whole grains tend to have the opposite effect and can lead to enhanced memory function and even better grades. Whole grain breads, wheat bran and brown pasta provide a quick energy boost while studying (Devine, Lloyd & Gray, 2006:267). They release glucose slowly into the blood stream keeping one mentally alert throughout the day.

Results from the 24 hour dietary recall reflect that although the students took carbohydrates more than other nutrients, they did not meet the minimum dietary requirements for enough energy supply. Thus, the majority of the students have food consumption patterns packed with carbohydrate than other nutrients. These results suggest that students had unbalanced diet and were at risk of overweight.

4.3.2.3 Consumption of meat, fish, eggs and nuts

Meat, fish, eggs and nuts provide the body with proteins and are crucial for muscle growth. Adequate amounts of protein can be met by regularly eating any type of meat and can also be found in lentils and beans, as well as soy products. Table 4.13 shows the frequency at which students consumed protein giving foods.

Table 4.13 Frequency (n=100) of consumption of protein foods, Meat, fish, eggs and nuts

Food variety	Never	%	Sometimes	%	Once per month	%	Once per week	%	Once per day	%
Beef	2	2%	14	14%	3	3%	2	2%	77	77%
Chicken	1	1%	24	24%	0	0%	25	25%	50	50%
Eggs	41	41%	33	33%	11%	11	6%	6%	9	9%
Beans	11	11%	35	35%	2%	2	50%	50%	2	2%
Fish	31	31%	55	55%	11%	11	3%	3%	0	0%
Nuts	0	0%	98	98%	0%	0	2%	2%	0	0%
Pork	100	100%	0	0%	0%	0	0%	0%	0	0%

Proteins were ranked third with the meat group having beef being the most consumed food item with 77% consuming red meat once per day. Red meat like grass-fed beef is a source of protein and also an excellent source of vitamin B12, which is vital for healthy brain function. Smith et al., (2011:98) in their study, report that people with high levels of markers for vitamin B12 deficiency are more likely to score lower on cognitive tests, as well as have a smaller total brain volume, which suggests a lack of the vitamin may lead to brain shrinkage. Protein should be taken in the right proportion since it is a vital part of brain growth during early development. Neurons, though mostly fat and fueled by glucose, they use proteins to communicate with one another and control what happens throughout the body. The enzymes, neurotransmitters and hormones that carry signals and help accomplish the tasks the brain dictates are made from protein. Protein however, has unique abilities to bend, twist and shape itself into the structures that allow enzymes to work and are vital to brain health (Barker, 2002:455). They aid digestion so that the brain gets the nutrients it needs, but they also work inside the brain too, breaking down plaque, creating neurotransmitters and much more. According to (Smith et al., 2011:95) too much animal protein can put some strain on the kidneys and deliver much more fat than one needs. However, plants are not devoid of protein. Nuts, seeds, legumes, lentils, beans and some whole grains are good sources of healthy proteins. Protein

deficiencies slow down development and lower cognitive function. Lack of proteins depletes the chemicals in the brain that control mood, appetite and energy levels (Barker, 2002:455), thus compromising on academic performance.

Chicken was consumed by 50% of the students while only 9% consumed eggs once per day. According to Azhar, Zubaidah, Norjan, Zhuang and Tsang (2013:121) besides chicken and eggs being sources of protein, they have been found to provide high levels of choline naturally in addition to many other nutrients. They went on to say that choline is a macronutrient that is important for liver function, normal brain development, nerve function, muscle movement, supporting energy levels and maintaining a healthy metabolism. Nutrition experts recommend getting higher levels of choline in order to boost brain function and to retain memory. Choline deficiency is associated with low energy levels, fatigue, memory loss, cognitive decline, learning disabilities, muscle aches, nerve damage and mood changes disorders. Thus, the results of this study suggest that half the students were having chicken at least once a day, which is an indicator for sound academic performance if coupled with other nutrients to balance the diet.

Only 2% had beans at least once per day which is a very insignificant number. Tiemeier et al., (2003:14) assert that legumes such as beans, chickpeas, kidney beans and lentils contain substantial amounts of protein which power the brain and make studying a breeze. Willet et al., (2010:443) reiterate that beans are under-recognised yet they are economical. Beans stabilise glucose (blood sugar) levels. Since the brain is dependent on glucose for fuel and cannot store the glucose, it relies on steady stream of energy, which beans can provide, hence the need for students to consume at least half cup of beans per day. In addition, legumes of all varieties contain high concentrations of folic acid which improves ability to recall information.

Nuts had 0% rate of intake per day though 9% indicated consumption of nuts once per week, it is still not sufficient, implying that none took nuts regularly yet like fish, many types of nuts such as almonds and walnuts contain high levels of essential fatty acids that help the brain to perform optimally (Meyers, Sampson & Weitzman,1991:1123). As an added benefit, Prinz, Roberts and Hantman (2013:48),

posit that nuts contain a good amount of iron and also provide oxygen to the brain which increases mental alertness and ability to retain information. A minimum of 20grams of nuts per day is recommended for optimal brain health. Since nuts are high in unsaturated fat (good-fat) and calories, they make great sources of energy as well. The students' food consumption patterns were comprised of low protein. These results suggest that students' protein supply was not met which results in them not being able to concentrate in class since protein boosts brain function, the organ used in information processing in learning.

On the whole, 18% of the students consumed milk as relish with pap and in tea and none consumed yoghurt and cheese yet yoghurt, as well as cheese consumption, has been shown to aid cognitive function in both younger adults and the elderly. Emerging evidence suggests that milk products may play a beneficial role in improving cognitive function and thus aid in thought processing and mental ability (Prinz et al., 2013:49).

4.3.2.4 Consumption of milk and milk products

Yoghurt and cheese consumption has been shown to aid cognitive function in young adults and the elderly. Emerging evidence suggests that milk products play a beneficial role in improving cognitive function and thus aid in thought processing and mental ability (Elwood 2005:503). Frequencies in Table 4.14 show how often students consumed milk and milk products such and yoghurt, cheese and milk in tea or as relish.

Table 4.14 Frequency (n=100) of consumption of milk and milk products

Food variety	Never	%	Sometimes	%	Once per month	%	Once per week	%	Once per day	%
Milk	16	16%	65	65%	65	65%	1	1%	18	18%
Yoghurt	94	94%	6	6%	6	6%	0	0%	0	0%
Cheese	99	99%	1	1%	1	1%	0	0%	0	0%

Previous studies have established that a high-dairy diet improves working memory performance while lower consumption of milk and milk products has been associated with poorer cognitive function and an increased risk for vascular dementia (Crichton, et al., 2012:36). Increased serotonin level from milk has beneficial effects on mood and cognitive function, including information processing (De-Haan, 2007:511). It can be deduced that milk products may be beneficial for the prevention of cognitive decline. Results of this study suggest that very few students consume milk and milk products on a daily basis which puts them at risk of cognitive function.

4.3.2.5 Consumption of vegetables

According to a study conducted by Anding et al., (2000:321), most vegetables had positive effect on memory retention, meaning they most likely help achieve better grades. Spinach does not top the list of popular vegetables, but it does make the cut when it comes to foods proven to boost brain power, and that could mean better grades. Spinach is full of folic acid and has even been shown to reverse memory loss (Astorg et al., 2004:39). Table 4.15 shows the frequency at which students consumed different types of vegetables as indicated in the table.

Table 4.15 Frequency of consumption of vegetables

Food variety	Never	%	Sometimes	%	Once per month	%	Once per week	%	Once per day	%
Cooked leafy vegetables	16	16%	14	14%	6	6%	53	53%	11	11%
Spinach	98	98%	2	2%	0	0%	0	0%	0	0%
Vegetable salads	92	92%	5	5%	1	1%	1	1%	1	1%
Cabbages	83	83%	8	8%	4	4%	4	4%	1	1%
Butter nuts	86	86%	14	14%	o	o%	0	0%	0	0%
Carrots	97	97%	3	3%	0	0%	0	0%	0	0%
Pumpkins	88	88%	5	5%	0	0%	0	0%	0	0%

Only 11% consumed cooked leafy vegetables per day while 53% consumed them once per week which is very insufficient. Green leafy vegetables are one of the best food sources of magnesium and magnesium citrate benefits brain cell receptors to speed the transmission of messages, while also relaxing blood vessels, which allows more blood flow to the brain (Selkowitz, 2000:252). Getting adequate vegetables, especially cruciferous ones which include broccoli, cauliflower, cabbage and dark leafy greens, may help improve memory (Torres & Nowson, 2007:23).

Eating these vegetables raw is the best way to get the optimal nutritional benefit, since cooking them often cooks out the nutrients the body and the brain need most (Taras, 2005:75). The results of the study suggest that students were not taking the most nutritious vegetables which they can even eat without cooking. Therefore students' consumption patterns lacked the most needed vegetables in their diet. It is suggested that students include vegetables in their daily meals for proper functioning of their brains.

4.3.2.6 Consumption of fruits

Table 4.16 highlights the frequency of fruit intake by students.

Table 4.16 Frequency (n=100) of consumption of fruits

Food variety	Never	%	Sometimes	%	Once per month	%	Once per week	%	Once per day	%
Apples	91	91%	2	2%	0	0%	0	0%	7	7%
Bananas	90	90%	5	5%	3	3%	1	1%	1	1%
Berries	90	90%	5	5%	3	3%	1	1%	1	1%
Oranges	89	89%	10	10%	1	1%	0	0%	0	0%
Pears	99	99%	1	1%	0	0%	0	0%	0	0%
Fruit juice	89	89%	11	11%	0	0%	0	0%	0	0%
Avocados	100	100%	0	0%	0	0%	0	0%	0	0%

Fruits were next in ranking, with 7% consuming apples and none consumed avocados. Pallesen et al., (2009:1079) points out that the peel of the apple includes a powerful antioxidant called quercetin that enhances memory function. None of the students consumed avocados at all. The avocado is a fatty fruit, a mono-unsaturated fat, which contributes to cardiovascular health and healthy blood flow.

However, the results of this study reflect that all students did not benefit from the intake avocados. Every organ in the body is dependent on blood flow (Dabas et al., 2013:6137). This suggests that promoting cardiovascular health is promoting good flow of blood to the organ system, which includes the brain and healthy blood flow means a healthy brain (Taras & Potts-Datema, 2005:76). Avocados lower blood pressure and a lower blood pressure promotes brain health (Dabas et al., 2013:6137). The results of the study suggest that students' food consumption patterns had insufficient fruit intake with just a few taking apples and none of the other fruits regardless of their importance to brain function. Based on the results of the questionnaire and interviews up to this point, it is clear that generally students had food consumption patterns that represented unbalanced diets. The cooks also reiterated that although the prescribed meals seemed adequate for the students, they were limited in terms of nutritive value and in terms of variety to cater for the supply of all necessary nutrients to balance the diet. In addition, based on by the students' penchant for beef and chicken and not vegetables for their relish as reported by the cooks, resident students contributed to food consumption patterns that neglected other important nutrients.

The frequency of water intake was next investigated and Table 4.16 shows the frequency at which students took water per day.

4.3.2.7 Water intake

Medical research studies discovered that less intake of water causes headaches and loss of concentration as the brain cells are starved (Nelson & Cox, 2012:113). Thus, students like any other human beings are expected to meet these demands.

Table 4.16 shows the amount of water taken by students per day.

All the students (100%) under study did not meet the recommended amount of 2 litres of water per day. Barker, (2002:465) notes that many diets recommend about 8 glasses of water (2 litres) a day and not many people follow this advice. Water is essential for every bodily function such as digestion and elimination of waste products out the body cells (Barker, 2002:345).

Table 4.17 Frequency of water intake per day.

Amount of water	**Frequency**	**Percentage**
Less than 2 litres	100	100%
2litres or more	0	0%
Never	0	0%
Total	**100%**	**100%**

Drinking at least 8 glasses of water will help one's diet as it transports nutrients throughout the body. Water can, therefore, be regarded as an essential formula for health and for the body to perform its necessary functions thus; it should be part of everyone's diet. The results suggest that all students were not having enough of the recommended daily water intake, thereby starving their brain cells and consequently, loss of concentration.

The next section presents results showing students' eating patterns.

4.3.3 Eating Patterns

Eating patterns involve the types of foods eaten and the number of times one eats in a day. In the next section students were asked whether they accessed their favourite meals regularly and the following responses were recorded in (Table 4.18).

4.3.3.1 Access to favourite meals.

When one gets access to their favourite meals they enjoy eating the food and Table 4.18 shows whether students got their favourite meals or not.

Table 4.18 Access to favourite meals (n=100)

Access to favorite meal	Frequency	Percentage
Yes	13	13%
No	87	87%
Total	**100**	**100%**

On the whole 87% of the students did not have access to their favourite meals more often while only 13% did. Levitsky, Garay, Nausbaum, Neighbors and Dellavalle, (2006:1009) suggest that access to favourite meals increases food intake in the short term. This may be relevant because it will make it easier for students to maintain energy balance in the long term. However, favourite meals may be unhealthy and because students like the foods, they may over eat and develop overweight but if the meals are healthy they may help prevent the development of overweight. According to Drewnowski (1992:371), eating food that one enjoys can cheer up and make one feel content and relaxed.

Eating is one of the pleasures of life and if possible students should consume foods they enjoy and avoid those they dislike. It has been shown that eating favourite foods can stimulate the release of ß-endorphins, which are known to enhance mood (Shi, 2005:1446). However the attractiveness of a food is not only related to its sensory properties, it also depends on how hungry one is, previous experience of eating the food and the social circumstances in which it is consumed. When students do not get favourite meals they do not enjoy eating and that compromises on the recommended nutrient intake. The next section sought to establish what students' favourite meals consist of.

4.3.3.2 Favourite meal constitutions

It was necessary to explore what students' favourite meals consisted of, in order to establish the nutritive value of such kind of food. Constitutions of students' favourite meals are reflected in the percentages provided in each column in Table 4.19.

Table 4.19 outlines the students' favourite meals.

Table 4.19 Favourite meals (n=100)

Meals	**Frequency**	**Percentage**
Indigenous foods	20	20%
Fast foods	63	63%
Snacks	17	17%
Exotic foods	0	0%
Total	**100**	**100%**

The majority of the students comprising 63% of the participants indicated fast foods as their favourite meals, and these tend to have too much fat and empty calories which, in turn, may be the major cause of a large number of students who were obese and overweight, as indicated in Table 4.7. From the participants' responses, 25% indicated preference for indigenous foods whilst 17% indicated preference for snacks. Manwa (2013:65) reports that due to western influence on the Zimbabwean population, especially in colleges, students have developed a preference of wrong unhealthy food such as fast foods. However, this kind of food has no value to the students' nutrition. In local food outlets, the same kind of food is prepared daily. Therefore, students tend to consume the same type of food repeatedly, thereby denying them of variety in the process. The students' food consumption patterns were mainly fatty foods with empty calories hence, students lacked variety. Thus, students were plying the mobile kitchens for their meals and practicing wrong dietary patterns in the process.

When cooks were asked about meals they considered to be students' favourite meals, they indicated rice and chicken; however, students may have seemingly appeared to prefer rice and chicken, yet this could have been the fact that of all the meals prepared by the college, it was a meal they considered as better than all the meals. From what the researcher observed, students did not really enjoy eating the rice and chicken as they threw a lot of it in the bin.

4.3.3.3 Number of meals taken per day during the week

Nutritionists and dieticians recommend at least 3 meals per day in order to meet daily nutrient requirements. In order to establish whether the students under study were meeting daily nutrient intake the number of meals they took per day were explored.

Table 4.20 shows the number of meals taken by the students per day during working days.

Table 4.20 Number of meals taken on a day during working days (Monday to Friday) (n=100)

Number of meals per day	Frequency	Percentage
3 meals every day	31	21%
2 meals	48	48%
1 meal	21	31%
Total	**100**	**100%**

Table 4.20 indicates that 31% took 1 meal per day while 48% respondents indicated that they took two meals per day and 21% took three meals per day during week days. Akbaraly, Singh-Manoux, Marmot, and Brunner (2009:147) purport that some students skip meals in order to achieve and maintain their desired body size. These results suggest that students were taking insufficient meals to meet the Recommended Daily Allowances during the week which could compromise on their concentration span. The following section explains why students took the number of meals they took during week days.

Table 4.21: Reasons for the number of meals taken per day (n=100).

Reasons	Frequency	Percentage
Meals are provided by the college on a daily basis	29	29%
Have no time to prepare breakfast	17	7%
I do not have enough food supplies	27	27%
Do not have enough time to take more meals per day	16	16%
Because I want to lose weight	8	8%
I only eat whenever I feel hungry	3	13%
Total	**100**	**100%**

The highest number of students (29%) indicated that the number of meals they take per day is determined by the college followed by 27% who indicated that it was because they did not have enough food supplies. Those are likely to be the ones who indicated having one meal per day. The other 16% indicated that they had no time to take more meals per days. Other students also indicated that they wanted to lose weight while others said that they only ate when hungry and others had no time to prepare breakfast in the morning. The results suggest that the college time table was the most determining factor of the number of meals taken by students during the week especially resident students and for the non-resident students it was mainly due to lack of funds and time to prepare meals.

Recent studies claim that increasing meal frequency does not increase metabolic rate when dietary intake is matched. In other words, total calories consumed count more than frequency. Consumption of a certain number of meals that allows one to meet nutritional needs consistently each day is more important (Cameron, Cyr & Doucet, 2010:1101). Historically, literature posits that adequate nutrient intake cannot be met with less than three meals per day. Resources allowing, colleges should be able to supply students with regular meals.

Frequency of food consumption during weekends was next investigated and the following results were established as recorded on Table 4.22.

4.3.3.4 Number of meals taken on a day during weekends (Saturday and Sunday)

Table 4.22 shows the number of meals taken by students during weekends.

Table 4.22: Number of meals taken during weekends (n=100).

