

**NUTRITION KNOWLEDGE, FOOD INSECURITY AND COPING STRATEGIES
AMONGST HEALTH CARE SCIENCE STUDENTS AT THE UNIVERSITY OF
LIMPOPO, SOUTH AFRICA**

By

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DISSERTATION

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DEDICATION

This study is dedicated to my deceased parents; Mabine Josias Mashabela and Bakhambile Joanah Mashabela who taught me patience. To my son Mafiri Katlego Madihlaba and my two sisters Ramabele Annah Mashabela and Malope Irene Mashabela, I am who I am thanks to your unconditional love and support.

DECLARATION

I declare that the “**Nutrition Knowledge, Food Insecurity and Coping Strategies Amongst Health Care Sciences Students at The University of Limpopo, South Africa**” dissertation hereby submitted to the University of Limpopo, for the degree of Master of Science in Dietetics has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

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MASHABELA M.E (Ms)

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Date

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ABSTRACT

Introduction: Nutritional knowledge is essential for selecting healthy and nutritious meals. However, access to consistent, adequate and nutritious food was unattainable for university students, despite the fact that food was considered a human basic right. Food insecurity is a real issue in South African universities, but it is poorly documented. Numerous studies have used one approach to measure food insecurity rates in various universities, either quantitative or qualitative. There is a scarcity of data on food insecurity among students in institutions of higher learning in Limpopo Province. Food-insecure students used a variety of coping mechanisms such as, borrowing money, buying cheap food, skipping meals, sharing food, and reducing portion size in order to cope with food insecurity.

The goal of the study was to investigate the level of nutrition knowledge, food insecurity, and coping strategies among students at the School of Health Care Sciences. at the University of Limpopo, South Africa.

Methodology: The explanatory sequential mixed-method approach was used in this study. The quantitative survey employed convenience sampling, with 237 undergraduate participants from the Health Care Sciences. Nutritional knowledge was assessed using a multiple-choice questionnaire adapted from the Perlstein study. Food security status was assessed using the eight (8) questions from Food Insecurity Experience Scale. Fourteen purposefully selected in-depth qualitative interviews were conducted to explore life experiences and coping strategies of food-insecure students. Statistical analysis was performed using STATA version 11.0, Fischer's exact test to test the association between food insecurity and nutritional knowledge with regards to age, gender and study level and thematic analysis for the qualitative data.

Findings: Students were on average 21 years old, in level II and level III years of study. Fifteen percent (n=36) had poor nutritional knowledge, 69% (n=164) had moderate nutrition knowledge, and 14.7% (n=35) had good nutritional knowledge. Both males and females in the current study had a fair amount of dietary knowledge. Twenty-four percent (n=57) experienced moderate food insecurity and 16% (n=37) had severe food insecurity. The rate of food insecurity in the study exceeded the national rate. Lack of budgeting skills, delayed distribution of bursary money, unforeseen costs, and household obligations were among the factors that aided in food insecurity.

Food-insecure students applied numerous coping mechanisms, such as borrowing money from friends, sharing food, buying cheap food, and cutting portion sizes. The study found a significant association between a study level and nutrition knowledge with a P-value of 0.02 for both study levels less than and more than two years. Six themes emerged from interviews with food-insecure students i.e., coping strategies, nutrition knowledge, hunger and academic effect, competing expenses, health triangle and contributing factors to lack of money to buy food.

Conclusion: This study provided insight into the food insecurity levels and the nutritional knowledge of the students in the Health Care Sciences at the University of Limpopo. It further offered an understanding of how students experienced food insecurity and the various coping mechanisms employed to deal with the situation. The rate of food insecurity in the study exceeded the national rate. Nutrition education programmes and interventions that address food insecurity are important and the strengthening of existing support systems to ensure that students cope and succeed in their studies. Future research is needed to cover a large scale of students.

Keywords: Food in/security, students, coping strategies and nutrition knowledge.

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LIST OF ABBREVIATIONS

APA	American Psychological Association
COVID-19	Coronavirus disease of 2019
DHET	Department of Higher Education and Training
DOH	Department of Health
FAO	Food and Agricultural Organisation
FBDG	Food-Based Dietary Guidelines
FI	Food Insecurity
FIES	Food Insecurity Experience Scale
GPA	Grade Point Average
IFA	International Fund for Agricultural Development
IHL	Institutions of Higher Learning
KCS	Korean College Students
MCS	Mongolian College Students
MMR	Mixed Methods Research
NHANES	National Health and Nutrition Examination Survey
NSFAS	National Student Financial Aid Scheme
SAVAC	South African Vulnerability Assessment Committee
TRA	Theory of Reasoned Action
TREC	Turfloop Research Ethics Committee
WFP	World Food Programme
WHO	World Health Organization
UNICEF	United Nations Children’s Fund
UKZN	University of KwaZulu-Natal
US	United States
USA	United States of America
USDA	United States Department of Agriculture
WHO	World Health Organization

DEFINITIONS OF CONCEPTS

A student is a person who is studying at a university or other places of higher education (Oxford Dictionary, 2018). In the current study, a student will refer to a person who is studying at the University of Limpopo in the School of Health Care Sciences.

A coping strategy is a thought process that is used to deal with an unpleasant situation or to change one's reaction to such a situation (APA Dictionary, 2019). In the study, a coping strategy refers to an action undertaken to solve a personal problem to overcome a stressful situation.

Food insecurity is the state of being without reliable access to a sufficient quantity of affordable, nutritious food (FAO, 2015). In the current study, food insecurity will mean not having the guarantee of food shortly to sustain the body and mind.

Food security exists when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 2015). In this study food security means having unlimited access to buy and eat nutritious food to sustain a healthy body and mind.

Mixed methods research involves combining qualitative (QUAL) and quantitative (QUAN) methods (Creswell and Plano-Clark, 2017). In the study, mixed methods will refer to collecting and analysing quantitative data separately then followed by collecting and analysing qualitative data and thereafter merging the results and interpretation.

Nutrition knowledge refers to knowledge of concepts and processes related to nutrition and health including food representing major sources of nutrients, dietary guidelines, and recommendations (McKinnon, Giskes and Turrel, 2014). In this study, nutrition knowledge will refer to knowledge of food and nutrients by students.

CHAPTER ONE: OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

One of the factors in choosing a healthy and nutritious food was nutritional knowledge (Worsley, 2002). According to Makowske and Feinman (2005), students lacked nutritional knowledge which may lead to unhealthy eating habits and practices. Young university students were prone to poor dietary habits such as skipped breakfast, ate a lot of fast food, sweets and sugary drinks (Musaiger, Awadhalla, Al-Mannai, Alsawad and Asokan, 2017). On the other hand, students that had more nutritional knowledge were seen to consume foods that contained less unhealthy fat and cholesterol (Yahia, Brown, Rapley and Chung, 2016). Knowing which food to buy and how to prepare could assist students to be food secure. Food literacy skills could enable one to stretch their food budget, choose and cook healthier food and save money which could lead to improved food security (Vidgen and Gallegos, 2014; Begley, Paynter, Butcher and Dhaliwal, 2019).

Food insecurity was a major issue all over the world. College and university students were no exception (Mukigi and Brown, 2018). It was caused by circumstantial, economic and other barriers that limited a specific population's access to sufficient and nutritious food (Jensen, Gregory and Singh, 2014). A lack of financial management skills, such as budgeting for food expenses also contributed to food insecurity (Forman, Mangini, Dong, Hernandez and Fingerman, 2018; Gundersen and Garasky 2012). Higher education students were more likely than the general population to be food insecure (Hughes, Serebryanikova, Donaldson and Leveritt, 2011; Nazmi, Martinez, Byrd, Robison and Bianco *et al.*, 2018). Scholars reported that individuals from low-income families, racial/ethnic minorities, those who grew up in food-insecure homes, and those who lived off campus were more likely to experienced food insecurity during college (Martinez, Webb, Frongillo and Ritchie, 2017; Payne-Sturges, Tjaden, Caldeira, Vincent and Arria, 2018). Furthermore, researchers pointed out that university students are vulnerable group with regards to food insecurities due to the high cost of attending university (Cheong, 2021).