Number of meals per day	Frequency	Percentage
1 meal	21	21%
2 meals	56	56%
3 meals	20	20%
4 meals	3	3%
Total	**100**	**100%**

During weekends 21% of the students took one meal per day, 56% took two meals per day and 20% took three meals per day while only 3% took 4 meals per day. The results show that a larger number of respondents took two meals per day during the week days and during weekends as well. These findings suggest that most students did not get the recommended daily meals, since a person should get at least 3 meals a day. No one meal can supply the required daily nutrient intake

4.4 Factors that influence college students' choice of food consumption patterns

In order to explore the factors that influenced food consumption patterns of students the objective was addressed by the triangulated data from both quantitative and qualitative data. In addressing this research objective findings are presented from both questionnaire and interview data in combination, with interview data playing the role of supplementing quantitative findings. Factors that influenced food consumption patterns have been investigated through gathering information through quantitative and qualitative data. Data from interviews describes and explains the factors that influenced food consumption patterns adopted by both residential and non-residential students, from the point of the students' perceptions and those of the cooks. Factors

that influenced food consumption patterns were investigated through gathering information on the following sub-themes.

Sub-themes:

- Inconsistent standard feeding times among resident students negatively influenced students' food consumption patterns;
- Religious beliefs influenced food consumption patterns for some students;
- Study-related stress led to disorganised and erratic feeding schedules among both resident and non-resident students; and
- Availability of funds.

4.4.1 Influential factors of food consumption patterns

In order to establish the factors that were considered by the students in making food choices, students were asked to tick the factors that applied to them in the questionnaire. Table 4.22 shows questionnaire findings on considerations for food consumption patterns of college students who under study.

Table 4.23 Considerations when making food choices (n=100)

Food choice considerations		Frequency	Percentage
Cost of food	Yes	90	90%
	No	10	10%
	Total	100	100%
Favourite meals	Yes	88	88%
	No	12	12%
	Total	100	100%
Food availability	Yes	45	45%
	No	55	55%
	Total	100	100%
Nutritive value	Yes	16	16%
	No	84	84%
	Total	100	100%

When making food choices, cost of food was ranked highest with (90%) while 88% indicated that they considered favourite meals, 45% food availability and only 16% considered the nutritive value of food. Issues of income, cost and access to food have been studied before and cost in particularly was found to be an important factor in what people choose to eat. In some cases, the least healthy food choices with high-fat and high-sugar foods tend to cost less per calorie than healthier alternatives like fruits and vegetables (Akbaraly et al., 2009:149). Paeratakul et al., (2003:1333) in their research found out that most students who have a lot to spend on food, take junk meals and snack on junk snacks leading to obesity. Cost of food could make it difficult for some lower-income consumers to afford healthier options, though it is worth noting that nearly all and not just those of low-income, fail to meet dietary recommendations due to other factors such as lack of nutrition awareness. Results also suggest that quite a good number did not consider nutritional value of foods and, instead, just took what was available, thus indicating poor nutritional practices.

When participants were interviewed the following responses were established;

4.4.2 Inconsistent standard feeding times among resident students negatively influenced students' food consumption patterns.

Interview data from the participating resident students revealed institutional meal times which students could not catch up with due to extremely busy daily study schedules which led to inconsistent eating patterns. Consequently students tended to sometimes miss meals when they go late to the dining hall. This is confirmed by one of the cooks,

> This place is too small to serve the more than 200 students in the college so students queue for long hours in order to get food. Although we start serving from 12pm but you will discover the students will only come after 1pm because they will be having lectures up to 1pm.

One student said:

> I can say ee the college meal times, food available, free times that I get because we are very busy throughout the day and our lectures sometimes spill into lunch as

> lecturers would say, ah let's use this hour to finish our lecture. Sometimes we are called for lectures at lunch.

This tendency contributed towards poor eating habits as the students reported that they were affected by other college activities such as lectures being held during lunch hour. This seems to suggest that the lecturers in the college also contributed towards the poor food consumption patterns of the students as they did not respect the students' eating schedules. Literature states that most professionals, apart from health personnel and nutritionists, lack even basic knowledge about human nutrition and its relationship to academic attainment (Otero, Aguirre, Porcayo & Fernandez, 1999:113). To effectively manage students in nutrition education activities, such professionals require some basic training in nutrition.

It should be noted that it is of paramount importance that students have their meals regularly in order to refuel their used up energy during learning. Therefore college authorities should respect students' meal times and promote healthy food consumption patterns. The lecturers exerted continuous pressure on the students throughout the days and seem not to understand the importance of proper food consumption patterns for the students to perform well in class. According to Abou-Zeid et al., (2013:2245), continued pressure can drain the body of essential proteins and B complex vitamins especially at examination time when the last thing any student would want to worry about is a balanced diet. As a result, the body loses its nutritional balance and the students feel tense, moody, exhausted, less confident and even depressed. All these are signs of a vitamin B complex deficiency (Rogers, 2001:139). The notion of good food behaviour is essential because good nutrition contributes to good health which indirectly results in producing good academic performance.

Students also complained of eating schedules being too spaced. A student echoed that:

> We starve here madam, because we have tea in the morning at 6am then lunch at 1pm and nothing in between and I can't learn... And I do not even follow what is being taught because I will be feeling dizzy and weak especially from 11am up till lunch.

They therefore would take supplementary meals at any times that were not designated for specific meals. It was imperative for the college to give students some food in between morning breakfast and lunch. However because of financial inadequacy the college could not do so. This had serious negative impact on the students' health status and consequently inability to concentrate under such conditions where students would feel dizzy and weak as reported above.

4.4.3 Religious beliefs influenced food consumption patterns for some students.

Four students reported that their choices of food were largely influenced by their religious beliefs. They indicated they did not eat certain foods such as pork because they were forbidden by their churches. The same students also argued that their cultures prohibited them from eating beef or meat slaughtered by people who did not belong to their tribe. They believed that eating any such animal flesh was spiritually unclean. Following is a remark by one of the students:

> Well I can say my major issue is to eat food that is clean as according to the bible, I do not eat pork or any meat whose source has just died without being killed.

Another student shared the same sentiment:

> I also do not eat certain foods like pork because of my church and culture. I also do not eat meat killed by people who are not of our culture and it's very difficult to get meat so I rarely eat meat.

This student seemed to share the same culture with the one, who stated that:

> I am also a Christian so I do not take pork and I also do not eat meat killed by someone not of the Remba tribe so I just buy meat from Halaal butchery because they use the Remba people to slaughter their animals.

The Remba people are a tribe from Mberengwa district in Zimbabwe, who have a unique culture that believes they have to kill their own animal for meat.

Thus, literature supports this assertion that, dietary habits are the habitual decisions an individual or culture makes when choosing what foods to eat (Kim et al., 2003:12). According to the cultural needs achievement theory postulated by Vygotsky (1978:43), it can be argued that each culture holds some food preferences and some food taboos hence it shapes food consumption patterns for its followers. Chikomba (1986:85) states that cultural influences lead to the difference in the habitual consumption of certain foods and in traditions of preparation, and in certain cases can lead to restrictions such as exclusion of meat from the diet. By implication such students may risk the danger of lacking crucial nutrients from such animal food sources, especially where they may fail to find substitutes from other animal products which tend to be more expensive in Zimbabwe, granted the financial constraints they indicated.

Furthermore, these cultural definitions seem to be consistent with the social status of the members of a particular society. In the African culture for example, it is prestigious for the chiefs or political leaders to eat pangolin (a rare to find animal) meat which is in no way accessible to the general populace. This means that within the confines of this culture, the belief that runs is that pangolin meat is a preserve of the powerful and the wealthy. Hence, it can be inferred that the choice and access of a particular diet is a socially constructed phenomenon.

While cultural definitions on the perceived food worth taking or not seem to regulate people's dietary patterns, when such socially-constructed perceptions ignore the intrinsic value of the foods people eat in terms of nutritional value, there appears to be a situation whereby certain people can be deprived of foods that may be important to the proper functioning of their bodies and minds. In the context of this study, the students should make choices of certain foods within the context spaces that define diets. The researcher further argues that granted the dynamism that characterises culture, the rigid beliefs some people hold can be outgrown by accepting the fact that the world is in a constant state of flux, implying that perceptions about food choices can be altered.

This observation seems to suggest that regardless of how much money a person may have, choice of food may be explained in terms of yet more complex factors

beyond culture and the economic variables. In as far as dietary patterns of college students are concerned, it can be argued that the interplay of the social cultural and economic factors poses some complication in explaining what and how students eat, both inside and outside residence. One cook argued that:

> It was difficult to plan meals for a large group taking into consideration their varied needs and preferences especially with limited budget for meals.

Evidence shows that in most African countries people have so wide a range of food choices determined by different cultural groups' preferences that it may be difficult to prescribe well-patterned diets on a particular institution (Huang et al., 2003:52). Some may also have been on therapeutic diets such as those for diabetes, hypertension and other chronic diseases that needed dietary management. Thus, during interviews one of the cooks indicated that they do not cater for individual special diets,

> It's only a standard menu and we don't consider any special diet as we do not have the resources to do so. We are actually struggling with the basic meals.

A non-resident student confirmed that:

> This is why those who take special diets or do not eat certain foods were excluded from residents' accommodation. …because they say they cannot cater for individual's needs, so those who do not eat meat or are on special diets are not in college residence. I am a vegetarian because in SDA we don't eat meat but substitute with foodstuffs that provide proteins such as tofu.

4.4.4 Study related stress led to disorganised and erratic feeding schedules among both resident and non-resident student.

All students interviewed reported they underwent a very strenuous study schedule at college, to the extent that the last thing they could think of was eating. It is not an exaggeration to claim that college students are confronted by a multitude of stressors as evidenced by the responses given during the interviews such as financial constraints, study stress to mention a few. Different stressors such as time

management, financial problems, sleep deprivation, social activities and for some students even having children can all pose their own threat to a student's food consumption patterns and consequently academic performance (Ivanovic et al., 2010:59). Stress appeared to alter these students' overall food intake in two ways, resulting in under or overeating, which may be influenced by stressor severity. On the side of students who were under-eating one student participant stated that due to study related stress, she lost appetite and as a result would skip meals,

> When I am too busy most of the times I lose appetite and can't eat and sometimes I even forget to eat.

According to Rogers and Pilgrim, (2003) cited in Mental Health Foundation, (2011:117) eating is thought to be suppressed during stress, due to anorectic effects of corticotrophin releasing hormone (CRH) and increased during recovery from stress, due to appetite stimulating effects of residual cortisol. CRH is produced in an area of the brain that controls body temperature, hunger and thirst. CRH is termed the *stress hormone* because it is secreted in higher levels during the body's response to stress and is responsible for correcting several stress-related changes in the body. Sungthong, Mo-suwan and Chongsuvivatwong, (2002:117) point out that one of the main issues with stress is that it can cause unhealthy eating habits and places emphasis on the consumption of fruits and vegetables because they contain dietary antioxidants which may improve cognitive function during stress. Stress-induced eating may be one factor contributing to the development of obesity (Huang et al., 2003:52). Thus, the establishment of functional foods that correctly regulate stress response must be firmly based upon scientific knowledge and legal regulation for students to effectively manage their dietary patterns during stress.

On the other hand where over-eating was established, contrary to the above sentiment another student indicated that she eats a lot when stressed with school work as a result, she ate anything at any time and had this to say,

> And also when I am stressed with a lot of schoolwork or maybe after failing an assignment I find myself wanting to eat and eat not because I will be feeling hungry but I feel relieved by eating.

This is an indicator of poor nutritional practices which result in students consuming more calories than needed hence the onset of overweight and obesity. Additionally, stress makes the body crave foods that are high in fats and sugars (Ivanovic et al., 2010:17) and these pose negative effects on the health of the students which would compromise on their academic performance.

Another student also mentioned that:

> I eat and the times that I eat are determined by the college and the work load I have on a particular day will tell what time I eat especially after supper because if I have a lot of assignments I stay up to maybe mid night and I will need something to eat in order to keep me going. Sometimes I do not have pocket money and nothing to eat in the hostel. It's very difficult to do assignments but if I have I eat. Sometimes when you have little money like R1 and you want to buy maputi others will laugh at you and you end up not buying. It's so painful because sometimes you just have to fall in love with someone so that he may buy you food not because you love them.

Most studies perceive college students' stress as emanating from a wide range of stressful events such as leaving home for the first time, developing of entirely new social contacts, being responsible for their own needs, academic work and many others (Rafidah et al., 2009:14; Ryan, 2004:252). Hence, the many stressors may affect the students' food behaviours and consequently their academic performance. From the sentiments echoed above it can be surmised as (Pearlin, 1996:20) affirms that these constellations of stressors may form because the conditions that underlie exposure to one set of stressors may also bring about exposure to others. The finding suggests that some students develop immoral behaviours so that they get food, due to stress and lack of concentration on college work resulting in bad food behaviours. In terms of Maslow's theory, the students have to first look for food to satisfy the biological deficiency of food needs before they can set themselves to any meaningful academic undertaking. If they have to satisfy this deficiency need through immoral means, it means further multiplication of stressors as culturally, the immoral behaviour is censured by the community.

Another student intimated that:

Findings of this study also unveiled that the type of students' residential accommodation while in college also poses stress on the students.

One student indicated that:

> As a non-resident student sometimes pressure of work makes me not to cook at all. I rarely take breakfast because it will be too early for me to eat as I leave home very early because I stay far from college and will carry bread and drink to drink at break time then I do not eat anything at lunch and will only eat at night when I come back home where I stay and sometimes have bread and drink or tea because I will be too tired of spending the whole day in class and walking almost 6km to and fro every day. Most of the times I get home and there is no electricity because of the load shedding.

Understandably, since the non-resident students have to source and prepare food for themselves, it stands to reason that when they are hard pressed by college academic work, they are thus exposed to erratic eating schedules. Thus the stress experienced from their busy schedules should make the students conscious of the need to plan and have well planned meals. Torres and Nowson, (2007:890) also states that high stress levels influence food habits and lead to poor academic performance. Relationship between stress and nutrition on academic work lies on the notion put forward by Rogers (2001:135) that a healthy body is able to maintain a healthy mind, meaning that certain risk factors for a physically ill health are also risk factors for depression and cognitive impairment.

4.4.5 Unplanned haphazard food consumption patterns for non-resident students.

The admixture of several variables that students experienced as issues which determined their choice of food explains the inconsistent, haphazard dietary patterns that students adopted regardless of the nutritive value of the food they consumed.

4.4.5.1 Availability of funds

All non-resident students reported that their choice of food was based the amount of funds available, the availability of convenience foods which they could prepare easily and quickly, the cost of the food as well as their favourite foods. These findings concur with those of resident students in the sense that although the dietary patterns adopted by resident students were more routine and fixed by the college, both categories of students consumed food stuffs anyhow, disregarding nutritive value. Like their counterparts, non-resident students highlighted the fact that owing to general financial constraints, they ate whatever type of food that came their way just to keep themselves going. For non-resident students the irregular consumption patterns were experienced with their main meals rather than supplementary meals as was the case with residential students. Both categories did not have balanced diets. The issue of funds has been found to be the most determinant of students' food consumption patterns due to the fact that the majority of the students were living below the poverty datum line as evidenced by their monthly incomes in Table 4.6.

A student bemoaned her situation as she said:

> Umm ahh, I eat when I am hungry that is if I have the food because sometimes I feel hungry but have nothing to eat due to lack of money.

Pertaining to economic circumstances, (Janssen et al., 2005:132) observe that in most Third World countries, poor people may have to take any food available to them on the basis of affordability, despite its poor nutritional value. Zimbabwe, as a nation, has suffered economic difficulties in the past three decades and food security was compromised. Zimbabwe today is regarded as food insecure. Conversely, students in many Zimbabwean institutions have had to make do with any food availed to them, owing to financial limitations (Chikomba, 1986:56).

4.4.5.2 Health consideration

One of the non-resident participants purported nutrition awareness and knowledge in making healthy food choices but was not financially sound. This suggests that this

student would have interest to adopt systematic food consumption patterns but financial constraints inhibited this ideal pattern. Although the participant admitted that it was difficult for her to purchase food that would provide balanced diet she was particular about how nutritious the foods she ate were.

The student commented that:

> As a student we have scheduled times for break and lunch break. I also make sure I don't eat anything anytime. If I feel hungry in between meals I eat but I eat light and healthy snacks like fruits so that I will be able to take my meals properly ee well. I don't take junk foods; I pack my food from home but financial problems are the major hindrances. Sometimes when there is load shedding you end up just having bread and drink as your meal.

College life is considered a very busy period for students. In order to make the body work as efficiently as possible, it is important that busy and stressed students are properly fueled and food functions as this essential fuel (LaFountaine, 2012:217). By implication, students should consume well planned meals that promote good health. Another student intimated that:

> I use resources available mostly and then acquire or buy what is not there to make proper meals. I consider nutrient value of the food. I make dishes, sorry, I plan dishes that I will make have all nutrients because there is no one dish that can provide all nutrients.

Thus for both resident and non-resident students, the food they consumed was not a product of systematic planning for a balanced diet but was rather dictated by circumstantial factors of an economic nature. Evidence suggests that food consumption patterns followed by the students were generally unhealthy, haphazard and inconsistent.

4.4.5.3 Lack of nutrition knowledge

Students' interview results suggest that students did not follow proper food consumption patterns because they lacked nutrition knowledge. During interviews one student mentioned:

> I do not plan any meals I just eat what the college gives us and I don't even know how meals are planned.

Research indicates that improving the awareness of nutritious meal choices holds the promise of enabling students to make correct choices of foods that may support proper cognitive functioning. Conversely, the provision of information to students that results in their ability to long-term habits of healthy eating has in the long run, a positive effect on cognitive and spatial memory capacity, potentially increasing a student's potential to process and retain academic information (Singh-Manoux, Hillsdon, Brunner & Marmot, 2005:25).

As a follow up to the results in Table 4.23 students were asked to comment on the prices of their favourite meals as indicated in Table 4.24.

4.4.6 Comment about the prices of your favourite meals

The study sought to establish how students rated the prices for their favourite meals in order to assess if they afforded their favourite meals. If one does not access their favourite meal they do not enjoy eating thereby compromising on nutrient intake. However, the benefits of favourite meals are dependent on the quality in terms of nutritional value.

Table 4.24 shows how students rate prices for their favourite meals

Table 4.24 prices of favourite meals (n=100)

Price category	Frequency	Percentage
Cheap	20	20%
Relatively expensive	38	38%
Very expensive	42	42%
Total	**100**	**100%**

The results show that 42% of the participants rated their favourite meals as very expensive followed by 38% who indicated relatively cheap and only 20% indicated cheap. This scenario shows that if students find their favourite meals expensive it implies they may not access their favourite meals more often thereby subjecting them to taking any affordable food which they may not enjoy eating. The results therefore suggest that favourite meals are a strong determinant of food consumption patterns implying that if students would get their favourite meals they would enjoy eating their meals and this promotes good health and consequently academic performance. Pawels and Volterrani (2008:450) report that favourite foods usually trigger positive emotions ; actually, the smell of food can evoke a strong emotional experience

When asked who provided their meals while in college, the responses were given as reflected in Table 4.25.

4.4.7 Meal provision

Table 4.25 presents the food providers for the students while in college.

Table 4.25: Food provider (n=100)

Food provider	Frequency	Percentage
College	50	50%
Self /Parents/ Guardians	50	50%
Total	**100**	**100%**

Students who comprised 50% of the participants were provided food by the college while the other 50% provided for themselves since they were non-resident students. Manwa (2013:45) suggests that accommodating students in halls of residents would make it easier to control students' dietary patterns to some extent if coupled with nutrition knowledge and enough resources. These results suggest that even the college was malnourishing students as evidenced by the menu provided by the college (see appendix I). This means that since the college had much influence on what students ate, they should revise the fees paid by the students so that they can provide a well-balanced diet.

Next investigated were the numbers of students who planned their meals and those who did not.

4.4.8 Meal planning

Meal planning is a crucial exercise as it allows for the inclusion of recommended nutrient requirements per day. Table 4.25 shows students percentages of students who plan and those who did not.

Table 4.26 Meal planning (n=100)

Meal planning	**Frequency**	**Percentage**
Yes	6	6 %
No	94	94 %
Total	**100**	**100%**

The majority of the students comprising 94% were not involved in the planning of the meals for reasons such as having food provided by the college and for others, it is because they had no nutrition knowledge. Only 6% planned their meals. This suggests that the majority of the students consumed unplanned meals which, in turn, affect academic performance.

When interviewing students on how they plan their meals, most of them indicated that did not plan because of various reasons such as lack of knowledge of doing so, while resident student indicated that the college provides them with food but do not involve them in the planning of their own meals. On being questioned on how they plan meals for the students, both cooks indicated that they did not systematically plan meals for the students. This confirmed the resultant fixed unplanned meals as they just followed the menu whose initiator they were not even sure of. This means that the college gave students unplanned meals, thus resulting in consumption of unbalanced diets. When asked who planned the menu, one cook said:

> …according to what I found here I found them already planned a a a the menu for the students. So we just continued with the one which was already there, but there are few changes here and there.

Regarding the planning and selection of foodstuffs according to whether they are balanced or not, both cooks who participated in the study argued that their planning was inconsistent and guided by available funds rather than the nutritive value of the meals for the students. The cooks confirmed insufficient budget for meals owing to the amount of funds paid by the students towards their meals.

One of the cooks expressed that:

> It's really a challenging task to plan meals for a large group of people with limited funds. As much as we would have loved to plan the meals in such a way that the meals provide all the necessary nutrients we can't do that because students are just paying $175 for the whole term and get 3 meals per day. So we are just considering funds available and we buy what is cheap. Because if you calculate you would find that its $1.94 per day divided by 3 meals. And where have you seen an adult having food for such an amount…

These findings confirm the haphazard dietary patterns that the students adopted, which they themselves also reported during the 24 hour dietary recall interviews. The students did not plan their meals which compromised on their nutrient intake. Worthington-Roberts and Williams (2000:247) state that it is very important to plan meals in advance in order to take note of individual dietary needs and the

recommended daily allowances. By implication, students' dietary needs were not considered.

In order to establish why students were not involved in the planning of their meals, the following responses were given in Table 4.27.

Table 4.27 Reasons for not being involved in meal planning (n=100)

Reason	Frequency	Percentage
Food is provided by the college and they do not involve us in the planning of our meals	50	50 %
I do not plan because I just cook what is there on that particular day.	36	36%
I do not plan because I do not know how to do it.	14	14%
Total	**100**	**100%**

All the students who resided in college indicated that the college planned for them and they did not have any input on the planning of the menu. The other 36% did not plan because they would only cook what was available while 14% indicated that they did not plan because they had no knowledge of doing that. The college did not involve a dietician because as specialist they would assist in coming up with balanced diets for the students.

In concurrence with questionnaire data above interview data from the resident students revealed that the students did not choose foods personally as they are prescribed by the college. They also intimated that since college plans and prescribes the meals for them they did not plan which foods to select during meals. By implication, students thus adopt a fixed uptake of food staffs institutionally prescribed for and imposed on them regardless of whether they are balanced or not. To further illustrate one of the sub themes produced by the researcher that food choice is depended on institutionally prescribed menus and whatever food is available. Interview results however, showed that resident students supplemented food they received from the college as and when they had funds for purchase of foodstuffs.

Above this, thematic findings confirm the dimension of unplanned and unfixed supplementary food consumption that resident students adopt in order to survive in college. Several students stated that what determined their choice of food was the amount of funds they possessed at any given time and they would purchase the available convenient foods such as bread and fizzy drinks as well. Most of the participates confessed that they did not bother about the nutritive value of the food they bought to supplement their college provided meals but consumed which ever food stuffs came their way just to keep going hence, the adoption of their dietary patterns. The resident students adopted unplanned food consumption patterns befitting a balanced diet.

These results suggest poor nutritional practices as the services of a dietician were supposed to have been sought. According to Akbaraly, Singh-Manoux, Marmot and Brunner, (200:148) dieticians work with individuals, groups, workplaces and media to provide dietary advice for healthy living. In America any institution that provides food to its clients, be it students in a college or hospital, the services of a dietician or nutritionist should be sought. They have the duty of identifying nutrition problems and assessing the nutritional status of students in a college setting. When they work in a college or university they are the ones who develop diet plans, manage cost effective food production operation, provide expertise in nutrition, as well as promote health and prevent disease. In Zimbabwe and other African countries, institutions can run their cafeterias without a dietician or a nutritionist placing the clients at risk of wrong food consumption patterns ending up malnourishing them. Dieticians would oversee meal preparation and serving to make sure dietary needs and food safety regulations are being met.

4.5 Impact of dietary patterns on academic performance of college students

To establish the impact of students' diet on academic performance, the relationships of individual nutrients and students' marks were correlated using IBM SPSS version 23. The students' marks per subject were correlated to intake of individual food groups in order to establish the relationship of intake of different foods and academic performance.

4.5.1 Relationships of food nutrients and academic performance

Table 4.28: Relationship of dietary intake of starchy foods and academic performance

	TOE	PE	Music	HE	IT
Starchy foods Pearson Correlation	-.346**	.568**	.530**	.528**	.572**
Sig. (2-tailed)	.000	.000	.000	.000	.000

*. Correlation is significant at the 0.05 level (2-tailed)

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

Results in Table 4.28 indicate that when starch intake increases, performance in Theory of Education decreases significantly**.** (r=-0.346; p=0.000 at α =0.01). However, qualitative data from interviews and observation showed that students did not even take adequate starch, meaning if they did the negative correlation could have been higher.

TOE is an academic subject while the other subjects are practical subjects and thus the reason why the performance decreases in TOE when there is an increase in intake of starchy food. The facts lye in the difference in energy expenditure in TOE and practical subjects. One needs to have more energy when doing practical subjects than when doing academic subjects. Carbohydrates found in starchy foods provide that energy. According to Tull, (1999:36) after eating, there is break down of carbohydrate into a sugar called glucose that fuels the cells of the body to function well. During digestion, glucose moves into the bloodstream which carries it to cells where it is used as a source of energy. When starchy food is increased in excess of the energy expended and activity remains low, the risk is excess starch is easily converted to fat, especially when accompanied with the high insulin levels that result from increasing blood sugar levels. The body becomes weak and feeling of dizziness is experienced thereby compromising on the concentration span and memory retention consequently affecting academic performance.

The excess fat in the body is a risk factor for obesity, a condition that has been claimed to cause shorter attention spans and decreased mental flexibility and tended to have lower estimated intellectual functioning, all of which may present challenges for students' learning (Ebbeling, Pawlak, & Ludwig, 2002:344). Researchers have found that with an increase in obesity comes the development of other diseases, which may also affect academic achievement. For instance, studies have shown that the prevalence of obesity parallels a rise in Metabolic Syndrome, a disease that increases the risk of cardiovascular disease and diabetes; it is also associated with cognitive impairments in adults and adolescents (Ebbeling, & Ludwig, 2002:344).

On the other hand, the results also indicate that when starch increases, performance increases significantly in the other subjects with Physical Education ($r=0.568$; $p=0.000$ at α 0.01); Music ($r=0.538$; $p=0.000$ at $\alpha=0.01$); Home Economics ($r=0.528$; $p=0.000$ at $\alpha=0.01$). Information Technology ($r=0.572$; $p=0.000$ at $\alpha=0.01$). Thus, after excess starch is converted to fat, it is then stored in the body fat stores for later use, thus performance increases significantly in practical subjects when starchy foods increase as they sustain the body energy during practical subjects which because of their nature students expend more energy when doing practical work, hence the positive correlation. Though carbohydrates are also important but should come from fresh fruits, vegetables and whole foods as often as possible, not from candy, soft drinks and processed foods as is the situation in this study.

These findings suggest that the more active one is the more they should have intake of starch to keep the body going. By implication, starchy foods should not be increased when one is leading a life of less physical activity as this may cause one to feel weak and dizzy because of the raised blood sugar levels. Feelings of weakness and dizziness are unfavourable conditions for academic attainment. A dense meal of carbohydrates can leave one feeling sluggish and tired as it also increases the levels of tryptophan in the brain. The amino acid tryptophan encourages the production of serotonin, a calming neurotransmitter associated with appetite, blood pressure, sleep patterns and learning. It is therefore necessary to take starchy foods according to level of activity in order to realise the benefits of carbohydrates as a source of energy during learning activities.

Table 4.29: Relationship of dietary intake of meat and substitutes and academic performance

		TOE	PE	Music	HE	IT
Meat and substitutes	Pearson Correlation	-.201*	-.121	-.028	-.157	-.131
	Sig. (2-tailed)	.045	.230	.785	.119	.194

*. Correlation is significant at the 0.05 level (2-tailed)

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

Results in Table 4.29 indicate that when meat and substitutes, which provide protein intake increases, performance in Theory of Education decreases significantly. (r=-0.201; p=0.045 at α =0.05). Too much protein has a negative effect on the functioning of the brain, for instance proteins (meat) and foods are burnt in a different way. It costs the body more energy to burn them together than apart from each other as much blood has to be sent to the digestive system so it cannot be sent to the head. According to Kretchmer (1996:999), neurons use proteins to communicate with one another and control what happens throughout the body thus the enzymes, neuro-transmitters and hormones that carry signals and help accomplish the tasks the brain dictates are made from protein. A protein rich meal can leave one feeling alert and energetic as levels of the amino acid tyrosine rise. Tyrosine promotes the creation of norepinephrine and dopamine that boost activity alertness and energy and these are favourable conditions for learning. Enzymes are made from protein and are vital to brain health as they aid digestion so the brain gets the nutrients it needs. Proteins assist one to stay healthy and alert during workdays. However the brain still needs a mix of carbohydrates, protein, good fats, and plenty of vitamins, minerals and antioxidants to keep functioning at optimum. When optimum functioning is achieved academic performance improves.

The table above also indicates no significant correlation of protein intake and practical subjects. The facts lie in the inadequate amounts of proteins taken by the students. The amounts were far below the recommended daily protein requirement for students hence the no significance being found.

Table 4.30: Relationship of dietary intake of fruits and vegetables and academic performance

		TOE	PE	Music	HE	IT
Fruits and vegetables	Pearson Correlation	.580**	.363**	.364**	.337**	.307**
	Sig. (2-tailed)	.000	.000	.001	.001	.002

*. Correlation is significant at the 0.05 level (2-tailed)

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

Results in Table 4.30 indicate that when fruits and vegetable intake increases, performance in all the subject areas increases significantly. TOE is (r=0.580; p=0.00 at α =0.01); PE (r=0.363; p=0.000 at α =0.01); Music (r=0.364; p=0.001 at α =0.01); HE (r=0.337; p=0.001 at α =0.01) and IT (r=0.3307; p=0.002 at α =0.01). Fruits have a very positive effect on the brains which stimulates brain functions. One of the substances that fruit contains is natural sugars which stimulate the brain so that one can think faster and recall information more quickly. There are many other substances that fruit contains which scientists think they stimulate the brain. Fruits are considered as the ultimate brain fuel. Deficiencies or excesses of certain vitamins or minerals can damage nerves in the brain, causing changes in memory, limiting problem-solving ability and impairing brain function (Selkowitz, 2000:252).

Table 4.31: Relationship of dietary intake of dairy products and academic performance

		TOE	PE	Music	HE	IT
Dairy and products	Pearson Correlation	-.257**	-.231*	-.223*	-.150*	-.056*
	Sig. (2-tailed	.010	.021	.026	.136	.581

*. Correlation is significant at the 0.05 level (2-tailed)

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

Results in Table 4.31 indicate that when dairy and dairy products intake increases, performance in all the subject areas decreases significantly. TOE is (r=-0.257; p=0.10

at α=0.01); PE (r=-0.231; p=0.021 at α=0.05); HE (r=-0.223; p=0.026 at α=0.05). According Crichton (2012;34) milk products have a beneficial impact on cognitive health through improvement in cardiovascular risk factors and metabolic syndrome components, which are factors that have been linked to detrimental brain damage (Kretchmer, 1996:999). In addition, calcium and whey protein may also be important through their associated role in glucose regulation and weight management. Other dairy components such as bioactive peptides with anti-oxidative properties may also have a direct effect on brain function which may enhance cognitive ability by preventing oxidative stress in the nervous system (Selkowitz, 2000:252). As a good source of tryptophan (an amino acid precursor of serotonin), α-lactalbumin in milk has also been shown to raise brain serotonin levels. It has been established that an increased serotonin level has beneficial effects on mood and cognitive function, including information processing. Higher serotonin levels may also attenuate the effects of reduced neurogenesis due to stress and aging (Selkowitz, 2000:252). Vitamin B_{12} in milk and milk products may also play a role in cognitive function and healthy brain aging. However epidemiological studies have linked vitamin B_{12} deficiency to an increased risk of Alzheimer's disease (De-Haan, 2007:113).

Table 4.32: Relationship of dietary intake of fizzy drinks and academic performance

		TOE	PE	Music	HE	IT
Fizzy drinks	Pearson Correlation	.580**	.363**	.364**	.337**	.307**
	Sig. (2-tailed	.000	.000	.001	.001	.002

*. Correlation is significant at the 0.05 level (2-tailed)

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

Results in Table 4.32 indicate that when fizzy drinks intake increases, performance in all the subject areas increases significantly. TOE is (r= 0.580; p=0.000 at α=0.01); PE (r=0.363; p=0.000 at α=0.01); Music (r=0.364; p=0.001 at α=0.01); HE (r=0.337; p=0.001 at α=0.01); IT (r=0.307; p=0.002 at α=0.01). Fizzy drinks contain little to no vitamins or other essential nutrients (Murakami et al., 2008:24). However, they

contain caffeine, carbonation, simple sugar or worse sugar substitutes and often food additives such as artificial colouring, flavouring, and preservatives. There has been a remarkable rise in the consumption of the soft drinks, yet too much of soft drinks can cause severe health problems from which one can hardly recover. A lot of research has found that consumption of soft drinks in high quantities is responsible for many health problems that included nutritional depletion, heart disease and mental distress. It is seen from the table above that intake of energy is significant. The Dietary pattern indicates a significantly higher energy intake. Habitual high sugar intake has been shown to impair cognitive function (Trockel, 2000:127). This study results contradict this literature as results have suggested that the more the intake of fizzy drinks, the higher the increase in academic performance. Since the sugar found in fizzy drinks provides energy to the body, it may have complemented the shortage of energy that was supposed to be achieved from carbohydrates, but this study showed that students were taking inadequate carbohydrate to meet the recommended daily intake of carbohydrate.

Table 4.33: Relationship of dietary intake of fats, oils and sweets and academic performance

		TOE	PE	Music	HE	IT
Fats, oils And sweets	Pearson Correlation	-.283**	.460**	.019**	.597**	.314**
	Sig. (2-tailed	.004	.000	.855	.000	.001

*. Correlation is significant at the 0.05 level (2-tailed)

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

Results in Table 4.33 indicate that when fats, oils and sweets intake increases, performance in Theory of Education decreases significantly. TOE is (r=- 0.283; p=0.004 at α=0.01). While fats and oils are essential for the proper functioning of the body and brain development it is imperative that they be taken sparingly and not in large quantities as they cause weight gain resulting in obesity (Niemeier et al., 2006:847). Overweight and obesity are risk factors for hypertension which is also a risk factor for the decline in cognitive abilities aggravated by a tendency of feeling weak and tired more often thereby losing concentration resulting in poor academic

performance.Theory of Education is also an academic subject which does not need too much energy as this may cause drowsiness since not much energy is expended during the lectures.