Poor academic, mental, and social outcomes have been linked to food insecurity. (Mukigi, Thornton, Binion, Brown and Church, 2018). In the United States, African Americans and Hispanics were more likely than White students to be food insecure (Martinez, 2016, Jensen, Gregory, Rabbitt and Singh, 2016). Doom and Haeffel (2013) discovered that food insecurity predicted low self-esteem in African American students. International data on the prevalence of food insecurity among students in the United States revealed that 15 to 58.8% of the sampled population was higher than the national average (Jensen, Gregory, Rabbit and Singh, 2016; Kaul, 2016; Lerer, 2013; Freudenberg, Manzo, Jones, Kwan, Tsui and Gagnon, 2011). There appeared to be a racial disparity in food insecurity among students (Martinez, 2016).

Studies showed that the prevalence of food insecurity amongst students in institutions of higher learning in US, Canada, Australia and New Zealand were higher compared to their national levels (Hughes *et al.*, 2011). Studies conducted in South Africa revealed similar higher rates of students' food insecurity compared to the national level (du Toit, 2011). In South Africa the prevalence of food insecurity was conducted in few and mainly historically disadvantaged institutions of higher learning. Some researchers concurred that the issue of food insecurity at institutions of higher learning was under-researched in South Africa (Munro, Quayle, Simpson and Bamsley, 2013; Van den Berg and Raubenheimer, 2015).

It should be noted that food insecurity measurements at international and national level was quite subjective such that there was no specific standard used as a benchmark (Headey and Ecker, 2013; Hendriks, 2013). University food insecurity studies used different methods of measuring and analysing food insecurity (Rudolph, Kroll, Muchesa, Manderson, Berry and Richard, 2018). Nonetheless, measuring food insecurity at any level including the individual level was an important method of determining the factors that may have caused the food insecurity or may affected food security in the future, and deciding on the appropriate interventions (Sabi, Kolanisi, Siwela and Naidoo, 2019). According to Silverthorn (2016), 39.2% of students in Canada were food insecure, whereas rates of food insecurity in Australia ranged between 48 and 72% (Hughes *et al.*, 2011; Micevski, Thornton and Brockington, 2014).

A study at the University of KwaZulu-Natal comprising of 5 campuses and 4 colleges conducted in KwaZulu-Natal Province amongst postgraduate and undergraduate students, found that 55% of the students who were identified as coming from low-income families were food insecure (Gwacela, Chita and Kolanisi, 2013). According to Van den Berg and Raubenheimer (2015), 24.6% of undergraduate and postgraduate students in the Free State University students were food insecure without hunger, while 60% were food insecure with hunger. A related study of undergraduate students at the Witwatersrand University discovered that 1% of students were severely food insecure, while 6% were moderately food insecure (Rudolph *et al.*, 2018).

It should be noted that the above South African studies involved majority of undergraduate and few postgraduate students from low socio-economic background. Food and Agriculture Organization and South African Vulnerability Assessment Committee, 2020 report revealed that Free State, KwaZulu-Natal and Limpopo had the following percent of moderate to severe and severe food insecurity, 21.8% and 13%, 26.4% and 16.4%, and 28.9% and 18.2% respectively. These percentages were higher than the national level which was 23.6% and 14.9%. Furthermore, Limpopo and Free State were amongst the provinces with the highest proportions of household without an employed person in 2020 (FAO and SAVAC, 2020).

It is therefore not surprising to have the high rates of food insecurity amongst the students from the South African institutions of higher learning based on the above FAO and SAVAC, 2020 statistics. To deal with the situation of food insecurity, students employed a variety of coping strategies. Students who were food insecure frequently skipped meals or ate less to stretch their food budget, and when food becomes available, they frequently overate (Olson, Bove and Miller, 2007; Kendall, Olson and Frongillo, 1996). Food scarcity students claimed that they have been forced to choose between food and medicine, as well as educational and housing costs (Martinez, 2016). Due to rising tuition and housing costs, a growing number of students were facing eviction from university residences (Hallett and Crutchfield, 2018; Broton, 2020). Many students struggled to cover the cost of housing because there was nothing left. Students struggled with meeting their basic needs amongst others such as adequate nutrition and safe shelter prior COVID-19 pandemic (Fernandez, Webster and Cornett, 2019).

During the coronavirus pandemic there was an increased loss of jobs and wages (Owens, Brito-Silva, Kirkland, Moore, Davis and Patterson, 2020) and unfortunately students often relied upon their parents and/ or family members to help over the university related expenses. Many households squirmed with disruptions to their employment and due to loss of income students were faced with food and housing insecurity and some had to move back with their families or relatives due to unaffordability (Cornett and Fletcher, 2022; Hotez, Gragnani, Fernandes, Rosenau, Chopra, *et al.*, 2021). Food and housing insecurity have been found to overlap among college students, exacerbating the potential negative outcomes of such experiences. According to a recent quantitative study conducted at the University of Kentucky, 43% of participants who qualified as food insecure were 18 times more likely to also present as housing insecure (Hege, Stephenson, Pennell, Revlett, Van Meter *et al.*, 2021). Another recent study found that food and housing insecurity were related to academic performance as measured by grade point average (Leung, Farooqui, Wolfson and Cohen, 2021). The Global Food Initiative's 2017 findings supported the intersection of insecurities, as 77% of those 50 students who identified as homeless also reported food insecurity (University of California, 2017). One large study of over 4,000 undergraduate students at ten community colleges across seven states found that one-half of these students experienced food insecurity, housing insecurity, or both (Goldrick-Rab, Richardson, and Kinsley, 2017). These astounding findings strongly implied that the two insecurities were linked and should be studied as such.

1.2 PROBLEM STATEMENT

Access to enough safe, nutritious food to meet daily needs and food preferences for an active and healthy life was critical for mental, social, and academic well-being. Additionally, students have poor dietary habits (Musaiger *et al.*, 2017). This could be due to a lack of knowledge about selecting healthy foods. One of the factors influencing the selection of healthy and nutritious food was nutrition knowledge (Buxton and Davies, 2013). Students that had more nutritional knowledge were seen to consume foods that contained less unhealthy fat and cholesterol (Yahia, Brown, Rapley and Chung, 2016). However, the researcher observed some students in Health Care Sciences occasionally asking for food or borrowing money from friends and lecturers to buy food.

Some Health Care Sciences students used the University of Limpopo food bank to cope with food insecurity, and those on financial aid had expressed concern that funds were insufficient to cover tuition fees, including food. Food insecurity has been identified as one of the major issues affecting students in institutions of higher learning (Wagner, Kaneli and Masango, 2021). However, there has been limited research in South African higher education. Food insecurity is a real issue in South African universities, but it is poorly documented (Meko, 2018). International statistics on student food insecurity ranged from 15 to 72%, while rates in South Africa ranged from 1 to 55 % (Jensen *et al.*, 2016; Kaul, 2016; Silvertorn, 2016; Micevski, 2014; Gwacela, 2013; Rudolph *et al.*, 2018; Freudenberg *et al.*, 2011; Hughes *et al.*, 2011).

Limpopo was among the provinces that were predominantly rural and with a high level of poverty and had the highest proportions of households relying on agricultural activities to supply their own food. FAO and SAVAC, 2020 report revealed that Limpopo experienced 28.9% of moderate to severe food insecurity with 18.2% experiencing severe food insecurity and these rates were higher than the national level. There was a lack of literature or studies conducted in Limpopo institutions of higher learning that sought to understand the prevalence of food insecurity and its impacts on students.

The University of Limpopo enrolled both undergraduate and postgraduate students from low socio-economic backgrounds, which puts them at greater risk of food insecurity like other South African institutions of higher learning. Thus, this study aimed to investigate the level of nutritional knowledge, food insecurity status, and coping strategies employed by the Health Care Sciences students in response to this problem. Furthermore, the study aimed to understand if there was an association between food insecurity and nutritional knowledge with regard to age, gender and study level amongst the students.