However, when fats, oils and sweets intake increases, performance in PE, Music, HE and IT increases significantly.PE ($r=0.460$; $p=0.000$ at $\alpha=0.01$); HE ($r=0.597$; $p=0.000$ at $\alpha=0.01$); IT ($r=0.314$; $p=0.001$ at $\alpha=0.01$) because these are practical subjects and if fat is taken it can be burnt during the lectures without causing any effects. Fats provide essential fatty acids, which are not made by the body and must be obtained from food. Butter and oils are examples of fats. Healthy sources of fat can be found in fish, nuts, and certain fruits and vegetables, such as avocados (Wardlow & Smith, 2011:786). Eating high concentrations of Omega-3 fatty acids leads to better grades, the facts lie in the point that fatty acids are essential to proper neural function (Murakami et al., 2008:24).The greater part of the brain is made up of fatty tissue, so it makes sense that eating fish and other foods high in fatty acids would help students focus more and to study more efficiently.

4.5.2 Students' perceptions on impact of dietary patterns on their academic performance.

Students gave their perceptions and experiences on how diet affected their academic performance.

4.5.2.1 Do you feel the same when you go for class having had breakfast and when you have not?

Table 4.34 displays the students' responses with regards to breakfast intake.

Table 4.34: Effects of breakfast on learning (n=100)

	Frequency	**Percentage**
Yes	0	0%
No	100	100%
Total	**100**	**100%**

All (100%) students understudied indicated that they did not feel the same when going to class having had breakfast and when they had not had breakfast. These results suggest that breakfast intake impacts on academic performance. When students were asked how they felt, the following responses were given as indicated in Table 4.35.

Table 4.35: Effects of missing breakfast in rank order (n=100)

Rank order	Frequency	Percentage
I feel dizzy	97	97%
Can't concentrate	95	95%
Dose in class	92	92%
Low retention	90	90%

The majority of the students comprising 97% indicated that they felt dizzy when they went to class without having breakfast. The other reasons were common, with all the students implying that students found it difficult to perform as expected. What these results suggest is that there is a big percentage of students attending class without enough energy to learn. According to Willett et al., (2010:541), skipping meals, especially breakfast, can throw off the entire routine, thus resulting in feeling weak and having a hard time focusing, making poorer food choices at the next meal and increased weight gain over time. When one misses breakfast, metabolism slows down, and when the body enters this starvation mode, it holds onto fat stores for energy.

Economos in Willett et al., (2010:541), goes on to say that breakfast improves concentration; when students skip breakfast and their blood sugar or blood glucose levels fall overnight and wake up and try to perform on low blood glucose, they tend to get tired and irritable because the brain certainly relies on a certain level of circulating blood glucose or blood sugar, and when that starts to dip, one cannot focus or maintain that focus for long periods of time. Therefore, if one cannot focus, they cannot perform well in class, and their academic performance declines.

4.5.3 Factors attributed to academic performance in rank order

Table 4.36 Shows students' perceptions on what they regarded as the factors that affect their academic performance.

Table 4.36: Rank order

Rank order	Frequency	Percentage
Sufficient food provisions	96	96%
Family income	94	94%
Decent accommodation	92	92%
Good health status	90	90%
Availability of resources	88	88%
Medium of instruction	87	80%
Tuition trend	86	86%
Enough daily study hours	84	84%

Table 4.36 presents results showing that the greater number of students (96%) indicated that their academic performance was influenced by food provisions. Other results from the 24 hour dietary recall record showed that the largest percentage of students did not get sufficient food provisions except for a few. The demographic data on family monthly income showed that 78% of the students were living below the poverty datum line. Family income dictates the affordability of food stuffs. Thus, even on the ranking order family income was second with 94 %. Most of them would go on 0-0-1 meaning no breakfast, no lunch and supper only. Results of this study confirm Maslow's theory of hierarchy of needs, that one of the basic deficiency needs that motivate human behaviour is the physiological need of hunger satisfaction. By implication and linkage, the human needs theory suggests that the human body needs energy from food to engage in any form of work while at the same time regulating neurological functioning (I.P.M.) of the brain (Miller, 2011: 328) and the foods selected for consumption among other factors cannot be explained in a vacuum, but in the context of particular socio-cultural and economic status (Vygotsky, 1978:49).

When students were interviewed the data was coded and two themes emerged**;** Theme: inadequate food quantity negatively impacted academic performance.

4.5.4 Inadequate food supply

During interviews some resident students intimated that the meals served to them were inadequate in quantity that they were left hungry. They revealed that the usual *sadza* and beans or *sadza* and vegetables alone are foods that they felt they were eating too much of them without enjoying them and they felt "do not stay in the tummy. One student illustrated this incisively:

> Uuu it's really a challenge madam the food is very limited to *sadza* and beans or vegetables and beef or rice and chicken and it really leaves me hungry. At least if we could have complete meals with everything like *sadza* and beef and vegetables and a dessert like pudding or ice cream, at least we will be full. You can never learn on empty stomach.

The students further argued that this inadequate food consumption led to a lack of concentration and poor performance. One student said:

> I lose concentration because of hunger and it will be difficult to participate in class.

Non-resident students also shared the same sentiments as their resident counterparts on this issue. Some of them argued that most of the time they did not have adequate food intake due to the serious financial constraints they faced.

> What I eat and the times that I eat are determined by the college and the work load I have on a particular day will tell what time I eat especially after supper because if I have a lot of assignments I stay up to maybe mid night and I will need something to eat in order to keep me going. Sometimes I do not have pocket money and nothing to eat in the hostel. It's very difficult to do assignments but if I have I eat.

They also argued that hunger made it difficult for them to concentrate and sometimes they absented themselves from lectures due to feeling weak and dizzy. Another

resident student echoed that due to irregular intake of food there are times when he failed to complete his college assignments on time.

> Sometimes I get so hungry that I can't even do my assignments when I get home and I would submit my assignment late. I find it very difficult to work when hungry.

These findings concur with findings from interviews under the themes as follows:

4.5.5 Unbalanced diet negatively impacted on academic performance.

When interviewed both resident and non-students reported that the meals they consumed were characteristically poor in both quality of preparation and nutritive value. They argued that the unbalanced diet affected their academic performance and one student remarked:

> We lack nutrients in the food that make us learn better.

The other student also echoed the same sentiments with the one mentioned above that,

> Uhm because you know umm in our academic learning, hantie we have to eat maybe ee we have to eat foods that aa boost our brain systems on most times they are giving us ma starch foods mostly we have sadza we have rice, we have sadza and always must eat sadza every day, we have bread that's starch and starch gives us a lot of energy and we don't need that energy because we will be seated in class the whole day, so they should give us something to boost our brains not to give us ah to give us energy.

In concurrence with the findings from questionnaire data (see Table 4.10), this finding confirms the students' awareness of a close relationship between highly nutritive foods and academic performance as an important knowledge gap that this study sought to fill. These results, therefore, suggest that if students get enough food provisions, they would perform better in class, which means that dietary patterns impact on academic performance.

4.6 Conclusion

The main objective of this study was to establish the food consumption patterns of Zimbabwe college students and the effects of these patterns on students' academic performance. From the data collected in this study, students' food consumption patterns were established using quantitative methods and triangulated by qualitative data. Themes emerged from the study, and these were: fixed and prescribed unbalanced diet among resident students; unfixed choice of supplementary food regardless of nutritive value by resident students; unplanned fixed meals were provided to students by college due to insufficient budget for meals; unplanned haphazard food consumption patterns for non-resident students; inadequate budget for meals for both resident and non-resident students; inconsistent standard feeding times among resident students negatively influenced students' food consumption patterns; religious beliefs influenced food consumption patterns for some students; study related stress led to disorganised and erratic feeding schedules among students; inadequate food quantity negatively impacted academic performance and unbalanced diet negatively impacted on academic performance. The study established that even though the college was providing the students with food, they were malnourishing the students as they did not provide them with balanced diets. The socio-economic status influenced dietary patterns of both resident and non-resident students.

The results indicate that the college, which was supposed to supply students with balanced meals, had inadequate funds and insufficiently fed the students with unbalanced meals. The majority of the students were going without food due to lack of funds, and this affected their academic performance as they would not be able to learn under conditions such as lack of concentration, feeling dizzy, feeling sleepy and inability to retain what they would have been taught due to hunger. This study showed that most students were learning under unfavourable conditions for learning: a well-nourished body is able to sustain a healthy mind which suggests that if students would get proper dietary patterns they may perform well in their studies.

CHAPTER 5: SUMMARY OF RESULTS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

In Chapter, four the researcher presented, analysed and discussed the findings of the study. The purpose of this chapter is to present the main findings, conclusions and sum up the study on the impact of Zimbabwean college students' dietary patterns on their academic performance. Chapter five summarises the major findings of the study, provides conclusions of the study and gives recommendations in relation to the findings of this study.

5.2 Summary of the research process

The main aim of this study was to explore students' dietary patterns and how these impact on their academic performance. The study employed a mixed methods approach using both quantitative and qualitative research methodologies which employed a case study research design of a polytechnic college in Zimbabwe. Purposive sampling was used to select study participants and these were two cooks and one hundred students, resident and non-resident.

In order to establish the dietary patterns followed by college students the research explored the students' food consumption patterns which showed that both resident and non-resident students were following unhealthy dietary patterns. This study was framed on the philosophical underpinnings of three theories, namely, the Human Needs Theory, Socio-cultural Needs for Achievement Theory and Information Processing Model (IPM). Reviewed literature to the study revealed that healthy nutritional practices impact positively on academic performance. The target population was the resident and non-residents students. It comprised of two hundred students and six cooks from the college. The study employed questionnaires, 24-hour dietary recall, face-to-face interviews, observations and document analysis to gather data. Participatory observation and document analysis were also used to collect qualitative data. Content validity was established with the help of the supervisor and the subject specialist. The instrument was pre-tested with 10 participants. Data were analysed to answer the research objectives. The IBM SPSS version 23, a computer

program was used to produce the frequencies and percentages for the quantitative data analysis while coding and themes were used for qualitative data. Data were presented analysed and discussed according to the themes that emerged. The quantitative and qualitative data were sythesised and literature related to the study was used to confirm or refute the findings.

The findings for this study are intended to benefit researchers regarding dietary patterns followed by college students. A review of the related literature resulted in the identification of several aspects relating to students' dietary patterns. These were general guidelines to healthy diet, considerations when making food choices, aspects that influence students' food consumption patterns, food groups and their functions, determinants of dietary patterns, meal patterns, meal planning, nutrition disorders, nutrition and brain function and effects of nutrition on learning.

5.3 SUMMARY OF RESULTS PER OBJECTIVES OF THE STUDY

In this section a summary of the results is presented according to the research aim and objectives of the study as set in Chapter one.

5.3.1 Findings pertaining to the main research aim:

The main aim of this study was to explore students' dietary patterns and how these impact on their academic performance.

This research assessed the students' food consumption patterns, influential factors and considerations in their daily food intake and how these affected their academic performance and was guided by the following objectives which were to:

- explore food consumption patterns followed by college students;
- examine factors that influence the choice of food consumption patterns of college students; and
- explore how students' food consumption patterns affect their academic performance

5.3.2 Objective 1: The first objective sought to explore food consumption patterns followed by college students. The main findings are presented in the discussion that follows.

5.3.2.1 Fixed and prescribed diet among resident students.

Students were having three meals per day of breakfast at 6am, lunch from 12pm to 1pm. The college prescribes the meals for the students and they had no say on whatever was provided for them by implication, students thus adopted a fixed uptake of food staffs institutionally prescribed for and imposed on them regardless of whether they like the food or not. The meals were so fixed that those who were on special diets would not be accommodated in college residents because the college did not cater for such diets and there were no cooking facilities in the hostels, hence, such students had to seek for alternative accommodation out of campus.

5.3.2.2 Unplanned and unbalanced meals provided by college due to inadequate budget for meals.

The cooks did not systematically plan meals for the students in terms of nutritive value, with the resultant fixed unplanned meals as the cooks just followed the menu whose designer they were not even sure of. The study argued that the meal planning was inconsistent and guided by available funds rather than the nutritive value of the meals for the students. The cooks confirmed insufficient budget for meals owing to the amount of funds paid by the students towards their meals. Resident students had to pay an amount of US$150 each per term of three months towards their meals. This meant that their budget was for 90 days; at three meals a day this was US$1.66 per day and US$0.55 per meal - a figure far from supplying basic meal for an adult. However, the kitchen staff had to work with what was available. Although the cooks showed nutrition knowledge, they could not plan meals on such a meager amount of money, and this suggests poor nutritional practices. Planning meals is an important exercise that allows the inclusion of all nutrients needed per day.

5.3.2.3 Limited food variety

The meals that students got were very limited in variety as indicated on the menu sheet attached on (appendix I). The students were having four plain slices of bread and black tea and rarely did the bread have margarine or jam, making it unpalatable. They also had more of *sadza* and beef or cooked green leafy vegetables and once in a while rice and chicken or beans for their lunch and supper. The meals supplied more carbohydrates and proteins and no vitamins and other nutrients. Students were never given any fruits for the whole term. It can safely be said that the college malnourished the students. The students did not enjoy the meals because there was also no variety in the preparation of the meals. Lack of food variety is a recipe for nutrition deficiency diseases.

5.3.2.4 Unplanned and unfixed supplementary food regardless of nutritive value by resident students

The findings of the study confirm the dimension of unplanned and unfixed supplementary food consumption that resident students adopted in order to survive in college. Several students stated that what they were given by the college could not take them through the day because the meal time intervals were too spaced that they would need supplementary food. They would buy available and convenient foods such as bread and fizzy drinks. Most of the participates confessed that they did not bother with the nutritive value of the food they bought to supplement their college provided meals but consumed whichever foodstuff came their way just to keep going. The resident students adopted unplanned food consumption patterns befitted of a balance diet. The students also contributed to their food consumption patterns that neglected other important nutrients by their penchant for beef and chicken and not vegetables for their relish, as reported by the cooks.

5.3.2.5 Unplanned haphazard food consumption patterns for non-resident students.

Non-resident students, like their counterparts highlighted the fact that owing to general financial constraints, they ate whatever type of food that came their way just

to keep them going. For non-resident students the irregular food consumption patterns were experienced with their main meals rather than supplementary meals as was the case with residential students. However, both categories did not have balanced diets. Non-resident students experienced unplanned haphazard food consumption patterns based on the amount of funds available which meant their meals were mainly dependent on the funds they had at any given time. They also prepared their meals using available foodstuffs. Some of the non-resident students would go without food for days, as indicated in the 24-hour dietary recall record.

5.3.2.6 Unhealthy food consumption patterns due to availability of junk food

Some of the students were relying on take away foods from the mobile kitchens that had mushroomed in the city. Students bought whatever was prepared on that particular day. Observation of the daily routine of students has shown that some students tended to buy fast foods from different food outlets around the college. It was clear that most students have diverted from home cooked meals to college cafeterias. The researcher observed that the college also sold fast foods to the non-resident student which was far below standard, such as rice and vegetables. Take away foods tend to have too much unhealthy fat which poses for risk of obesity. The research also revealed that students relied on the availability of convenience foods which they could prepare easily and quickly, the cost of the food as well as their favourite foods.

5.3.2.7 Nutrition disorders among college students

Results showed that students had one or more physical signs of malnutrition, with symptoms such as cotton mouth, stomatitis (scars at corners of mouth), redness of lips; and these were possible deficiencies of Riboflavin, niacin, iron or pyridoxine and these are found in foods such as breakfast cereals, whole grains, brown rice, turkey, beef liver, apples, and eggs. However, the Food Frequency Questionnaires and 24-hour dietary recall records of students showed that they were not eating these foods as the majority of the students did not take these foods except for resident students who took beef on regular basis.

Some students had bleeding gums which is caused by deficiency of Vitamin C whose sources include papaya (paw paw), oranges, pine and broccoli among other foods. The 24-hour dietary recall record showed that not even a single student had any one of the above sources of Vitamin C. Generally students did not eat fruits and vegetables. Spoon-shaped nails were also observed, and this may be deficiency of Iron. Foods that provide Iron are beef or chicken liver, canned sardines, turkey and others. None of the students in the college ate these foods, hence the high numbers of students with spoon shaped nails. It should be noted that Iron deficiency also affects brain function.

A skin problem was also observed, with students having dry and scaling skin, a sign of lack of Vitamin A, C and K, Zinc, Protein or Niacin. Of the foods that provide the nutrients, very few students took vegetables and poultry, and none took mushroom, broccoli or eggs. Non- consumption of these foods affects memory retention, thus compromising academic performance.

5.3.2.8 Lack of nutrition knowledge

Only a few (3%) of the respondents were knowledgeable while the majority (97%) had no nutrition knowledge. These findings imply that the rest of the students were ignorant of what they should take and when. Lack of nutrition knowledge is an indicator of poor nutritional practices. Although students knew that they should consume balanced diets they did not know how to plan the meals.

5.3.2.9 Inadequate daily nutrient intake

All students under study included carbohydrates and fats and oils in their daily diet followed by 88% who indicated having fizzy drinks daily while 63% had proteins. Students who indicated eating dairy foods, fruits and vegetables were 31% and 12% respectively. Even though the numbers of people who claimed to consume certain nutrients were high, evidence from data indicates that they were taking inadequate nutrients, less than the USDA recommendations.

5.3.2.10 Lack of access to favourite meals

The majority of the students comprising 87% did not access their favourite meals except for 13% who indicated that they access. Of the total students, 63% had fast foods as their favourite meals, 20% indigenous, 17% snacks and no one took exotic meals. When students do not get favourite meals they do not enjoy eating and that compromises on the recommended nutrient intake.