1.3 PURPOSE OF THE STUDY

The goal of the study was to determine the level of nutritional knowledge, food insecurity and coping strategies among students at the University of Limpopo's School of Health Care Sciences.

1.4 RESEARCH OBJECTIVES

The study strove to achieve the following objectives:

- To determine the level of nutritional knowledge of students in the School of Health Care Sciences by completing a self-administered semi-structured questionnaire comprising of 25 multiple choice questions: 1 – 5 about food-based dietary guidelines, 6 – 15 about food groups, 16 – 20 about nutrient contents and 21 – 25 about nutrients benefits.
- To assess the level of food insecurity among School of Health Care Sciences students using an 8 questions Food Insecurity Experience Scale asking about the past 12 months of experience with response options of no or yes and frequency response options of rarely (if it happened once or twice), sometime (3 – 10 times) and often (> 10 times).
- To assess the association between food insecurity and nutritional knowledge with regard to age, gender and study level among students in the School of Health Care Sciences by using Fischer's test.
- To explore the coping strategies of food-insecure students in the School of Health Care Sciences by using an interview guide with one central question and 8 follow-up probing questions.

1.5 RESEARCH QUESTIONS

The following research questions guided the researcher throughout the study.

1.5.1. Quantitative research questions

- What is the nutritional knowledge of students in the School of Health Care Sciences?
- What is the level of food insecurity among students in the School of Health Care Sciences?
- What is the association between nutritional knowledge and food insecurity with regard to age, gender, and study level amongst students in the School of Health Care Sciences?

1.5.2 Qualitative research question

- What are coping strategies of food-insecure students in the School of Health Care Sciences?

1.6 SIGNIFICANCE OF THE STUDY

Student food insecurity remained higher than in the general population, which was a global challenge and a cause for concern (Couch, Gilboy and Delshad, 2017; Bruening, Argo, Payne-Sturges and Laska, 2017; Nazmi, Martinez, Byrd, Robison and Bianco, 2018). The findings of this study will help the university to find ways to support and provide for food-insecure students, develop programmes to improve nutritional knowledge among students, and to strengthen existing platforms to combat food insecurity on campus. This dissertation will be made available to the University of Limpopo management structure, in particular the Vice-Chancellor of the institution, student affairs, Human Nutrition and Dietetics, School of Agriculture and Department of higher education and training.

1.7 ARRANGEMENT OF CHAPTERS

This dissertation is divided into six (6) chapters. Introduction, research problem, aim, objectives and research questions are presented in chapter one. The second chapter is a review of literature, which reveals evidence from previous studies on nutritional knowledge, university students' food insecurity and coping strategies. Additionally, the theoretical framework is discussed in this chapter. Chapter three, the methodology chapter describes the study design and methods used, including ethical considerations, data management analysis and trustworthiness measures. The presentation of findings and the discussions of quantitative and qualitative data are discussed in chapter four and five, respectively. Chapter 6 summarises the research project as well as the conclusions, recommendations and limitations of the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section presents a literature review that focused on nutrition knowledge and dietary habits and the prevalence of food insecurity among students at institutions of higher learning globally and locally. It further described students' finances in South African universities, the effects of food insecurity on academic performance, health, and food-insecure students' coping mechanisms. It also presented the theoretical framework of the study.

2.2 Nutritional knowledge and dietary habits of food insecure students

Lack of nutritional knowledge could be detrimental to the health and well-being of society; this further affects the nutritional status and could lead to long-lasting lifestyle diseases (Chalmun, Padma, Pratap, Vincela, and Varma *et al.*, 2018). Dietary patterns have been linked to the risk of diseases and quality of life (Hodge, Bassett, Shivappa, Hebert, and English *et al.*, 2016; Mueller, Blondin, Korn, Bakun and Tucker *et al.*, 2018). Figuring out which variables impacted dietary patterns over life expectancy could enlighten interventions to improve diet quality and related well-being outcomes (Mueller *et al.*, 2018).

Food decision was additionally liable to change over life expectancy (Monteleone, Spinelli, Dinnela, Endrizzi, and Laureati *et al.*, 2017). One of the key factors in choosing healthy and nutritious foods was dietary awareness (Buxton and Davies, 2013). Having nutritional knowledge could help people broaden their food budget, select and prepare healthier foods and save money, all of which could lead to improved food security (Vidgen, 2014; Begley *et al.*, 2019). Musaiger *et al.* (2017) reported that poor student dietary habits included, breakfast skipping rates, low milk intake, fish, fruits, and vegetables, high fast-food intake, high intake of candy (sweets and chocolates), and sugar-sweetened beverages (carbonated beverages and sugar-sweetened fruit drinks). Other results showed that less meat, fruits and vegetables were consumed by students living far away from home (El Ansari, Stock and Mikolajczyk, 2012). They also went all-day period of not eating (Freudenberg *et al.*, 2011).

Female students, according to Yahia *et al.* (2016), were more knowledgeable in nutrition and consumed lower amounts of total fat, saturated fat, and cholesterol per day as compared to their male counterparts. In the study conducted by Ozdogan among university students in Ankara, found that females had higher nutritional knowledge scores than males (Ozdogan, Yardimci and Ozcelik, 2018). These findings corroborated those found by Yahia *et al.* (2016). Females' higher nutritional knowledge scores may be related to the point that in general females are more likely than men to be interested in diet, nutrition and body weight particularly during their university years (Livingston, Saafir and Manuel, 2012; Moadeli, Neyrizi, Sharifikia and Marandi, 2015).

A similar study was conducted by Labban (2015), who found that female Syrian university students had higher nutritional knowledge scores than males. This was an indication that adequate nutritional knowledge had a positive effect on eating habits and could promote a healthy lifestyle if applied on a day-to-day basis by university students. The study further revealed that students who were involved in health-related projects scored higher in nutritional knowledge assessments than students in non-health-related programmes. This suggested that students who were enrolled in health-related programmes had a better understanding and improved consciousness about healthy diet and healthy lifestyle than students in non-health related programmes because of the awareness and exposure they received.

Contrary to the findings by Yahia *et al.* (2016), Ozdogan *et al.* (2018) and Labban (2015), male and female students at a dental college in Telangana State had the same level of nutritional knowledge in a study conducted by Chalmun *et al.* (2018). Abraham, Norienga and Shin (2018) reported that students chose food based on palatability and convenience. In their study, students rarely ate fast food because they believed it contained unhealthy additives. As much as they ate more fruits to maintain their health, they still consumed more processed food even though they knew it was unhealthy. This suggested that having nutritional knowledge does not guarantee healthy eating habits. Brown, O'Connor and Saviano (2017) discovered that college students used vending machines to select food based on convenience, palatability, time and cost instead of nutritional value. Abraham *et al.* (2018) and Brown *et al.* (2017) agreed that students chose food based on palatability and convenience, but Brown *et al.* (2017) further reported that the students used vending machines on campus.

According to Erdenelbileg, Park and Chang (2018), Korean College Students (KCS) were more knowledgeable and experienced in nutrition information than Mongolian College Students (MCS). This could be attributed to the fact that 47.2% of KCS and 8.3% of MCS participated in nutrition classes at school taught by trained specialists such as nutrition teachers, resulting in KCS having a higher level of nutritional knowledge than MCS. A similar study by Shuchen and Kim (2015) reported that 58.1% of Korean college students had higher scores on nutritional knowledge as compared to 44% of Chinese students. This was due to the fact that Korea conducts annual national health and nutrition surveys, and monitors and publicly reports on national nutritional status.