5.3.2.11 Insufficient number of meals taken per day during the week and weekends.

Students who took two meals per day were 48% while 31% respondents indicated that they took one meal per day and 21% took three meals per day during weekdays. Students were taking insufficient meals during the week which could compromise on their concentration span. Nutritionists recommend that people should take four to five meals per day in order to meet required nutrients.

5.3.2.12 Students' BMIs indicate health risks

The majority of the students were overweight and obese. Excess weight is a risk condition for high blood pressure and other diseases that trigger tiredness to the body and loss of concentration, which are unfavourable conditions for academic performance. Some students were underweight, a very dangerous condition which may cause permanent damage to the brain because it signifies serious deficiency of several nutrients. Malnourishment, low-income status, poor mental health, and poor self-care can contribute to a person being underweight, according to researchers. In this study results suggest causes of underweight as low income status.

5.3.2.13 Sedentary life style

Almost all the students, except four, were leading sedentary life styles. They lacked physical activity due to pressure of school work. Students were at high risk of obesity and overweight due to lack of exercise because they consumed a lot of energy foods (carbohydrates) but would not expend the energy. It follows that their energy intake in

foods exceeded the amount of energy they expended thus the excess was stored in their bodies as fat which is one of the major causes of obesity, a very negative condition for academic performance.

5.3.3 Objective 2: The second objective was to examine factors that influence the choice of food consumption patterns of college students.

The following factors were established as the factors that influenced choice of food consumption patterns in this study:

5.3.3.1 Cost of food and availability of funds

The majority of the participants had their food consumption patterns influenced by the cost of food items. According to rank order cost was the highest, thus signifying that many students could not afford to buy foodstuffs. The demographic data confirmed this factor by results that showed that 78% of the respondents were living below the Zimbabwe poverty datum line of US$495 per month, hence it explains why cost became the most popular hindrance for food acquisition. Cost of food made it difficult for some lower-income students to afford healthier options, though it is worth noting that nearly all and not just those of low-income, failed to meet dietary recommendations due to other factors such as lack of nutrition awareness. Even the college could not supply students with balanced meals because of insufficient funds for meals.

5.3.3.2 Consideration of availability of food

Some students pointed to the fact that they considered the food items they had for preparation of their meals. Resident students also highlighted the same that they just ate the food that was availed to them by the college and ate whatever came their way. Lack of foodstuffs on the market was also a strong influential factor for students' food consumption patterns**.** Even those with money would sometimes not get what they want in the supermarkets because of food insecurity in Zimbabwe. The country has been hard hit by economic sanctions for two decades now, leaving the supermarkets and grocery shops unable to stock foodstuffs for the citizens at large.

5.3.3.3 Health consideration

Only one of the non-resident participants purported nutrition awareness and knowledge in making healthy food choices but was not financially sound. I consider this aspect as one of the main findings of this study because it reflects a unique stance that nutrition knowledge alone is not enough without the financial support to acquire the needed foodstuffs. This suggests that this student would have interest to adopt systematic food consumption patterns but financial constraints inhibited this ideal pattern. Although the participant admitted that it was difficult for her to purchase food that would provide a balanced diet she was particular about how healthy the foods she ate were.

5.3.3.4 Lack of consideration of nutritive value

Only 16% of the students indicated that they considered nutritive value when making food choices while the majority did not consider the nutritive value. Nutritive value is the major determinant of diet quality hence the low percentage of students who considered nutritive value suggests high intake of unbalanced diets leading to malnutrition. However, even those that considered nutritive value could not achieve that due to financial constraints and unavailability of foodstuffs for purchase.

5.3.3.5 Inconsistent feeding times

Interview data revealed institutional meal times which students could not catch up with due to extremely busy daily study schedules led to inconsistent eating patterns. Consequently, students tended to sometimes miss meals when they became late for the dining hall. Lecturers in the college also contributed towards the poor food consumption patterns of the students as they did not respect the students' eating schedules by occupying them during tea and lunch breaks. Students also complained of eating schedules being too spaced.

5.3.3.6 Influence of religious beliefs

The majority of the students (99%) were Christians except for one (1%) who was of

traditional religion. Some students had limited variety of food due to their religious affiliations such as those who did not take any meat not killed by someone from their religious circles. Some students indicated that they did not eat any form of meat but rather lived on vegetarian diet because they were Seventh Day Adventists. However, the two students who were on vegetarian diet were both among the five students who had normal BMI, indicating that their diet was healthy; even if they were not taking meat, they were taking substitutes of meat such as tofu from soya beans.

5.3.3.7 Study related stress

All students indicated that they underwent a very strenuous study schedule at college, to the extent that the last thing they could think of was eating. Stress appeared to alter these students' overall food intake resulting in some students under-eating and others overeating. One of the students who were under-eating stated that due to study related stress, she lost appetite and as a result would skip meals. However, the facts lie on the point that eating is suppressed during stress, due to anorectic effects of corticotrophin releasing hormone (CRH) and increased during recovery from stress, due to appetite stimulating effects of residual cortisol.

5.3.3.8 College as food provider influenced students' food consumption patterns

The study established that the college had a lot of influence on what resident students ate. The college prescribed students' diets, and if the college would practice good nutrition by employing a dietician and supply balanced diets to students, it would be the best method of achieving healthy dietary patterns for students.

5.3.4 Objective 3: The third objective sought to explore how students' food consumption patterns affect their academic performance.

The following were the findings;

5.3.4.1 When starch increases performance in Theory of Education decreases significantly

It was noted that when students' starch intake increased, their performance in Theory of Education decreased significantly. When starch is increased in excess of the energy expended and activity remains low, the risk is excess starch is easily converted to fat. TOE is an academic subject which did not require a lot of energy. The excess fat in the body is a risk factor for obesity a condition that was common in respondents of this study and has been claimed to cause shorter attention spans, decreased mental flexibility and lower estimated intellectual functioning, all of which may present challenges for students' learning. This is the reason why most students reported being weak and feeling of dizziness compromising on the concentration span and memory retention, consequently affecting their academic performance.

5.3.4.2 When starch increases performance increases significantly in practical subjects

The performance of students increased significantly when their starch intake increased. Arguably, after excess starch is converted to fat, it is then stored in the body fat stores for later use, thus performance increases significantly in practical subjects when starchy foods increase as they sustain the body energy during practical subjects which because of their nature students expend more energy when doing practical work, hence the positive correlation.

5.3.4.3 When meat and substitutes, which provide protein intake increases, performance in Theory of Education decreases significantly

Results indicated that when the intake of meat and substitutes increased, performance in Theory of Education decreased significantly. Studies have shown that too much protein has a negative effect on the functioning of the brain, for instance, meat and meat products take long to digest and cost the body more energy to burn them; therefore, much blood has to be sent to the digestive system and very little goes to the head.

5.3.4.5 When fruits and vegetable intake increases, performance in all the subject areas increases significantly

Fruits and vegetables have been found to have a very positive effect on the brain, which stimulates brain functions. One of the substances that fruit contains is natural sugars which stimulate the brain so that one can think faster and recall information more quickly. The two students who were on vegetarian diet were found to perform very well in all subject areas. Quite a large number did not consume fruits and vegetables and deficiencies excesses of certain vitamins or minerals can damage nerves in the brain, causing changes in memory, limiting problem-solving ability and impairing brain function. Hence, the low grades in most of the students who did not take fruits and vegetables.

5.3.4.6 When dairy and dairy products intake increases, performance in all the subject areas decreases significantly

Results indicated that when dairy intake increases performance decreases. The scenario lies in the fact that students did not take enough of dairy foods hence the negative correlation. Milk products have a beneficial impact on cognitive health through improvements in cardiovascular risk factors and metabolic syndrome components, which are factors that have been linked to detrimental brain damage In addition, calcium and whey protein may also be important through their associated role in glucose regulation and weight management. Other dairy components such as bioactive peptides with anti-oxidative properties may also have a direct effect on brain function and may enhance cognitive ability by preventing oxidative stress in the nervous system.

5.3.4.7 When fizzy drinks intake increases, performance in all the subject areas increases significantly.

This study results contradict this literature as results have suggested that the more the intake of fizzy drinks the increase in academic performance. Since the sugar found in fizzy drinks provides energy to the body, it may have complemented the shortage of energy that was supposed to be achieved from carbohydrates, but this

study showed that students were taking inadequate carbohydrate quantities to meet the recommended daily intake of carbohydrates. However, it should be borne in mind that there has been a remarkable rise in the consumption of soft drinks, yet too much of soft drinks can cause severe health problems from which one can hardly recover.

5.3.4.8 When fats, oils and sweets intake increases, performance in Theory of Education decreases significantly.

Results showed that students were taking too much fats and oils and there was significant decrease in performance in Theory of Education. TOE being an academic subject not much fat was burnt and the fat may have caused drowsiness during the lectures. While fats and oils are essential for the proper functioning of the body and brain development it is imperative that they be taken sparingly and not in large quantities as they cause weight gain. This resulted in obesity a risk factor for hypertension which is also a risk factor for the decline in cognitive abilities aggravated by a tendency of feeling weak and tiring more often thereby losing concentration resulting in poor academic performance.

5.3.4.9 When fats, oils and sweets intake increases, performance in PE, Music, HE and IT increases significantly

When fats and oils intake increased, performance in PE, Music, HE and IT increase significantly because these are practical subjects and if fat is taken it can be burnt during the lectures without causing any effects. Eating high fatty acids leads to better grades, the facts lie in the point that fatty acids are essential to proper neural function.

5.3.4.10 Missing breakfast had a negative impact on academic performance

The majority of the students comprising 97% indicated that they felt dizzy when they went to class without having breakfast. These results suggest that students attended class without enough energy to learn. Literature used for this study reports that breakfast was found to improve concentration and when students skip breakfast and their blood sugar or blood glucose levels fall overnight and they wake up and try to

perform on low blood glucose, they tend to get really tired and irritable because the brain certainly relies on a certain level of circulating blood glucose or blood sugar, and when that starts to dip, one cannot focus or maintain that focus for long periods of time. Therefore, if one cannot focus, they cannot perform well in class, and their academic performance declines.

5.3.4.11 Sufficient food intake ranked the highest factor attributed to academic performance

The greater number of students 96% indicated that sufficient food intake would greatly influence their academic performance positively. However, this study established that students were not getting sufficient food provisions, implying that their academic performance was compromised. Students who were observing proper dietary patterns were found to be performing well in their studies although this may not be conclusive because of some confounding variables. Poor diet quality has been found to have problematic consequences for students with an independent association between overall diet quality, and academic performance has been demonstrated, especially in terms of diet adequacy and variety.

More specifically, reduced fruit and vegetable consumption and increased dietary fat intake have been significantly linked to poor academic performance. Furthermore, a direct and significant negative correlation between fast food consumption and academic performance has been found, independent of students' weight and parental income level. Breakfast consumption is associated with improved diet quality, attendance, alertness, cognitive function, and well-being. However, a comparative link between food consumption and increased academic performance was not possible because it would be unethical to deny a group of people their food.

5.3.4.12 Family income ranked second highest factor attributed to academic performance

Students also implicated family monthly income as a contributory factor to their academic performance. The students were affected much because of insufficient funds for meals even those staying in college. The majority of the students lived

below the poverty datum line of less than US$495 monthly income for the Zimbabwean populace.

5.3.4.13 Unbalanced diet negatively impacted on academic performance

Students reported unbalanced diet being detrimental to their academic performance. Inadequate food consumption led to a lack of concentration and poor performance. In this study, it was also established that the majority of the students went without food due to lack of funds, and this affected their academic performance as they were not able to learn under such conditions as lack of concentration, feeling dizzy, feeling sleepy and inability to retain what they would have been taught due to hunger. The study unveiled that most students were learning under unfavourable conditions for learning as both resident and non-students reported that the meals they consumed were characteristically poor in both quality of preparation and nutritive value. They argued that the unbalanced diet affected their academic performance. Most of them argued that most of the time, they did not have adequate food intake due to the serious financial constraints they faced. They also argued that hunger made it difficult for them to concentrate and sometimes, they absented themselves from lectures due to feeling weak and dizzy. Another resident student echoed that due to irregular intake of food there are times when they failed to complete their college assignments on time.

5.3.4.14 Balanced diet contributes to sound academic performance

Students who were observing proper dietary patterns were found to be performing well in their studies. This finding confirms the students' awareness of a close relationship between highly nutritive foods and academic performance as an important knowledge gap that this study sought to fill. These results, therefore, suggest that if students get enough food provisions, they would perform better in class, which means that dietary patterns impact on academic performance. The findings from this study confirmed the views from literature that a well-nourished body is able to sustain a healthy mind, which suggests that if students would get proper dietary patterns, they may perform well in their studies.

5.4 Conclusion

This section presents conclusions drawn from the data which were gathered in the study. These conclusions were guided by the study research questions.

The case study shows that the Zimbabwean government has failed to accommodate students in the college halls of residence due to the growing numbers of students attending college.

This study concluded that both resident and non-resident students at the college had unbalanced diets. Though resident students had their meals supplied by the college, their meals were as fixed, inadequate and unbalanced as those of their counterparts. The college did not plan meals, and the students were not included in the planning of the meals. The cooks indicated that they just used the menu they found at the college when they joined it. They further indicated that it was difficult to plan the meals because of the inadequate budget for the meals, and because the diet was fixed, it lacked variety in the food consumed on daily basis. Students were being loaded with starchy foods and meat products, carbohydrate and protein respectively, at the expense of other nutrients.

Generally, students did not consume the adequate number of meals per day, and that compromised their daily nutrient intake. Increase in the consumption of fast foods has been established among the college students due to lack of time to prepare meals and the availability of junk foods.

The food consumption patterns established in this study were as follows:

- Fixed and prescribed diet among resident students;
- Unplanned and unbalanced meals provided by college due to inadequate budget for meals;
- Limited food variety;
- Unplanned and unfixed supplementary food regardless of nutritive value by resident students;
- Unplanned haphazard food consumption patterns for non-resident students;

- Unhealthy food consumption patterns due to availability of junk food;
- Inadequate daily nutrient intake;
- Insufficient number of meals taken per day during the week and weekends; and
- Vegetarian diet among students from the SDA church.

The study has also established that the college did not use any dietary model, and neither did they have any knowledge of such.

The factors that were found to influence students' food consumption patterns in this study were the cost of food and availability of funds. The issue of funds was found to be the main factor of students' food consumption patterns in this study. This evolved across the resident and the non-resident students. The greater percentage of the population is living in poverty, students included with disposable incomes below the poverty datum line implying low-economic status. The students also had to do with food available to them either as provided by the college or what they managed acquire for themselves. This seemed to be a national problem as the country at large has been declared food insecure. Some students' food consumption patterns were influenced by religious beliefs such as the Remba people and the Seventh Day Adventists. The other factor was study related stress which was found to alter students' overall food intake. The food provider was also found to influence food consumption patterns of the students as evidenced by the way the college was malnourishing the students by giving them unbalanced meals.

5.5 RECOMMENDATIONS

This section highlights recommendations that are made based on the research findings. These need the attention of everyone who is a food provider, nutritionist, dietician and even those in the health profession:

5.5.1 Dietary guidelines

There is need for each country to have its own dietary guidelines which clearly state national recommendations for nutrient consumption that promote academic achievement to college and university students rather than using the American guide for everyone.

5.5.2 Food policy

The college should have policies and practices regarding meal provision for the students and evaluate them more often. Food is vital for academic performance because it provides the energy required for cognition. Improving students' diet quality by increasing their consumption of fruits, vegetables, and whole grains, and reducing their intake of saturated fats and extra-calorie foods will provide more adequate energy and nutrients for the brain.

5.5.3 Nutritionist/Dietician services

Colleges should hire the services of dieticians or nutritionists if they are going to provide meals to the students. Nutritionists and dieticians should continuously assess nutritional awareness levels in the community and colleges and provide nutrition alertness services and nutritional counseling to students.

5.5.4 Clinic quarterly reports

The college clinic should give quarterly reports on the nutritional status of students who visit the clinic as it helps college authorities to take nutrition seriously. Research can focus on how nutritional knowledge can be taught in universities.

5.5.5 Nutrition projects

Research has asserted that malnourished students do not achieve optimum development. The Ministry of Higher and tertiary Education and other stakeholders are encouraged to ensure nutrient adequacy in college students. To achieve this, it is

recommended that the college get engaged in projects such as nutrition gardens and establish poultry and cattle breeding so that they can have cheaper supply of protein foodstuffs.

5.5.6 Recommendations further study

Further research is needed to determine the extent of the relationship between healthy food and increased academic performance. There is also need to carry out a longitudinal study with other colleges in order to generalise the results.

5.5.7 Developed Model for students' dietary requirements

Below is an illustration of the developed model for students' dietary patterns.