Despite having higher nutrition knowledge scores, Erdenelbileg *et al.* (2018) found that Korean students' dietary attitudes were lower with unhealthy dietary habits such as skipping breakfast but higher with alcohol consumption. This suggested that Korean students could not apply the acquired nutritional knowledge to their health benefits. Mueller *et al.* (2018) discovered that participants had behavioural factors that were associated with different dietary patterns in their study. Students who never ate out had lower intakes of refined grains, processed meats, and alcoholic beverages, which were characteristics of Western and Alcoholic dietary patterns. The study also discovered increased consumption of plant-based foods, which represent prudent dietary patterns (Mueller *et al.*, 2018). This implied that students who never ate out had better dietary habits than those who reported eating out more frequently.

2.3 Institutions of higher learning and food insecurity

It was estimated that between 720 and 811 million people globally faced hunger in 2020 (FAO, 2021). According to the FAO 2021 report, the “State of Food Security and Nutrition in the World” showed that the COVID-19 pandemic had caused the level of hunger globally to rise, by 1.5% in 2020, to approximately 9.5%. The report presented in the paper is concerning, in 2020, around 2.7 billion people lacked access to sufficient and nourishing food, and about 12% of the world’s population experienced severe food insecurity. Roughly 420 million undernourished people in Asia and 280 million in Africa lived in 2020.

This FAO report emphasised the severity of the world's food security and nutrition situation and highlights that "business as usual" is not an option and that bold approaches and measures must be developed and implemented as soon as possible in order to reverse the course and overcome the dire challenges (FAO, 2021). The South African Human Rights Commission's 2016/2017 reported that the right to nutritious food remained a challenge, with one-quarter of South Africans suffered from hunger and 28.3% at risk of suffering from hunger. Furthermore, Statistics South Africa's (2017) fourth-quarter report for 2016 showed that 26.6% of South Africans were unemployed.

The right to food in South Africa was recognised and guaranteed in various laws at international, regional and national levels. Section 27(1) (b) and section 28(1) (c) of the Constitution states that everyone had the right to have access to sufficient food and ensured that every child had access to fundamental nutrition. As a result, government had to ensure the right to food for everyone, including students in tertiary institutions in South Africa (Adeniyi and Durojaye, 2020). Bruening *et al.*, 2017, cited studies by Rubin *et al.* (2014), Kahu *et al.* (2013), Wladis *et al.* (2015), Taylor (2015); and Nelson *et al.* (2013), and concluded that food insecurity affected students from low socioeconomic backgrounds. They emphasised that even though these students pursued post-secondary education, their basic need for human well-being in terms of access to consistent adequate nutritious food might not be achieved (Dubick, Mathews and Cady, 2016).

2.3.1 Food insecurity status at institutions of higher learning globally

Food insecurity was a challenge across the globe and there was a limited evidence to date suggesting more research was needed to address the issue (Bruening *et al.*, 2017). Studies revealed estimates of 32.9 to 50.9% of college students in the US who suffered from food insecurity as compared to the general population at the rate of 12.3% in 2016 (Nazmi *et al.*, 2018; Bruening *et al.*, 2017; Coleman-Jensen, Rabbitt, Gregory and Singh, 2017). The food insecurity rates for the students were higher than the general population and this was a concern. Nazmi *et al.* (2018) conducted a study among students at a university in the US and reported a 44% prevalence of food insecurity. This was considerably far above the 13% reported of national household food insecurity in the US in 2015.

A related study at Mid-Atlantic State University revealed 32.6% of food insecurity among the students (Couch *et al.*, 2017). The occurrence of food insecurity amongst students at California State University, Western Oregon University, Deakin, and Griffith Universities was found to be ranging from 24 to 72% respectively, (Crutchfield, 2016; Patton-Lopez, Lopez-Cevallos, Cancel-Tirado and Vazquez, 2014; Hughes *et al.*, 2011; Micevski *et al.*, 2014). Studies carried out at the University of California across the 10-campus system and Wisconsin HOPE found that 19% of students experienced low food security, 23% faced very low food security (Goldrick-Rab, Broton, and Eisenberg, 2015; Martinez, 2016), and 32% of students suffered food insecurity with or in the absence of hunger in Merced (Lerer, 2013). Another related study performed at the City University of New York found that 39.2% of students suffered food insecurity, with 22.7% being food insecure with hunger (Freudenberg *et al.*, 2011). Food insecurity status also differs across nationalities. This was seen in the study conducted at Minnesota University, which revealed that 45% of students of colour reported food insecurity concerns, as compared to 22% of students of white colour (Kaul, 2016). Food insecurity is a global challenge for university students.

2.3.2 Food insecurity at institutions of higher learning in South Africa

In South Africa, student food insecurity remains a problem. According to a quantitative study conducted at the University of KwaZulu-Natal for both under and postgraduate students, 53% (n=243) of students were vulnerable to food insecurity because they consumed fewer than three meals per day, 44% (n=194) were moderately vulnerable because they feasted twice daily while 9.2% were extremely susceptible because they only ate once per day (Sabi, Kolanisi, Siwela and Naidoo, 2019). Although not as high as UKZN, the Free State University had a 31.9% prevalence of food insecurity (Gwacela *et al.*, 2013).

A survey conducted at the University of the Witwatersrand reported that further from depleted funds and going without food, students also had difficulty obtaining food on campus (Dominguez-Whitehead, 2015). A related survey also done at the same institution revealed an overall hunger score of 6% which was classified as moderately food insecure and 1% of the students were severely food insecure (Rudolph *et al.*, 2018).

An incomparable poll found that 55% of students at the UKZN said they were from low-income homes and suffered food insecurity as a result of little to no financial support from their families. (Gwacela *et al.*, 2013). Other studies done at UKZN and Northwest University found that food insecurity amongst students was 34.4% and 30%, respectively (Gwacela *et al.*, 2013; Munro, Quayle, Simpson, and Barnsley, 2013). At the national level, the prevalence of food insecurity among students does not provide a clear picture of the severity of the problem as studies were only conducted in a few and mainly historically disadvantaged South African institutions of higher learning.

2.4 Student financing and meal allowance in South Africa

Many underprivileged students benefited from the National Students Financial Aid Scheme (NSFAS), which covered tertiary education costs and was sometimes viewed as a solution to food insecurity. Unfortunately, the current organisational structure of the fund heavily favoured other expenses such as tuition, housing, and study materials, leaving little money for food, which was frequently insufficient (Adeniyi and Durojaye, 2020). Other issues that prevented these students from having access to food include delayed NSFAS bursary payments, travelled time to the nearest grocery store, and expensive food options on campus. As a result, students were both physically and financially unable to obtain food (Adeniyi and Durojaye, 2020).

Students supported by NSFAS and student loans (40.7% and 39.3%, respectively) were found to be susceptible to food insecurity as equated to their self-/family funded counterparts at 8% (Sabi *et al.*, 2019). There had been a significant increase over the last decade in student enrolments at South African universities. Overall government spending on education and higher education support had also increased sharply over the years (Letseka and Maile, 2008; Cloete and Moja, 2005). According to reports, many South African students experienced major fiscal difficulties (Department of Higher Education & Training, 2011; Petersen, Louw and Dumont, 2009). Munro *et al.* (2013) conducted research at UKZN and Micevski *et al.* (2014) found that financially assisted students are substantially more vulnerable to food insecurity compared to non-financial assisted students. For 2011, students received an annual meal payment in the amount of R5026, which was paid out in eight instalments of R628.24. This translates into R20.85 per day for every student to spend on food, and therefore just under R7/meal.

Munro *et al.* (2013) concluded that R7/meal would not be adequate for academic success to provide optimal food. This was very true as the money would only buy cheap high energy-dense food. The 2018 revised bursary programme provides full grant funding to working-class and low-income students attending public universities. Allowance covered books, living expenses, food, rent, and other miscellaneous expenses. An annual meal allowance was given to students at the cost of R14 400, which included R2750 for living expenses. The meal allowance was R1294.44 monthly payable over a period of nine months (DHET, 2019). National students financial Aid Scheme (NSFAS) assisted needy students. However, the money is not enough to provide a balanced meal daily.