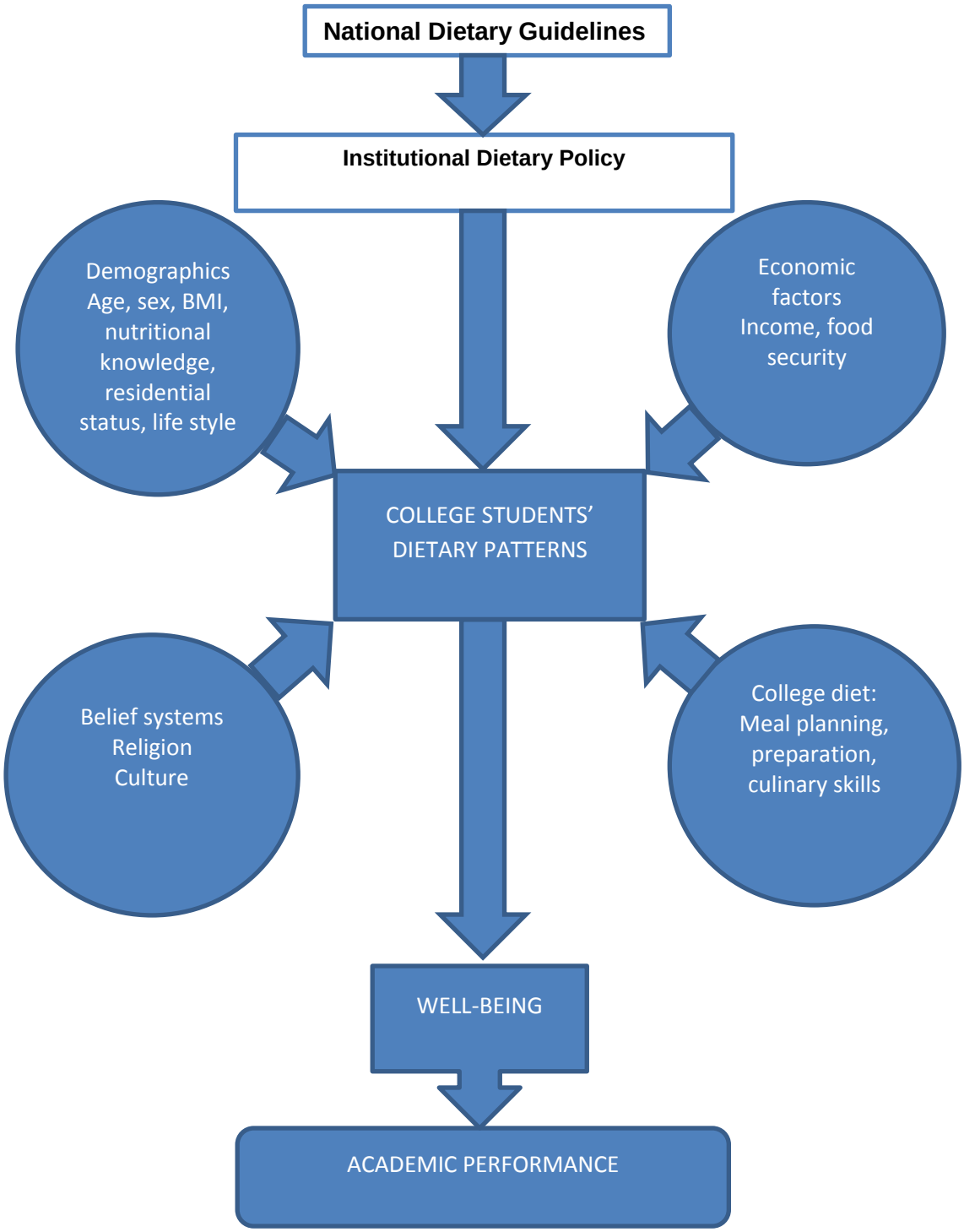


Figure 5.1: Dietary model for college students

Figure 5.1 illustrates a model the researcher developed for dietary patterns for college students. The figure shows the process of a healthy diet plan for students. In this model the stakeholders involved are the national food policy makers in conjunction with the Ministry of Health and child welfare which is the certifying institute for health, food and security policies, dieticians and nutritionists in Zimbabwe, the MoHTESTD, the training college administration, kitchen staff and the students. There is need for all the parties involved to be actively involved in planning and serving healthy diets to students for them to attain successful academic performance.

Dietary Guidelines for Zimbabweans

This model suggests the need for Zimbabwe to have a national dietary guideline that would be accessible to every citizen. Thus, the ministries that are involved in training students should develop their own institutional policies and guidelines that suit their students. Every institution that would provide meals to students should engage the services of a dietician who should communicate the policies directly to the college, students, the lecturers and the kitchen staff. They could also offer best expertise in the area of needs assessment and meal planning that takes into account the nutritional requirements of the students. This should enable college administrations to be aware of what is expected and to ensure that all those directly involved in providing food to the students may implement the policies accordingly. In ensuring the quality of diet given to the students, the dietician should be in a position to periodically monitor and evaluate the meal planning and preparation process. The recommendations should be clearly documented for the purposes of continuity even if a staff member leaves, those who join should be able to continue.

Daily nutritional requirements

Students' needs should be established according to the demographics given in this model. These variables have been selected because they are important in determining students' Daily Nutritional Requirements. The dietician would then calculate the students' nutritional needs using their age, sex, BMI and life style and recommend adequate daily nutrient intake for the students. These calculations are

necessary to avoid under-feeding or overfeeding students and also to supply nutrients in their correct proportions. Accommodating students in the college residence is recommended as this would help managing students' dietary patterns by the training institutions.

Nutrition knowledge

To attain good health and nutritional status, all people including students need sufficient knowledge and skills to grow, purchase, process, prepare, eat and provide their families with a variety of foods, in the right quantities and combinations. This requires a basic knowledge of what constitutes a nutritious diet and how people can best meet their nutritional needs from available resources (Taras, 2005:75). Food habits and nutrition-related practices, which are often based on knowledge, traditions and taboos or poor understanding of the relationship between diet and health, can adversely affect students' nutritional status and consequently their ability to learn (Hom, 2010:36). However, people can adopt healthier diets and improve their nutritional well-being by changing their food and nutrition attitudes, knowledge and practices, if sufficient knowledge is provided to them to do so.

Economic factors

The institution should make available funds for food procurement. If the students have to pay a fee towards their food, costing should be done first. Thus, the college should charge according to the food items needed and not the other way round. It is the foodstuffs that are going to be used for the students' meals that should determine the amount of fees to be paid by the students and not to consider what to buy from the funds already collected. There is a danger of under-charging; then at the end of the day, the institute fails to provide balanced diets because of insufficient budget for meals. However, the dietician should plan meals considering food availability and recommend cheaper substitutes for the nutrients.

Food security

Food security should be borne in mind, and these include food availability, food access and food utilisation. In this case food availability would be achieved when sufficient quantities of food are consistently available to all students within the college. Such food can be supplied through household production, other domestic outputs and commercial imports. Food access is ensured when all students within the college have adequate resources to obtain appropriate food for a nutritional diet. Access depends upon income available to the students, on the distribution of income within the institution and on the price of food. Food utilisation is the proper biological use of food, requiring a diet providing sufficient energy and essential nutrients. Effective food utilisation depends in large measure on the food provider's knowledge of food storage and processing techniques and basic principles of nutrition.

Belief systems

The belief systems such as religion and culture should also be taken into account considering that Zimbabwe is a multicultural nation. Foods selected for consumption among other factors cannot be explained without the context of particular socio-cultural demands and standards and economic conditions. Belief systems should be considered as and when they are reported within an institution.

College diet quality

The institution should also put emphasis on the culinary abilities and cooking skills of the food preparer. Students' meals should be well planned in such a way that they promote cognitive functioning as well, rather than providing students with empty calories. The meals should be planned in such a way that they supply the much needed nutrients for brain functioning and cognition. The cooking methods should also be varied to avoid monotony so that the students would appreciate and enjoy the meals. The quantities should provide satiety without overfeeding and should also not be too little to leave the students hungry.

Well-being of the students

The students' dietary patterns should bring about well-nourished students who will perform well academically. Previous studies established that proper dietary patterns maintain the health of body and mind, prevent diseases, help normal development of the body, and also take important roles in maintaining mental and emotional stability (Barker, 2002:185). When students are well fed they are better placed to perform well academically. The notion of good food behaviour is essential because good nutrition contributes to good health which indirectly results in producing good academic performance.

Academic performance

Academic performance is a higher need in Maslow's hierarchy of needs which only comes into focus when the lower needs which include food, in the pyramid are met. Generally poor diet quality suggests ill-health and cognitive malnutrition and compel corrective action. Ill-Health can lead to poor school performance. In-turn academic success is an indicator for the overall well-being of students; therefore, the need to foster close relationship of nutrition, health and education attainment.

CONTRIBUTION TO THE BODY OF KNOWLEDGE

Previous studies focused on the relationship between nutrition and health. There was little said about nutrition and academic performance. The study combined three theories (Maslow's Human needs theory, Miller's Information Processing Model and Vygostky's socio-cultural needs for achievement) and proposes that the human body needs energy from food to engage in any form of work (Maslow) while at the same time regulating neurological functions of the brain (Miller) and the foods selected for consumption among other factors cannot be explained in a vacuum, but in the context of particular socio-cultural demands and economic conditions (Vygostky).

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APPENDIX A

QUESTIONNAIRE FOR STUDENTS

The purpose of this study is to explore the food consumption patterns of college students. Please kindly fill in all the information required in the questionnaire. You are free to ask for clarification if need be.

SECTION A. Demographic Data

Respondents' code		Resident/ non-resident	
Age in years		Faculty	
Gender		Religion:	
Nutrition knowledge		Economic status	
Physical activity		Background rural/urban	

SECTION B. Anthropometric Data

Fill in the first phase of the anthropometric data only. The second phase will be filled during your last week of the term.

First phase

Weight___kg

Height ___m

Calculate BMI = $\frac{\text{Weight}}{\text{Height}^2}$

BMI__(Kg/m²)

Second phase

Weight__ kg

Height __ m

Calculate BMI = $\frac{\text{Weight}}{\text{Height}^2}$

BMI__ (Kg/m²)

Inference of nutritional status based on BMI (Kg/m²)

(a) Normal weight BMI=18.5-24.9

(b) Underweight BMI<18.4

(c) Overweight BMI>25

SECTION C. Food choice Patterns

1	How much water do you take per day?	
	Less than 2 litres	
	2 litres or more	
	Never	
2	Do you access your favorite meals frequently?	
	Yes	
	No	
3	What does your favorite meal consist of?	
	Indigenous foods	
	Fast foods	
	Snacks	
	Exotic foods	
4	Comment about the prices of your favorite meals?	
	Cheap	
	Relatively expensive	
	Very expensive.	
5	From which of the following food groups do you consume foods in your daily diet? Tick all that apply.	
	Cereals	
	Whole grains	
	Vegetables	
	Fruits	
	Proteins	
	Fats, oils and sweets	
7	What do you consider when making food choices?	
	Cost of food	
	Favorite meals	
	Food availability	
	Nutritive value	

SECCTION D: FOOD EATING PATTERNS

1. Who provides your meals while you are at college?
   ……

2. Are you involved in the planning of the meals? Y☐ ☐
   If No, explain your answer……

3. How many meals do you take on a day during working days?(Monday to Friday)
   Explain why: …….
4. How many meals do you take on a day during weekends? (Saturday and Sunday)
   Explain why……
   ……
   ……

5. What times of the day do you have adequate time for eating on a day?
   Explain why…….
   ……
   ……..

SECTION E. Academic Performance

1. Do you feel the same when you go for class having had breakfast and when you have not? ☐ Yes ☐ No

   Explain how you feel
   ……
   ……
   ……
   ……..

2. What factors would you attribute most to your academic performance? Explain fully.
   ……
   ……
   ……
   ……
   ……
   ……
   ……

APPENDIX B

FOOD FREQUENCY QUESTIONNAIRE FOR STUDENTS

SECTION A. DEMOGRAPHICS

Tick in the appropriate box

1. Age

18-20	
21-25	
26-29	
30-35	
36 and above	

2. Sex

Female	
Male	

3. Religion

Christianity	
Traditional	

4. Background

Urban	
Rural	

5. Family Monthly Income

$495 and below	
$496 - $999	
$1000 and above	

SECTION B: FOOD FREQUENCY

Food variety	Once per day	More than twice per day	Once per week	Once per month	Sometimes	Never
Cereals, breads and grains	1	2	3	4	5	6
Cornflakes						
Cerevita						
oatmeal						
Mealie meal porridge						
White bread						
Brown bread						
Whole wheat bread						
Polished rice						
Brown rice						
Fruit Group	1	2	3	4	5	6
Apples						
bananas						
Oranges						
Pear						
Fruit juice						
Vegetables	**1**	**2**	**3**	**4**	**5**	**6**
Cooked leafy vegetables						
Vegetable salads						
Butter nuts						
Pumpkins						
Cabbages						
Carrots						

Meat, fish, eggs and nuts	1	2	3	4	5	6
Beef						
Pork						
Chicken						
Turkey						
Lamb						
Fish						
Eggs						
Beans						
Nuts						
Milk Group	1	2	3	4	5	6
Yoghurt						
Milk						
Cheese						
Fats, Oils and Sweets	**1**	**2**	**3**	**4**	**5**	**6**
Oils						
Salad dressings						
Cream						
Butter						
Margarine						
Sugars						
Soft drinks						
Candies						
Cakes						
Sweet desserts						
Sweets						

THANK YOU!

APPENDIX C

24 HOUR DIETARY RECALL RECORD

General Instructions

- Please record all food and beverages consumed over a 24-hour time period for the next 7 days.
- Record everything you eat and drink, including snacks
- Try to record at the time you consume the food.
- Please estimate portion size (1 cup, 1 piece etc).
- Please eat as you usually eat.
- Start each new day on a new page.
- Please write clearly.

How to Record Each Food

- Describe each food and beverage in detail, as best you can.
- Complete the Meal and Place Prepared columns for each meal or snack.

Example:

Meal **Place Prepared**
B = Breakfast H = Home
L = Lunch R = Restaurant
D = Dinner C = College
S = Snacks O = Other

			FOOD ANDBEVERAGES	**AMOUNT**
1	B	C	Bread and butter	2 slices
2			Lemon tea	1 cup
3	L	C	Rice and beef stew	2 cups
4			Coleslaw salad	1 cup
5	S	R	Hamburger	1
6			Coke	1 cup
7			Apple	1

Participant Code……Day 1

Meal **Place Prepared**
B = Breakfast H = Home
L = Lunch R = Restaurant
D = Dinner C = College
S = Snacks O = Other

FOOD AND BEVERAGES				**AMOUNT**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Participant code……Day 2

Meal **Place Prepared**
B = Breakfast H = Home
L = Lunch R = Restaurant
D = Dinner C = College
S = Snacks O = Other

			FOOD AND BEVERAGES	AMOUNT
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Participant Code……Day 3

Meal **Place Prepared**
B = Breakfast H = Home
L = Lunch R = Restaurant
D = Dinner C = College
S = Snacks O = Other

			FOOD AND BEVERAGES	AMOUNT
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Participant Code……Day 4

Meal	**Place Prepared**
B = Breakfast	H = Home
L = Lunch	R = Restaurant
D = Dinner	C = College
S = Snacks	O = Other

			FOOD AND BEVERAGES	**AMOUNT**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Participant Code……Day 5

Meal	**Place Prepared**
B = Breakfast	H = Home
L = Lunch	R = Restaurant
D = Dinner	C = College
S = Snacks	O = Other

			FOOD AND BEVERAGES	**AMOUNT**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Participant Code……Day 6

Meal **Place Prepared**
B = Breakfast H = Home
L = Lunch R = Restaurant
D = Dinner C = College
S = Snacks O = Other

			FOOD AND BEVERAGES	AMOUNT
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Participant Code……Day 7

Meal **Place Prepared**
B = Breakfast H = Home
L = Lunch R = Restaurant
D = Dinner C = College
S = Snacks O = Other

			FOOD AND BEVERAGES	AMOUNT
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

APPENDIX D

INTERVIEW SCHEDULE FOR STUDENTS

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Good morning sir/madam

1. What do you consider when making food choices?
2. How do you plan your meals?
3. What are the factors that influence your food consumption patterns, either negatively or positively?
4. How would you associate your food consumption patterns to your academic performance?

Thank you once again for your contribution towards this study. Have a good day.

APPENDIX E

INTERVIEW SCHEDULE FOR COLLEGE HEAD COOKS

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please feel free to say anything. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

BIOGRAPHICAL DATA

Academic qualifications	
Sex	
Professional qualifications	
Job description	
Religion	

1. How do you plan the meals for the students?
2. How do you take care of the nutritive value of the diet whenever you plan meals for the students?
3. How would you rate the meals you serve to the students in terms of adequacy?
4. Which meals do you consider to be students' favourite meals?
5. What challenges do face with providing meals for the students?
6. What do you suggest college should do to overcome these challenges?

APPENDIX F

Observation Guide for students

PARTICIPANT CODE……...

DAY...……

MAIN FOCUS	OBSERVATIONS
Punctuality	
Attendance to lectures and all college scheduled activities	
Attentiveness during learning activities	
Level of participation in class	

Physical signs of malnutrition

Body part or body system	Observed Symptoms and signs
Hair	
Face	
Eyes	
Mouth	
Tongue	
Gums	
Skin	
Nails	
Glands	

APPENDIX G

Transcription 1

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent number 1 RS

Researcher: Eeh what do you consider when making food choices?

Student: As far as main meals are concerned as residential students we don't make any choices because the college just provides us with what they planned for us. So we eat what they give us.

Researcher: Were you not involved in the planning of the meals?

Student: We were not involved they just put a menu on the wall in the DH for us to see what we will be eating for breakfast, lunch and super.

Researcher: How do you plan the other meals you take other than those you are given by the college?

Student: Maam I do not plan, I just take whatever comes my way. I cannot afford other meals and we do not cook in the hostels.

Researcher: What are the factors that influence your food consumption patterns?

Student: Umm I can say ee the college meal times, food available, free times that I get because we are very busy throughout the day and our lectures sometimes spill

into lunch as lecturers would say, ah let's use this hour to finish our lecture. Sometimes we are called for lectures at lunch especially in subjects like ehh…

Researcher: Sorry let's not mention any names.

Student: Oh that's fine maam ndandorasika (was getting lost) kkk

Researcher: Ah no, no offence my dear kkk. We are only trying to be careful

Researcher: How would you associate your food consumption patterns with your academic performance?

Student: Hey, to tell the truth the college is trying its best but meal times are too spaced, like in the morning we have breakfast at 6am to 7am and have lunch at 1pm. I will be very hungry and weak that I even fail to concentrate sometimes I even feel like sleeping. You know what, if only we could have enough meals we would pass very much because other resources we have, like computers are readily available for everyone to use, we have Wi-Fi that we use for free we catch it anywhere around the college. Our lecturers are also good at teaching but we do not hear them because of the hunger. So I would say hunger is affecting my performance.