2.5 The effects of food insecurity on students

Unsatisfied physiological needs, according to Maslow's Hierarchy of Needs, could jeopardise an individual's survival (Mcleod, 2007). According to Sabi *et al.* (2019), 69.8% of male and 55% of female students were severely food-insecure and incompetent of satisfying their food and nutrition needs. As a result, they became vulnerable to low self-esteem and lacked the motivation to study. This corresponds to Maslow's Hierarchy of Needs model.

Poor nutrition was experienced more by the food insecure student population due to food intake becoming erratic (Hughes *et al.*, 2011). Munro *et al.* (2013) reported that as a result of hunger, 11.3% of students often had a concentration deficit and 12.2% reported fatigue.

Food insecurity had a negative impact on one's physical and emotional health, as well as an increased risk of chronic diseases such as diabetes, heart disease, and anxiety (Tarasuk, Mitchell and Dachner, 2012). Food insecurity did not cost just more than physical well-being; it also had an impact on psychological and emotional health (Williams, MacAulay, Anderson, Barro and Gillis *et al.*, 2012).

2.5.1 Effects of food insecurity and poor health

Foods such as fruits and vegetables with a higher nutrient density were often more expensive (Oldewage-Theron and Egal, 2010; Temple, 2006). Martinez *et al.* (2019) reported that food-insecure students had fewer daily servings of fruits and vegetables, fewer days of moderate to vigorous physical activity, and fewer days of adequate sleep, all of which contributed to poor overall health status.

Past studies discovered that students who were food-insecure had elevated stress, depression, and anxiety which has a direct impact on their well-being and mental health status (El Zein, Shelnut, Colby, Olfert and Greene *et al.*, 2019; Raskind, Haardorfer and Berg, 2018; Morris, Smith, Davis, and Null, 2016). These side effects may have contributed to poor health outcomes (Mukigi *et al.*, 2018). It is therefore clear that food insecurity posed a risk to the health of students at institutions of higher learning.

2.5.2 Effects of food insecurity and poor academic performance

Food insecurity had been reported to have a negative impact on academic performance. In a study done at the UKZN, Sabi *et al.* (2019) reported that 65% of students went hungry and 28% missed classes due to lack of food. University food insecurity hurts the educational experience (Hughes *et al.*, 2011). Food insecurity may have compromised the ability by students to perform well in their classes and may have forced them to take time off from university or completely discontinued their education (Maroto, Snelling and Linck, 2015). Dubick *et al.* (2016), discovered that it was hard to concentrate in class or to focus on studies when you were hungry or worried about financial obstacles.

A study conducted at Witwatersrand University showed that 52% of students felt the quality effect of hunger (Rudolph *et al.*, 2018). Goldrick-Rab *et al.* (2015) recorded that low-income undergraduates had a harder time succeeding academically, their grades decreased, their test results seemed to be lower, and overall, their chances of graduating were narrowed. Students with food insecurity were likely to have a lower grade point average (GPA) than students with food security (Hagedorn and Olfert, 2018; Martinez, 2016; Patton-Lopez *et al.*, 2014). Allen and Alleman (2019) found that a food insecure student often performed less than their peers, and others would participate in off-campus jobs which resulted in missed classes.

He further alluded that working while studying showed no benefits in resolving food insecurity status among university students (Allen *et al.*, 2019). This was because efforts to integrate employment and academics led students to do little shifts resulted in low wages that cannot meet their ultimate needs, which left them still affected by food insecurity.

According to a study conducted at the University of Alberta in Edmonton, students who were food insecure had three academic challenges: 73% found it difficult to concentrate in class or write exams; 23% found it difficult to study; and 15% failed to turn in assignments (Farahbakhsh, Hanbazaza, Ball, Farmer and Maximova *et al.*, 2017).

2.6 Coping mechanisms of food insecure students

Students who lacked access to food adjusted in different ways. Hanna (2014) recorded that all of the students surveyed did not have a balanced diet, 69.2% skipped a meal (44% frequently, 22% routinely), 92% decreased the amount of their meals, and 38% did not consume any food at all throughout the day. Some had opted to cheat or working additional jobs (Micevski *et al.*, 2014; Farahbakhsh, Ball, Farmer, Maximova and Hanbazaz *et al.*, 2015; Nellum, 2015). Other studies reported that some students resorted to stealing (Micevski *et al.*, 2014; Patton-Lopez *et al.*, 2014). Patton-Lopez *et al.* (2014) discovered that working while studying did not improve academic focus or food security levels. Farahbakhsh *et al.* (2015) discovered additional coping strategies, such as applied for additional student loans and or tapped in campus-based food banks.

However, Koller (2014) noticed that food banks were not a good solution to the problem of food insecurity amongst the students as it was the last option to be considered. Van den Berg *et al.* (2015) established that combined money with friends to buy food, borrowed money from relatives, friends, and parents, sold possessions to get money for food, and stolen food as coping strategies. Studies published by Mukigi *et al.* (2018) and Rudolph *et al.* (2018) revealed that participants used the following coping strategies to deal with food insecurity: reduced quantity and quality of meals, ate cheap food, used support networks, avoided expensive fast-food places, meal pooling, eaten fewer meals, and went home to get food. Hagedorn *et al.* (2018) found that food-insecure students at Appalachian university changed their eating habits, borrowed money, and bought school supplies in advance to afford food. Hanbazaza, Ball, Farmer, Maximova and Farahbakhsh *et al.* (2017) alluded that both domestic and international food-insecure students from the University of Alberta used the same coping strategies to deal with food insecurity.

These included not buying university supplies, bought food using credit cards, delayed bill payments, worked more hours and sold belongings. Although domestic students were able to request food from relatives and friends, international students could not be due to distance from home. Six-point five percent (6.5%) of domestic food-insecure students attended events for free food while 9.7% stolen food as a coping mechanism for food insecurity. A similar study conducted by Nikolaus, Ellison, and Nickols-Richardson (2019a) revealed coping strategies of food-insecure students and classified them into four categories, i.e.

- (1) Self-sufficiency and concealed personal situations from others.
- (2) Sought social support from friends and acquaintances to the point of attended gatherings or meetings that provided free meals on campus.
- (3) Sought formal support through employment or government assistance; and
- (4) Sought emergency support, which included visited food pantries, begged or stole food.

2.7 Theoretical Framework

The theoretical framework was a foundation in which all knowledge was constructed (metaphorically and literally) for a research study. It served as the structure and support for the rationale for the study, the problem statement, the purpose, the significance, and the research questions (Kivunja, 2018). In this study the Theory of Reasoned Action (TRA) developed by Martin Fishbein and Icek Ajzen (1975) was used. The framework assumed that people consider the consequences of their behaviour before engaged in that behaviour.

The TRA is concerned with behaviour; it used attitudes and norms to predict behaviour intention. It also recognised that there were situations that limited the influence of attitude on behaviour and separated behavioural intention from behaviour (Fishbein and Ajzen, 1975). The concepts of TRA are outlined in Table 2.1 and summarised in Figure 2.1 below.