Researcher: Thank you very much for your contribution towards this study.

Transcription 2

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Respondent 2 RS

Researcher: Good evening

Student: Good evening how are you? Sorry for postponing the interview we had a test during break madam.

Researcher: It's okay never mind, thank you for affording me an alternative time.

Student: It's okay madam.

Researcher: Right, what do you consider when making food choices?

Student: I consider the money that I have, what it buys like cheap things and sometimes what is being sold at the tuck shop. But also here at college we are given food by the college so I don't choose that one. I only eat what they cooked, what they cook. But when I choose for myself I eat in the evening, I choose food that is not cooked like bread or buns then mazoe but it's once in a while only when I have money. And the tuck shop only sell soft drinks and biscuits so hey tight, you have to walk to town to look for bread and mazoe and you are tired after school.

Researcher: How do you plan your meals?

Student: like I said I eat at the college DH and what I have in the hostel at that time because money is a problem.

Researcher: What factors influence eh your food consumption patterns?

Student: You mean eeh what madam?

Researcher: I mean what do you eat and the times that you eat.

Student: Hoo what I eat and the times that I eat are determined by the college and the work load I have on a particular day will tell what time I eat especially after supper because if I have a lot of assignments I stay up to maybe mid night and I will need something to eat in order to keep me going. Sometimes I do not have pocket money and nothing to eat in the hostel. It's very difficult to do assignments but if I have I eat. Sometimes when you have little money like R1 and you want to buy maputi others will laugh at you and you end up not buying.

Researcher: Ok so how would you associate your food consumption pattern with your academic performance?

Student: Yoo it's very difficult to study on an empty stomach. Yes we get food from the college but haa it's not well balanced. I did food and nutrition up to form 4 so I have knowledge of this. Yaa at break we only get bread and butter and tea, that alone cannot take us up to lunch. At least they should give us something at 11:00 break. I wish the college could know that from 10am till lunch we will be hearing nothing. Like me when my stomach is empty I sleep.

Researcher: And your lecturers do not see that?

Student: Madam we are too many that they cannot see that. The classes are too big. We also need to rest a bit after lunch, but sometimes the que is very long and you get food at 1350hrs and you have a lecture at 2pm. Our food times is affecting our performance. And sometimes the sadza is just sadza and vegetables. The mealie meal doesn't stay long in the tummy.

Researcher: Besides food is there anything else that affects your learning?

Student: Haa all other things are excellent like Wi-Fi, computers and qualified lecturers with others doing doctors like you kkk.

Researcher: kkk thank you very much

Transcription 3

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 3 RS

Researcher: Good morning sir

Student: Good morning ma'am how are you?

Researcher: Well I do not want to delay you. What do you consider when making your food choices?

Student: Nothing madam I just eat what is there. I don't have any money so I eat from the dinning. And that's all and when I get some bit of money I buy a little of chibataimunhu (beer) kkk

Researcher: So you drink beer

Student: I do drink to refresh because this place is horrible with pressure otherwise I will crack my head.

Researcher: What are the factors that affect influence your food consumption patterns?

Student: Here madam I eat as per college timetable and if you miss you have missed. So it's the college that influence our times of eating and what we eat.

Researcher: How would you associate your food consumption patterns with your academic performance?

Student: We starve here madam, because we have tea in the morning then lunch at 1pm and nothing in between and I can't learn plus bhabharazi kkk irnoda kudya zvakasimba (hangover needs heavy eating). And I do not even follow what is being taught because I will be feeling dizzy and tired especially from 11am up till lunch. You see this big body needs food kkk. If we were to get enough food I will perform. Kana zai chairo hatidye (even an egg we don't eat). The diet is not good, actually I will say there is no diet. But it's better than what we eat in the rural areas. My performance is mostly affected by food madam. I wish you could talk to them madam, we will have distinctions here, kkk just joking.

Researcher: kkk thank you very much for sparing time for this study

Transcription 4

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Respondent 4 RS

Researcher: Good morning madam

Student: Good morning Ms Mpofu. How are you doing?

Researcher: I'm good thank you. Right let's start our interview I hear you have assembly today.

Student: Yes madam

Researcher: What do you consider when making food choices?

Student: As a resident student I do not have any choices because meals are being provided by the college and we just eat what they give us. That is why those who take special diets or do not eat certain foods were excluded from residents' accommodation.

Researcher: Oh is it?

Student: Yes madam because they say they cannot cater for individual's needs, so those who do not eat meat or are on special diets are not in residence

Researcher: So what would you say are the factors that affect your food consumption patterns?

Student: I would say the college and also money available because sometimes I get money to buy myself better food in town, but even sometimes when I have money I don't have time to go to town so I will just buy what is there at the tuck shop. Unfortunately our tuck shop only sells biscuits, soft drinks and zap nacks. At least they should sell fruits and bread as well.

Researcher: So how would you associate your food consumption patterns to your academic performance?

Student: Uuu it's really a challenge madam the food is very limited to sadza and meat or vegetables or rice and chicken and it really leaves me hungry. At least if we could have complete meals with everything like sadza and beef and vegetables and a desert like pudding or ice-cream at least we will be full. You can never learn on an empty tummy. We thank God our college is well furnished with computers, a good library, Wi-Fi and very competent lecturers but miss on the diet aspect. Sometimes I feel like falling down if I don't have money to supplement my food. We don't get all nutrients needed per day. Also the food is prepared the same way every time and yooo the smell makes me loose appetite. At my secondary school we used to get balanced meals and would take them well at good times and my performance was very good, but now it has gone down because of starvation.

Transcription 5

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 5 RS

Researcher: I would like to know what it is that you consider when making food choices.

Student: I do not make any choices because food is provided by the college.

Researcher: Are you involved in the planning of meals?

Student: we are not involved in the planning of the meals as students we just see the menu card in the DH, that's all.

Researcher: How do you plan your meals if they are any that you take besides those provided by the college?

Student: I don't plan I just eat what I have in the hostel, what is available, I don't choose. When you choose you will be having money to buy variety. But we eat what is there. Usually I eat biscuits and drink.

Researcher: How do you associate your food consumption patterns to your academic performance?

Student: Uhm because you know umm in our academic learning, hantie we have to eat maybe ee we have to eat foods that aa boost our brain systems on most times

they are giving us ma starch foods mostly we have sadza we have rice, we have sadza and always must eat sadza every day, we have bread that's starch and starch gives us a lot of energy and we don't need that energy because we will be seated in class the whole day, so they should give us something to boost our brains not to give us ah to give us energy.

Researcher: Ah thank you very much for participating in this interview

Transcription 6

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 6 RS

Student: Ma'am I only have 10 minutes and would appreciate if we do it fast.

Researcher: what do you consider when making food choices?

Student: When I make my food choices I consider funds available to say what can I buy with this money and how long is it going to last me. But for the food that we are given at college they made the choices for us kkk

Researcher: And how do you plan your meals

Student: I never plan meals because I get them at college, Im just abiding to the rules of the college and I won't be there when they are preparing the food.

Researcher: Ok what factors influence your food consumption patterns?

Student: It is the college that guide my food consumption pattern by giving us what they and at the times they want. So my food consumption pattern are dependent on the college.

Researcher: How would you associate your food consumption pattern to your academic performance?

Student: I lose concentration because of hunger and it will be difficult to participate in class. We lack nutrients in the food that make us learn better.

Transcription 7

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Respondent 7 NRS

Researcher: How are you this morning?

Student: Fine and how are you ma'am?

Researcher: What do you consider when making food choices?

Student: Main consideration is the money that I will be having followed by my favourite meal and the food available for purchase. I will also consider the time that I will take to prepare the meals because I leave home at 6am and get back home around 6pm and sometimes there is no electricity or even firewood. So I consider food easy to cook.

Researcher: How do you plan your meals?

Student: I try to balance my meals but hey it's difficult because of lack of money and time to cook. So planning meals is difficult, I can say I don't plan.

Researcher: Ok and what are the factors that influence your food consumption patterns?

Student: Like I said earlier on its time to eat. I also do not eat certain foods like pork because of my church and culture. I also do not eat meat killed by people who are

not of our culture and it's very difficult to get meat so I rarely eat meat. I rarely take breakfast because it will be too early for me to eat as I leave home very early because I stay far from college and will carry bread and drink to drink at break time then I do not eat anything at lunch and will only eat at night when I come back home where I stay and sometimes have bread and drink or tea because I will be too tired of spending the whole day in class and walking almost 6km to and fro every day.

Researcher: So how would you associate you food consumption pattern to your academic performance?

Student: Maiwee it's really affecting me because I am naturally intelligent but now I can't concentrate in class because of hunger and tiredness and my performance has gone down. My assignments are not pleasing although they are passing but they are at the edge. I know if I would get good food I would do better, I could not stay in residence because of the special needs as I said before.

Transcription 8

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 8 NRS

Researcher: What do you consider when making food choices?

Student: I consider money that I have to say eh, to say what can this money buy. Because even if there is something that I want I cannot choose it if it more than the money I have. I yee, I also choose food that is easy to prepare and get cooked quickly because we are very very busy and may not have time to cook thinks like aa cook things like beans. Some things I bring from home like mealie meal and peanut butter. Zve balanced diet I don't know what it is, I never did foods at school but I heard we are going to do it here kkk

Researcher: How do you plan your meals?

Student: I never plan my meals I just mix whatever is there.

Researcher: What are the factors that affect your food consumption pattern?

Student: Well I can say my major issue is to eat food that is clean as according to the bible, I do not eat pork or any meat whose source has just died without being killed kkk. The other thing is funds, pressure of work at school. And also somethings we don't know what is good for us kkk. Also sometimes distance to where I want to buy disturbs what I want to buy like the vegetable markets. Also im influenced by

hunger and I eat when I feel hungry. Also when I am too busy sometimes I forget to eat. That's what I can say.

Researcher: How do you associate your food consumption pattern with your academic performance?

Student: Umm I would say of all things food is the most challenging factor in my learning because ever since I came to college I suffer of hunger because most money went to fees. I usually come without eating and sometimes feel if I had not come because I would not hear anything. I can't concentrate to tell the truth. My performance has gone down. Sometimes I don't finish assignments on time. Sometimes I end up not coming to college; I sleep because I don't feel too much pain when asleep. If I come to college I get there late because I would be walking slowly.

Researcher: Ok thank you very much.

Transcription 9

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 9NRS

Researcher: What do you consider when making food choices?

Student: Umm, do I ever choose kkk? Aah, I can say I only eat what I have or what I am eating with friends at college.

Researcher: When you cook how you plan your meals?

Student: Hee ma'am I don't plan kkk. Sure I don't plan I just cook.

Researcher: What influences your food consumption patterns?

Student: Umm ahh, I eat when I am hungry that is if I have the food because sometimes I feel hungry but have nothing to eat. Sometime pressure of work makes you not to cook at all. And also when I am stressed maybe after failing an assignment I find wanting to eat and eat not because I will be feeling hungry but I feel relieved by eating kkk hakuzi kupengawo here maam kkk (is it not madness maam).

Researcher: No it's not my dear it happens and you are not the only one.

Student: Sure ma'am, aah thanks sure ma'am

Researcher: How do you associate your food consumption pattern to your academic performance?

Student: It really affects my learning ma'am. I am passing here and there but sometimes really fail because when you write about something you did not really understand it's really a problem. That's all I can say.

Transcription 10

Introduction and instructions

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Thank you

Molyn Mpofu

Responded 10 NRS

Researcher: What do you consider when making food choices?

Student: I consider the cost and how healthy the food is. I am really particular with what I eat. I thank God for having done food and nutrition at school.

Researcher: What do you mean by healthy foods?

Student: Eee that is the food that provides necessary nutrients to the body.

Researcher: ok thank you very much. So how do you plan your meals?

Student: I plan my meals considering what is already available. I make sure my meals have the following, CHO, protein, vitamins and I don't look at expensive sources of these. I also do not include unhealthy food fatty based meat to avoid high blood pressure and cardio vascular disease because of the fat. I also make sure my meals are attractive so that I feel I want to eat the food.

Researcher: What influences your food consumption patterns?

Student: As a student we have scheduled times for break and lunch break. I also make sure I don't eat anything anytime. If I feel hungry I eat but I eat light and healthy snacks like fruits so that I will be able to take my meals properly ee well. I

don’t take junk foods, I pack my food from home. I am also a Christian so I do not take pork and I also do not eat meat killed by someone of the Remba tribe so i just buy meat from Halaal butchery because they don’t use the Rembas to slaughter their animals. Sometimes I also eat the food that my friends eat because we will be sharing food at college, so you find I would have gone out of my way so that my friends do not say I am proud. Sometimes when there is load shedding you end up just having bread and drink as your meal.

Researcher: How do you associate your food consumption pattern to your academic performance?

Student: I am always performing well in class because I am always well eaten, I mean I always have my food well, we have computers, Wi-Fi, a library with e-learning I can safely say all is well with my performance.

Transcription 11

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 11 NRS

Researcher: What do you consider when making food choices?

Student: I usually consider money available and what it can buy. I also consider my favourite food.

Researcher: How do you plan your meals?

Student: I use resources available mostly and then acquire buy what is not there to make proper meals. I consider nutrient value of the food. I make dishes, sorry, I plan dishes that I will make have all nutrients because there is no one dish that can provide all nutrients. I also plan considering where I am going to eat from like I can't carry sadza to college.

Researcher: What influences your food consumption patterns?

Student: Too much work makes me to lose appetite. Stress makes me eat too much of sweets. I also watch my weight so I don't eat too much. Also the college time table determines my time to eat. Yaa that's it

Researcher: How would you associate your food consumption pattern to your academic performance?

Student: It really takes a great deal of a good diet in order to perform well in class. I have experience this is on several occasions that when I come to school without having eaten , hey I feel terrible, I feel I can't concentrate, it will be very difficult for me to sit, I feel like sleeping. But when I have eaten ahh no problem I learn well. I may fail maybe just because I didn't understand the concept not because of hunger. I wish the issue of food in colleges can be really addressed.

Researcher: Thank you very much.

Transcription 12

Introduction and instructions

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Thank you

Molyn Mpofu

Respondent 12 NRS

Researcher: What do you consider when making food choices?

Student: Aah I just eat what my wife cooks, she is a very good cooker kkk, but she knows what I like best

Researcher: How do you plan your meals?

Student: That's for her, but sometimes it depends on the money we have in the house, so she sometimes says I will cook this and that because that is what is there.

Researcher: Ok but you as an individual what influences your food consumption pattern?

Student: Firstly it's the time the food is served or the time I get home after school. If I have a lunch box I will eat during lunch or buy food from the tuck shop because I'm lazy to carry a lunch boxlike a woman and sometimes I lose the lunch box kkk.

Researcher: kkk and how would you associate your food consumption pattern with your academic performance?

Student: I never come to college without eating because I would have wasted my day. Food is very important for keeping the brain lively. Even if you have all the resources without food I tell you, you can't learn. I am doing well in my performance because I will be well nourished.

Transcription 13

Introduction and instructions

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Thank you

Molyn Mpofu

Student Number NRS 13

Researcher: I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Thank you.

Student: Thank you maam.

Researcher: What do you consider when making food choices?

Student: I consider what I like best that is my favourite meal which is chips and chicken from chicken inn. I can eat this, ee eat every day, I like it very much**.** Even when I am at home I makesure that I have this while others have whatever they cook. My mother always complains am eating chips too much.

Researcher: Ok. How do you plan your meals?

Student: I never plan meals I just go with my friends and buy prepared food from the restaurants and other food outlets. I don't have time to cook and its even cheaper and less time consuming than cooking and there is always no electricity.

Researcher: What are the factors that influence your food consumption patterns, either negatively or positively?

Student: its availability of my favourite food maam and also I like going out and so we eat out with my friends.

Researcher: How would you associate your food consumption patterns to your academic performance?

Student: I don't know why but when I eat I always feel like sleeping and I dose in class. But if I eat less I feel much better but will feel hungry quickly so I don't know what I should do to be able to lively in class. But my mother was saying it's the types of food that I eat that has too much fat.

Researcher: Which foods are those?

Student: For breakfast I eat fried eggs, fried sausages, beacon, beans and bread. With tea and coke if it's hot.

Researcher: Ehe kkkk your mother is right kkk. Well thank you very much. Thank you once again for your contribution towards this study. Have a good day.

Transcription 14

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Student Number NRS 14

Researcher: I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers.

Student: Thank you.

Researcher: What do you consider when making food choices?

Student: I consider convenience because we have a lot of work at college and the time is very limited to do other things like cooking.

Researcher: So how do you plan your meals?

Student: I don't plan because I buy from the caravans in town. There are now a lot of them in town so it's easy to buy prepared food and go to do my assignments.

Researcher: ok. What are the factors that influence your food consumption patterns?

Student: If the food is there I eat whenever I am hungry. Sometimes pressure of work determines what time I eat. Sometimes it's so stressful that the last thing I can ever think of is food.

Researcher: How would you associate your food consumption patterns to your academic performance?

Student: Oh food really keeps me going and I feel energetic to learn when I have eaten and I strongly recommend that students should take their food properly in order for them to pass.

Researcher: Thank you very much.

APPENDIX H

Transcription 15

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Cook Number 1

Good morning madam

Researcher: May I kindly have the following information;

Academic qualifications	Ordinary Level
Sex	Female
Professional qualifications	Professional Cookery
Job description	Head cook
Religion	Christianity

Researcher: I would like to thank you for accepting to take part in this interview. Please answer as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers.

Well, how do you plan the meals for the students?

Cook: Umm it's really a challenging task to plan meals for a large group of people with limited funds. As much as we would have loved to plan the meals in such a way that the meals provide all the necessary nutrients we can't do that because students are just paying $175 for the whole term and get 3 meals per day. So we are just considering funds available and we buy what is cheap. Because if you calculate you would find that its $1.94 per day. And where have you seen an adult having food for such an amount kkk.