Table 2.1: Theory of Reasoned Action concepts

Concept	Definition	Application
Attitude	A person's positive or negative feelings about performing a specific behaviour.	Attitude was influenced by the strength of behavioural beliefs and evaluation. There was a correlation between attitude and outcome. If one believes that a certain behaviour would lead to a favourable outcome, then one was more likely to have a positive attitude towards a behaviour. For example, if students believed that borrowing money would help them access food to deal with food insecurity, they would do it. A person was more likely to have a negative attitude toward a behaviour if they believed it would result in a negative outcome. For instance, if students believed that accessing food from food campus banks was associated with stigma or disbelieved it would benefit them, they were more likely to have a negative attitude and not utilised the services.
Behavioural beliefs	Stipulates association of certain performance of behaviour with a certain set of outcomes	For example, if students believed that reduced portion sizes or skipped meals could alleviate food insecurity, then behavioural belief would be that reduced portion sizes or skipped meals was a strategy to deal with food insecurity.
Evaluation	Refers to the way people perceive and evaluate the potential outcome of a performed behaviour.	Students might evaluate the outcome of using the campus food bank as positive if the behavioural belief was to improve food security. They could evaluate the outcome as negative if the behavioural belief was that it was not acceptable to peers.
Subjective norm	Refers to the way perceptions of relevant groups or individuals such as family members, friends, and peers may affect one's performance of the behaviour or perceived social pressure to perform or not to perform the behaviour.	If students believed that buying cheaper meals was acceptable within one's social group, they would be more likely to be willing to engaged in that activity. But if one's friend group perceived that the behaviour was bad, one would be less likely to buy cheaper foods.
Motivation to comply	Addresses the fact that individuals may or may not comply with the social norms of the referent groups surrounding the act.	Depending on the individual motivations in terms of adhering to social pressures, the individual would either succumb to the social pressures of performing the act if it was deemed acceptable or would resist the social pressure of performing the act if it was deemed unacceptable. If students believed that stealing food was not acceptable but was a way of coping with food insecurity, they would still be motivated to steal and resist the social pressure.

Behavioural Intention	Refers to a person's attitude and subjective norms towards the behaviour or perceived likelihood of performing the behaviour.	The attitude and subjective norms could predict the intention but not the behaviour. For example, if students perceived that a healthy food option was expensive, they would buy cheaper food that was affordable. In this case, behavioural belief was that cost was more important than nutrition. The attitude towards the act was so strong.
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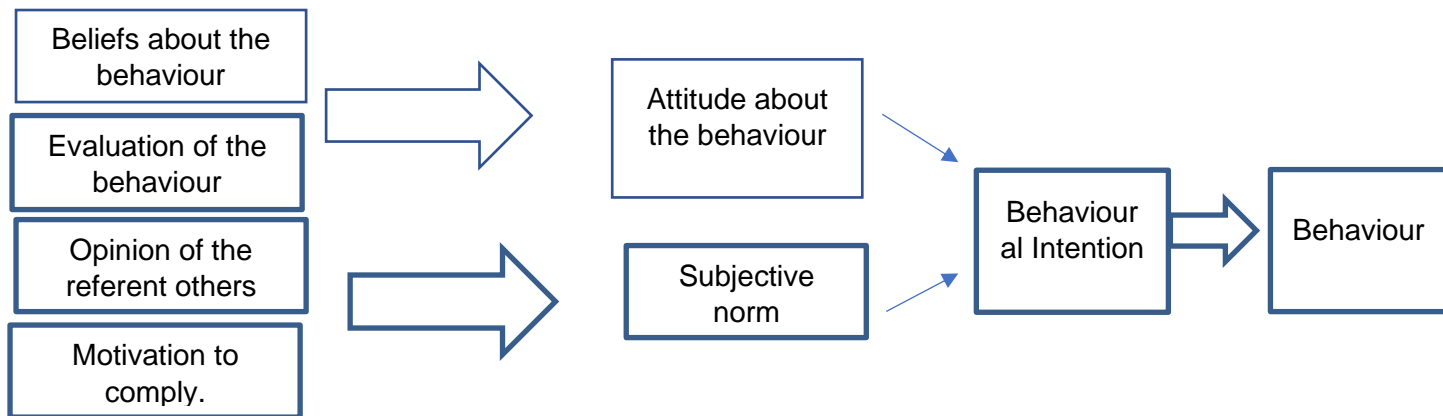


Figure 2.1: Summary of the Theory of Reasoned Action (Fishbein and Ajzen, 1975)

2.8 Summary

A review of the literature revealed several aspects of nutrition knowledge, food insecurity, and coping strategies to address food insecurity. Adequate nutrition knowledge was essential because it influenced dietary habits, which could improve the health and lives of students in higher education institutions. Food insecurity remained problematic for university students all over the world. Available literature had limited evidence to date on the actual prevalence rate, suggesting a need for more research to address the issue.

The research needed to include both qualitative and quantitative studies to get deeper into the root cause of the problem and experiences of the food insecure students. Studies must be conducted on all continents, particularly Africa, because the majority of available studies are from America, Canada, Australia and Europe. Student financing through NSFAS was insufficient to cater for food as the chunk of the money was directed to tuition, accommodation and other study materials. This must be reviewed as it was one of the solutions to student food insecurity options. Food insecurity showed serious implications for the physical and mental health of the students.

High levels of depression, anxiety and stress were linked to food insecurity, which impacted the overall health of food-insecure students. It had a negative impact on academic performance and resulted in dropouts.

Students used a variety of coping strategies to deal with food insecurity, among others, shared meals, borrowed money, eaten less expensive meals, skipped meals, begged, or even stolen food were all possibilities. TRA was used as a theoretical framework that guided the study. The next chapter discussed the research methodology of the study.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter three presents the research method used in guiding this research. In this study, a mixed-methods approach was used to look into students' knowledge of nutrition, their level of food insecurity, and their coping mechanisms in the School of Health Care Sciences. This study followed a two-phase survey process. In the initial quantitative survey, the researcher aimed to determine the level of nutrition knowledge, and food insecurity status of the study population. The follow-up qualitative interview phase helped to explain the quantitative findings. Participants were allowed to liberally share their life experiences on how they coped with food insecurity through one-on-one telephonic interviews. The integration of the survey results and the interviews aided in building a deeper understanding of the intention of the study. University Limpopo was selected as a study site because there were no previous studies conducted on students' nutritional knowledge, food insecurity, and coping strategies in the province. Health Sciences students were chosen because they were observed asking for money from the lecturers to buy food and that they are from low socio-economic background.

3.2 STUDY DESIGN

The explanatory sequential mixed methods research design was used in this study. The main reason for using mixed methods was that combining quantitative and qualitative methods could provide a better understanding of research issues than using only one method (Creswell, Plano Clark, Klassen, Smith and Meissner, 2012; Tashakkori & Teddlie, 1998). One of the most common designs in mixed methods research was the explanatory sequential design. It was divided into two interactive phases: the initial quantitative phase and the subsequent qualitative phase. Because the priority weight was in the quantitative approach, this was commonly referred to as QUAN-qual (Kemper, Springfield and Teddlie, 2003).

When researchers needed qualitative data to explain quantitative significant or no significant results, or when researchers wanted to form groups based on qualitative research, the explanatory design was typically used (Creswell *et al.*, 2012; Morgan, 1998; Tashakkori & Teddlie, 1998).

As a result, the explanatory design was appropriate for this study because: (1) the researcher wanted to gain a deeper understanding of the survey results through a follow-up interview; and (2) the researcher needed to purposefully select participants for the interview based on the initial quantitative results.

The procedures in this study are demonstrated in Figure 3.1 below.

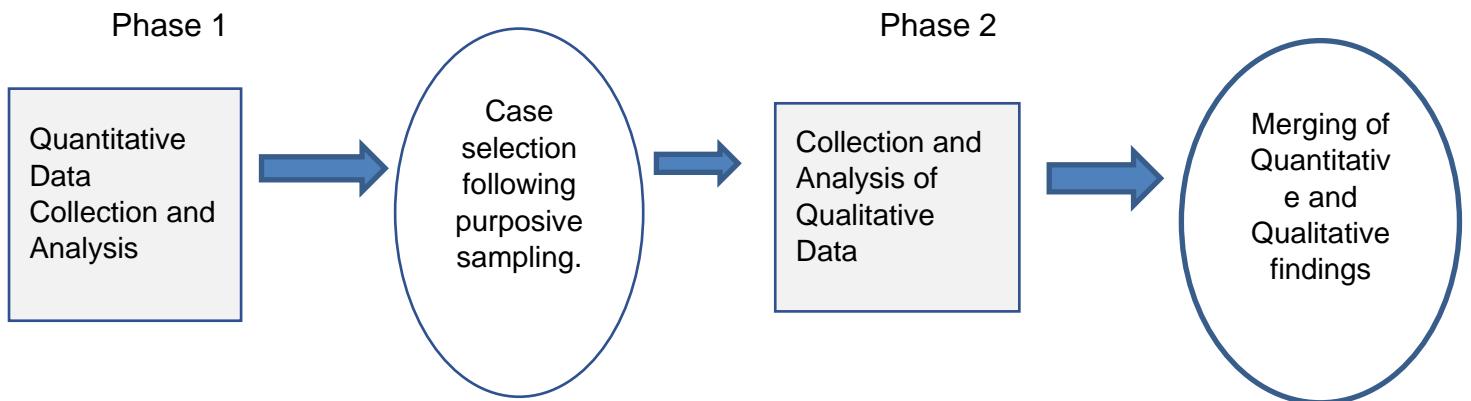


Figure 3.1: Schematic Explanatory sequential Design representation (Creswell & Creswell, 2018).

3.2.1 Quantitative Strand

The quantitative explanatory sequential design was used to determine the level of nutrition knowledge and food insecurity amongst Health Care Science students at the University of Limpopo, South Africa. Creswell and Creswell (2018) defined the quantitative research approach as a means for testing objective theories by examining the relationship between variables. These variables could be measured, typically on instruments so that numbered data could be analysed using statistical procedures. Participants were recruited from their residential areas on and off-campus, some from their respective departments under the School of Health Care Sciences. Participants were requested to complete a semi-structured self-administered questionnaire, which consisted of three sections, namely, demographic information, nutrition knowledge multiple-choice questions (to determine the level of nutrition knowledge amongst students) and food insecurity experience scale (to determine the level of food insecurity).

3.2.2 Qualitative Strand

The qualitative research approach was followed in this study to explore coping strategies of food-insecure students in the School of Health Care Sciences at the University of Limpopo, South Africa. John and David Creswell (2018) explained qualitative research as a means for exploring and understanding the meaning individuals or groups ascribed to a social or human problem.

Participants who were classified as moderate and severe food insecure were purposefully selected to continue with a semi-structured telephonic interview that lasted between nine and twenty-one minutes.

3.2.3 Study Site

The study was conducted at the University of Limpopo, which was situated 40 km east of Polokwane. The University was in the foothills of Hwiti in Mankweng Township, Limpopo Province, South Africa.

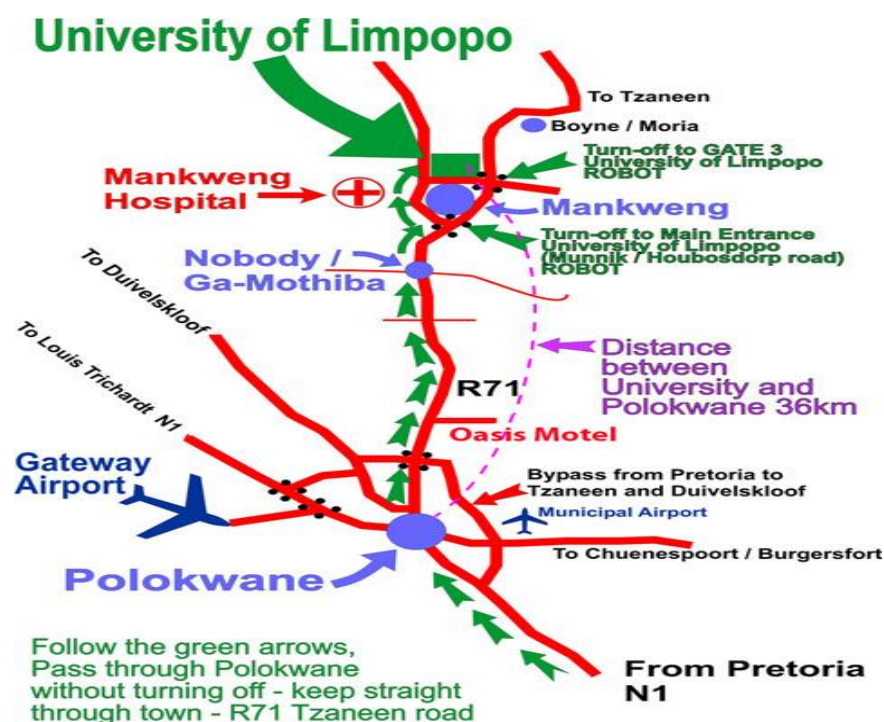


Figure 3.2 The map of the University of Limpopo

(https://www.ul.ac.za/application/images/get_here_map.jpg, cited 04/04/2020)

3.2.4 Study population and Sampling

The population comprised participants from level II to level IV under the School of Health Care Sciences. Participants were recruited from the following departments: Optometry, Nursing and Pharmacy. The initial targets included the Medical Science department but because of Covid-19 and logistical issues, Medical Science participants were not available.

3.2.4.1 Quantitative Sampling

This quantitative survey used convenience sampling, which consisted of 237 participants. Convenience sampling was used in the study due to Covid-19 challenges. It was a non-probability sampling technique with a selection of participants because they were often readily and easily available (Ackoff, 1953).

3.2.4.2 Qualitative Sampling

The study used purposive sampling, which was a strategy in which a particular set of persons or events was selected deliberately to provide important information that cannot be obtained from other choices. It was where the researcher included cases or participants in the sample because they believed that they warranted inclusion (Maxwell, 1996). Fourteen participants were interviewed until the researcher was no longer getting any new information to address the research questions. Data saturation was believed to have been reached at that point (Bernard and Ryan, 2010; Given, 2016).

3.3 ETHICAL CONSIDERATIONS

Adherence and consideration of ethical norms in research projects was important to promote research goals such as avoidance of harm and error. Codes of ethics helped to ensure a healthy and credible relationship between researchers and participants. In this way, accurate results could be communicated to the public from participants' point of view.

3.3.1 Ethical clearance

The researcher acquired approval from the Departmental Research Committee, Faculty of Higher Degrees Committee (Annexure A) and the Turfloop Research Ethics Committee (Annexure B) at the University of Limpopo. Thereafter, permission to collect data was requested from the School of Health Care Sciences (Annexure C).

3.3.2 Permission to conduct the study.

Permission to conduct the study was obtained before the commencement of the research. The School of Health Care Sciences and the Ethics Committee approved and granted an ethical clearance certificate. Relevant departments under the study were informed about the aim, objectives and methods of the study. Permission was granted and data collection commenced.

3.3.3 Informed Consent

Written consent was obtained from participants before the commencement of the study. The participants were informed about the aim, objectives and methods of the research study. Participation in the study was voluntary. Participants were also informed that they have the right to withdraw at any time without reasons. For those willing to participate, a brief description of the research aim, the procedure to be followed, consent, and contact details of the researcher were given to make an informed decision. Participants were made aware that they might be asked to participate later in one-on-one interviews, where the interview would be recorded to capture the discussion. Their cell phone numbers were required to schedule the interviews at a time that was more convenient to them. The consent form included the title of the study, the researcher's name, the researcher's contact details, the participant's cell phone number and the aim and objectives of the study (Annexure D)

3.3.4 Confidentiality and Anonymity

Confidentiality and anonymity of participants were preserved by preventing their names and information from being shared with those who did not participate in the study. Information gathered using Dictaphone, notes and transcripts was shared only with the appropriate supervisors, and records were kept in a secure location. Anonymity was maintained by providing participants with codes.

Participants' names were not used during the interview and did not appear on transcripts (Lancaster, 2017). Participants were informed that the results and recommendations of this study would be submitted to the University of Limpopo and were treated with dignity throughout the data collection process.

3.4 PREPARATION FOR DATA COLLECTION

The Turfloop Research Ethics Committee (TREC) granted approval for the study to be conducted and permission to collect data was granted by the School of Health Care Sciences. The researcher requested permission to collect data from the Department of Optometry, Pharmacy and Nursing to build rapport, discuss the involvement of the participants in the study, and inform the heads of departments about planned dates for data collection. Class representatives from the above departments were briefed on the questionnaire in case clarity was needed by students, then they collected the self-administered questionnaires and distributed them accordingly (Annexure E).