Researcher: so how do you take care of the nutritive value of the diet whenever you plan meals for the students?

Cook: It's very pathetic; like I said before we do not even consider nutritive value we are just giving them something to fill their tummies. They are just getting more of Carbohydrates and proteins. No vitamins and other nutrients. And remember each meal should supply these nutrients but there is not a single meal that we serve them that provides all nutrients.

Researcher: Would you rate the meals you serve to the students as adequate or not?

Cook: I wouldn't really be sure because there are two things here. They sometimes throw away food in the bin which might mean that they are full or maybe it will be dislike of the food.

Researcher: Which meals do you consider to be students' favourite meals?

Cook: Yuuu kkk these ones they like rice and chicken and there will be very little food thrown in the bin.

Researcher: What challenges do face with providing meals for the students?

Cook: This place is too small to serve the more than 700 students in the college so students queue for long hours in order to get food. Although we start serving from 12pm but you will discover the students will only come after 1pm because they will be having lectures up to 1pm. The other challenge is that of resources as earlier indicated I won't repeat. We also have a problem of load shedding by ZESA and that one is a national problem, however this affects our cooking time the quality of food.

Researcher: What do you suggest college should do to overcome these challenges?

Cook: Firstly there is need for a big dining hall so that students may be served fast and not delay for lectures because sometimes some students end up going back for lectures without eating. And also the issue of resources, I mean funds for food should be revised upwards to at least $1 per meal so that we may be able to provide balanced meals to the students for them to be well nourished.

Researcher: Thank you once again for taking part in the study. I really appreciate.

Transcription 16

Introduction and instructions

I would like to thank you for accepting to take part in this interview. Please respond as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers. Also, you do not have to say who you are because only the ideas and not your name are important.

Thank you

Molyn Mpofu

Cook Number 2

Researcher: Good morning madam
Cook: Morning how are you?

Researcher: Am fine thank you and how are you? I would like to thank you for accepting to take part in this interview. Please answer as honestly as possible. Remember the views expressed here are only going to be used for this study and there are no wrong answers.

Cook: Thank you.

Researcher: Aaa well as we can see your sex is female kkkk.

What are your academic qualifications?

Cook: Ok I have gota a six 'O'Levels

Researcher: So its o level. Then your professional qualification?

Cook: aah I am a skilled worker class one cook. I did professional cookery at at at Hotel school and I also did further education training certificate with VTC under HEXCO.

Researcher: ok thank you very much. So what is your job description in this institution?

Cook: I am a cook

Researcher: You are a cook

Cook: Yes

Researcher: ok

And what is your religion?

Cook: I am a christian

Researcher: a Christian

Cook: yes hh

Researcher: That's great. I would like to know, how you plan your meals for the students.

Cook: ah what I can say, aa I am still new here, I came recently end of end last year 2014

Researcher: Ok

Cook: So according to what I found here I them already planned a a a menu for the students. So we just continued with the one which was already there.

Researcher: which was already there

Cook: Yes but there are some changes here and there.

Researcher: Ok

Cook: umm like the one which I showed you

Researcher: Yes I saw it.

Cook: Umm umm thats the menu we are using currently.

Researcher: Would you have any idea of who planned those meals?

Cook: Um ee the one I found (name supplied) she was the one who was here before so she is she one who planned it with the other colleagues are here. So there are the

ones who planned it and it changes here and there according to my understanding. So I just carried from there, from thereee.

Soo o what can I say about the menu? Its its its not that well balanced. Because when you are serving meals hantsho it's supposed to be starch hantsho, protein and vegetables which is there, which ee has got vitamins ee content but currently it's like we are serving ee eee starch and protein. And then at times its starch and vitamins. If maybe starch and protein hantho and have a supplement of vitamins let's say fruits. Currently we don't provide those.

Researcher: ok

Cook: Eh we don't provide those, way or the other. He so the e e the e e lack of some protein um nxe some vitamins, some nutrients here and there ehe because they are supposed to 5 ah so you kuti (that) maybe it will just be two.

Researcher: 2

Cook: ehe

Researcher: so in other words you are saying the nutritive value of the diet is not as adequate as it should be, the nutritive value.

Cook: Yaah it's not a well-balanced one

Researcher: And in terms of adequacy do the students get satisfied when hey eat the food? Not on the side of nutrition or nutritive value but satiety.

Cook: Yaah its aaah aaah what I have noticed is like they want to have rice and chicken, thats their favourite.

Their favourite is rice and chicken

Researcher: Ok

Cook: Yaah sadza here and there but mostly they always want to take chicken and rice. That is their favourite meal at the moment. So at times if they have aah vegetables, at times they complain hee tavakuda nyama (we want meat), hee but kuhamba njani (whats happening) but I have noticed the days we have the eeh vegetables especially in the afternoon ehe they don't normally like those ehe but I

always tell them that at times you have to take vegetables for roughage purposes you need to take vegetables not meat because you fine meat is their favourite especially beef and chicken. Beef and chicken.

Researcher: It's normally the students kkk. Yaah so to add on, on that I wanted to ask on quantity do you think they have enough- the students, do they not complain that they are not satisfied, the food was not enough or maybe it was too much?

Cook: They don't normally complain, I can say they have got enough sometimes even have ee e we serve we don't have a shortage we don't normally have.

Researcher: They sometimes throw away.

Cook: Ehe they sometimes throw away excess food in the bin.

Researcher: Which means the quality is ok for them.

Researcher: What are the challenges that you face with providing the meals?

Cook: In terms of preparing?

Researcher: Yes

Cook: Sometimes we normally have challenge of load shedding – electricity so sometimes when there is load shedding we either use gas if that is available or we use fire.

Researcher: Ok

Cook: So at times we will be working under pressure like moving from the kitchen to… to the shed outside there. Ahm but in terms of supply sometimes we have challenges here and there but not every time because we usually request our orders on time and we collect it on time so that we do not inconvenience ama students uhm.

Researcher: And what about time for eating? Do you feel the time they have for eating is adequate?

Cook: Uhm because we usually serve from 1230h to 1400h. It's adequate, the time is ok but eh in terms of the facilities now eh this is not a DH as such.

Researcher: Ok

Cook: This is a canteen. Of which we cannot serve all the students at one goal.

Researcher: Ok. So you wait for the others to finish.

Cook: We can't serve them all so – ehe yes while others are still waiting others are eating, if you have noticed others will still be on the que.

Researcher: How many do you serve at once?

Cook: We can't serve 300 or 500, we can't feed them at one go because this facility it's a canteen and not a DH.

Researcher: So it means the college should have a DH

Cook: We do not have a DH

Researcher: So this is just a make shift structure?

Cook: It's a make shift structure.

Researcher: So we don't serve them at one goal. Roughly how many do you think this all takes?

Cook: Aah I have never counted, I have not done any physical count but usually we serve 250 at lunch but not at one goal, uhm not at one goal because I can say hundred and eh… it should be over 100 not exceeding 250 around 100 or 150 somewhere there.

Researcher: That's ok. So what do you suggest the college should do to overcome these challenges?

Cook: kkkk haah

Researcher: What do you think? What can you say if the college could do this for us then it would eeh make life easy for us

Cook: Haah ahh because I once raise this issue some sometime back when we had a workshop that aah –it depends with the government plans according to how they are going to put their things in place in terms of building the DH because in the… the

college has to build a aa proper DH with all the facilities ehh for the students, the wash up place, everything because as it is, it is just a makeshift because because we need to have eeh a DH which caters for over a 1000 students at one go and have all things in place. The facilities for the gas, the facilities for the fire place and the changing rooms for the staff. All that needs to be in place uhm

Researcher: So-o- from these challenges do you also think that monetary problems come in as well? Like in the provision of student food. Do you think whilst you have the plans for the students' diet could it be because college does not have money to buy the students fruits like you were saying students should have fruits and you know that the diet is not balanced. What do you think is the major problem, could it be the problem of money?

Cook: Aaah, I can say yes because aa at the moment the fees are subsidised…

Researcher: By the government?

Cook: By the government so eeh in terms of requesting now, we now have to just request eeh within the resource which are there.

Researcher: Available

Cook: Or we don't have to exceed the resources which are there, the budget. We have to make do with what is there.

Researcher: So students do not pay any money towards food?

Cook: They do pay for it. It's specifically for their food.

Researcher: Do you have any idea of how much they are paying?

Cook: They are currently paying US$150 per term towards food.

Researcher: Which is for 3 months?

Cook: 3 months

Researcher: Which means it's an average of $50 per month

Cook: Per month uhm

Research Assistant: Per month we have 30 days.

Researcher: So per day less than $2

Cook: kkk

Researcher: Less than a dollar per meal, is it?

Research Assistant: Yaah it's way less than a dollar because they get 3 meals per day

Cook: Yes yes of which in the morning its breakfast 4 slices of bread, butter, jam and a cup of tea. Uhm so it's like we don't we do not even a full breakfast whereby you can give them cereal or porridge, there is no cereal, no porridge, no egg.

Researcher: Ok

Cook: It's just bread and butter and a cup of tea and it either black or white. Uhm only and they lunch it will be depending on the menu which is there. Normally in the afternoon at times its protein which is chicken and rice or chicken and sadza and in the evening its beef and sadza or vegetables and sadza sometimes beans and rice

Researcher: Under normal circumstances if you were to prepare a… a balanced diet or a balanced meal for the students, for the students what would you, what would you suggest should be included?

Cook: As for the breakfast it has to be accompanied by cereals. Cereals, tea and ah some toast and egg at least.

Researcher: OK so that breakfast will be balanced?

Cook: Uhm it will be balanced and even with a fruit. As for a ah for such institutions we can't have a full breakfast like the ones served in the hotels kkk

Researcher: kkk you can say that again

Cook: It can't be a full one, it can just be something, a protein, vitamin and a bit of starch from the bread.

Researcher: Thank you very much. From your observation, do you think the food that these students are eating promote their learning? If they go to the lectures, like

maybe, let me elaborate that when students are in the lecture they have to be attentive.

Cook: Exactly

Researcher: They have to concentrate

Cook: Uhm

Researcher: They have to be lively, so do you think the food they are getting gives them enough energy to concentrate in class?

Cook: Yes they do. They do kkk

Researcher: kkk thank you

Cook: Haah they always say haa sisuthi haa sesitsute then they go back for their, for their lectures but every day they will complain that haa sitshone ngendlala (we were hungry the whole day). Hlebe sesila mbile whatever. I haven't heard any complaints.

Researcher: So in other words you can say although the food is not well balanced but it's keeping the students going

Cook: It's keeping them going

Researcher: Ok haa this is all we wanted to hear from you. Thank you very much kkk. Like we have promised this is just meant for the study and we are not going to release this information to anyone. If ever there is need for someone to know about is we will first talk to you and tell you the importance but if you are not willing we won't do that.

Researcher: Thank you very much.

Research Assistant: Thank you very much.

APPENDIX I

JOSHUA MQABUKO NKOMO POLYTECHNIC

STUDENTS MENU

DAY	TEA	LUNCH	SUPPER
MONDAY	BREAD	RICE &CHICKEN	SADZA & BEEF
TUESDAY	BREAD	SADZA & VEGETABLES	SADZA & CHICKEN
WEDNESDAY	BREAD	SADZA & CHICKEN	SADZA & BEEF
THURSDAY	BREAD	RICE & BEANS	SADZA & CHICKEN
FRIDAY	BREAD	SADZA & LACTO	SADZA & BEEF
SATURDAY	BREAD	RICE & BEANS	SADZA & CHICKEN
SUNDAY	BREAD	SADZA & VEGETABLES	SADZA & BEEF

APPENDIX J

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms M Mpofu

Student No:
11641131

PROJECT TITLE: **Impact of dietary patterns on academic performance of Zimbabwean college students.**

PROJECT NO: **SEDU/15/CSEM/04/1012**

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Prof AP Kutame	University of Venda	Promoter
Dr HN Mutshaeni	University of Venda	Co-Promoter
Prof LL Maliwichi	University of Venda	Co-Promoter
Ms M Mpofu	University of Venda	Investigator - Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: December 2015
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Prof. G.E. Ekosse

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950λ LIMPOPO PROVINCEλ SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

APPENDIX K

TO: Whom It May Concern

From: Prof. A.P. Kutame

Date: 30 June 2015

Permission granted to gather data on dietary patterns and academic performance of college students in Zimbabwe: Molyn Mpofu: DED: Student Number 11641131

Reference is made to the above:

1. Molyn Mpofu,student number 11641131 is a Doctor of Education student at the University of Venda who is at the stage of gathering data for her thesis titled: **Impact of dietary patterns on academic performance of college students in Zimbabwe.**
2. I humbly request for your permission that she may collect data within your institution.
3. She will be bound by the regulations of the Ministry of Higher and Tertiary Education, Science and Technology Development in Zimbabwe.

Your support in the regard will be highly appreciated.

Kind Regards

Prof. A.P. Kutame (Promoter)

University of Venda
Private Bag X5050, Thohoyandou, 0950
Limpopo Province South Africa
Tel: (015) 962 9106; **Fax**: 086 525 9111; Cell: 072 056 3658
E-Mail: Philip.kutame@univen.ac.za; Philip.kutame@gmail.co.za

"A quality driven, financially sustainable, rural-based comprehensive university"

APPENDIX L

All official communications should be addressed to:
"The Secretary for Higher & Tertiary Education
Telephones: 795891-5, 796441-9, 730055-9
Fax Numbers: 792109, 728730, 703957
E-mail: thesecretary@mhet.ac.zw
Telegraphic address: "EDUCATION"

ZIMBABWE

Reference:

MINISTRY OF HIGHER AND TERTIARY EDUCATION, SCIENCE AND TECHNOLOGY DEVELOPMENT
P. BAG CY 7732
CAUSEWAY

04 May 2015

4806 Chidhambakura st
Rujeko B.
Masvingo

Dear Ms Molyn Mpofu,

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH ON "IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS.

Reference is made to your letter, in which you request for permission to carry out an educational research on **"IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS".**

Accordingly, be advised that the head of Ministry has granted permission for you to carry the research ***within the Ministry.***

It is hoped that your research will benefit the ministry. Accordingly, it would be appreciated if you could supply the office of the permanent secretary with a final copy of your study, as the findings would be relevant to the Ministry's strategic planning process.

M. J. Chirapa (Ms)
For: PERMANENT SECRETARY

APPENDIX M

→ Dean: Tr. Ed.
Dean: Tech Ed.

All official communications should be addressed to:
"The Secretary for Higher & Tertiary Education
Telephones: 795891-5, 796441-9, 730055-9
Fax Numbers: 792109, 728730, 703957
E-mail: thesecretary@mhet.ac.zw
Telegraphic address: "EDUCATION"

ZIMBABWE

Reference:

MINISTRY OF HIGHER AND TERTIARY
EDUCATION, SCIENCE AND
TECHNOLOGY DEVELOPMENT
P. BAG CY 7732
CAUSEWAY

04 May 2015

4806 Chidhambakura st
Rujeko B.
Masvingo

Please render her the assistance she needs for the research. N. Moyo — Principal

PRINCIPAL
J.M. NKOMO POLYTECHNIC
06 JUL 2015
P. BAG 9830, GWANDA
TEL. 22390/22315

Dear Ms Molyn Mpofu,

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH ON "IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS.

Reference is made to your letter, in which you request for permission to carry out an educational research on **"IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS".**

Accordingly, be advised that the head of Ministry has granted permission for you to carry the research ***within the Ministry.***

It is hoped that your research will benefit the ministry. Accordingly, it would be appreciated if you could supply the office of the permanent secretary with a final copy of your study, as the findings would be relevant to the Ministry's strategic planning process.

M. J. Chirapa (Ms)
For: PERMANENT SECRETARY

APPENDIX N

School of Education
University of Venda
P. Bag X5050
Thohoyandou 0950

03 July 2015

Dear Principal,

I am currently conducting research on the Impact of dietary patterns on academic performance of Zimbabwean college students. I have been granted permission by the Ministry of Higher and Tertiary Education, Science and Technology Development to conduct research in the college.

1. An interview will be conducted and will take approximately 30 minutes per participant.
2. There is no known risk involved in the research.
3. There are no costs involved.

You are assured that the identities and responses of the participants will be regarded as **extremely confidential at all times and they will not be made available to any unauthorised user.**

CONSENT

In terms of the ethical requirements of the University of Venda, you are kindly requested to consent by filling in below:

I Dr N. Moyo have read the contents of this note and understood the terms involved.

Signature: N. Moyo Date:

PRINCIPAL
J.M. NKOMO POLYTECHNIC
06 JUL 2015
P. BAG 5832, GWANDA
ZIMBABWE TEL: 2239/22315

APPENDIX O

RESEARCH CONSENT FORM

Title of study: IMPACT OF DIETARY PATTERNS ON ACADEMIC PERFORMANCE OF ZIMBABWEAN COLLEGE STUDENTS.

Please read this form carefully and complete. If you are willing to participate in this study, read the appropriate responses, sign and date the declaration at the end. If you do not understand anything and would like more information, please feel free to ask.

- I have had the research satisfactorily explained to me verbally and in written form by the researcher.
- I understand that the research will involve: giving information about dietary patterns using oral interviews, observations on food intake and class attendance as well as physical body measures.
- I understand that I may withdraw from this study at any time without having to give an explanation.
- I understand that all information about me will be treated confidentially and that I will not be named in any written work arising from this study.
- I understand that I will not be compensated for giving information in this study.
- I understand that the researcher will be discussing the progress of the research study with college authority at JMNkomo Polytechnic College.
- I understand the researcher will obtain my in class test scores in five major subjects in my area of discipline to determine my academic performance

I therefore freely give my consent to participate in this research study.

RESPONDENT:

Signature:…..……Date…….

RESEACHER:

Signature:……Date…….....