The purpose of the study together with the procedures to be followed during data assortment was explained to the students' class representatives. The researcher collected the completed questionnaires and scheduled appointments for a telephonic one-on-one interview with relevant participants at a time that was convenient to them.

3.5 DATA COLLECTION METHOD

Data was collected for both quantitative and qualitative strands. Due to COVID-19 restrictions, an electronic questionnaire was developed and distributed to all participants unfortunately only six students with private emails responded. All students using university emails did not respond as access was denied and gate pass permission was not granted, as a result, the only solution was to use hardcopies method for the survey. A pilot study was conducted prior to the main study with the aim of pre-testing the measuring instruments to be used. This has assisted the researcher in adjusting the measuring instruments (Yegidis and Weinbach, 1996: 132).

3.5.1 Quantitative data collection

The researcher distributed the questionnaires through the student class representatives of Nursing, Pharmacy, and Optometry. Questionnaires were delivered by hand so that the participants could complete them in their own time and then the researcher collected them within two days (De Vos, 2005: 168). Participants were reminded about the aim of the study and the consent form before completing the questionnaire.

It was a self-administered semi-structured questionnaire that had three sections. Section A contained demographic information (adapted and adopted from Booth and Anderson, 2016) and Section B contained nutrition knowledge in the form of multiple-choice questions (adapted and adopted from Perlstein, McCoombe, Macfarlane, Bell and Nowson, 2017).

The multiple-choice questions comprised 25 questions: questions 1 – 5 were about food-based dietary guidelines, questions 6 – 15 food groups, questions 16 – 20 nutrients contents, and questions 21 – 25 were about nutrient benefits and deficiencies. Section C contained food insecurity questions (adapted and adopted from Food Insecurity Experienced Scale (FIES) by FAO Voices of the hungry, Wambogo, Ghattas, Leonard and Sahyoun (2018). It had 8 questions, asking about the past 12 months of experience with response options of no or yes and frequency response options of rarely (if it happened once or twice), sometime (3 – 10 times) and often (> 10 times). Participants were requested to complete all the data to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics (Brink, Van Der Walt and Van Rensburg, 2012). The total number of questionnaires returned were 250 out of 285 that were distributed. There were 35 non-responses.

Thirteen (13) questionnaires out of the 250 were excluded owing to inadequate data, resulting in a sample size of 237 and a response rate of 94.8%. Baruch (1999) reported that a response rate of 60% with a standard deviation of ± 20 is acceptable.

3.5.2 Qualitative data collection

The researcher grouped participants into three (3) categories based on the FIES results, i.e., food security or mild food insecurity, moderate food insecurity and severe food insecurity.

The researcher purposefully selected participants from the three categories. Thirty-eight (38) participants who responded yes on the food insecurity experience scale questionnaire, with a total raw score of seven (7) to eight (8) yes were selected to participate in the interview session. Twenty-four (24) participants were not interviewed because of the following reasons: fourteen (14) of the participants' cell phone numbers were forever on voice mail, nine (9) did not pick up the call after an appointment was scheduled and 1 participant's number was incorrect. The total number of participants who remained was 14.

The interviews were scheduled at a time that was convenient to the participants, mostly it was in the evening after their classes and only a few opted for the day. It was a telephonic interview due to Covid-19 restrictions and the University of Limpopo regulations to cap the rate of the infection. The researcher conducted the telephonic interviews using an interview guide (Annexure F).

The interview guide had one central question: **“Could you kindly explain how you cope when you do not have enough food or money to buy food and strategies that you apply to cope with the situation during the university term”**. This was followed-up by probing questions. The researcher used probes to allow the participants to elaborate more on the topic (Povee and Robert, 2015).

The duration of the interview session ranged from a minimum of nine minutes to a maximum of twenty-one minutes. The researcher reassured the participants of the confidentiality of the information that they shared and encouraged them to talk liberally about their coping strategies while dealing with food insecurity.

3.5.3 Inclusion criteria

Second, third and fourth-year level students who were registered in the School of Health Care Sciences in the departments of Optometry, Nursing and Pharmacy were included in this study. De Vos *et al.* (2005) stated that in a qualitative study, purposeful participant selection is critical, so specific criteria must be established.

3.5.4 Exclusion criteria

First, second, third and fourth-year level students in the School of Health Care Sciences in the Department of Optometry, Pharmacy and Nursing, who were not in the university for the past 12 months, were excluded from the study.

Human Nutrition and Dietetics students at all levels were excluded because they were conversant with the subject matter under study. All participants who did not agree to participate, to sign the consent form and participants who agreed to participate but failed to complete all the necessary data needed were also excluded from the study.

3.5.5 Pilot Study

A pilot test was conducted on six students from the School of Health Care Sciences, to evaluate the ease of use and clarity of the instrument for both quantitative and qualitative strands. Based on the results of the pilot study, items were revised, merged, and eliminated on the self-administered questionnaire and the interview guide. Modification of the interview guide was to ascertain that the surveyed participants interpret the meaning of the question as intended (Creswell and Hirose, 2019). In addition, the content of the instruments was reworded as needed to achieve goal comprehension. The results of the pilot study did not form part of the main study.

3.6 REDUCED BIAS

Bias was a deviance from the truth in data acquisition, analysis, interpretation and/ or publication, and could lead to fictitious conclusions. In this study, the researcher confirmed that prejudice was avoided by not asking participants questions that encouraged them to answer in a specific and biased way (Pannucci and Wilkins, 2010). The researcher's ideas were not forced on the participants during data collection, and hinting questions were avoided. Participants were allowed to speak freely without any fear. Furthermore, participants were literate and able to answer the questionnaire independently unlike when the researcher was administering the questionnaire which could lead to bias due to constant error. Participants answered the questionnaire on their own time without any pressure from the researcher which served as another bias reduction.

3.7 MANAGEMENT AND ANALYSIS OF DATA

Management and analysis of both quantitative and qualitative were discussed below in 3.7.1 and 3.7.2.

3.7.1 Quantitative data management and analysis

Babbie (2013) defined data analysis as a statistical representation and manipulation of observations aimed at describing and explaining the phenomena reflected by observations. The demographic information, nutrition knowledge and food insecurity data questionnaire were pre-coded. These codes were entered onto Microsoft Excel. Data was then submitted to a statistician who used STATA software package version 11.0 (StataCorp, College, Tx, 2009) to analyse descriptive statistics.

Fischer's exact test was used to test the association between food insecurity and nutrition knowledge with regards to age, gender and study level. The P-value of 0.05 was used as a measure of significance. Participants were labelled as P1, P2, P3, etc. until the last participant. One point was awarded to the correct answer and zero was allocated to an incorrect answer. Each participant was scored out of 25 and thereafter a percentage was calculated. The nutrition knowledge was classified according to modified Bloom's cut of points (Al-Salihy and Enad, 2017), where 80 – 100% indicated good knowledge, 60 – 79% as moderate knowledge and < 60% as poor knowledge.

Participants answered yes/no to the eight (8) food insecurity questions and responses were aggregated to give a raw score ranging from 0 – 8. Food insecurity was classified into three categories:

- 1) Food secure or mild food insecurity with raw scores = 0 – 3,
- 2) Moderate food insecurity with raw scores = 4 - 6
- 3) Severe food insecurity with raw scores = 7 – 8 (Wambogo *et al.*, 2018).

3.7.2 Qualitative data management and analysis

The demographic data was pre-coded, and codes were entered onto Microsoft Excel. The data was checked, and percentages were calculated. Participants were sampled from the quantitative strand. All interviews were telephonically recorded using a voice cube ACR recorder from the cell phone and transcribed verbatim later by the researcher. During the interviews, the participants were labelled P1 until P14. The transcriptions were analysed and coded. The supervisor and the co-supervisor verified the transcriptions for accuracy by listening to the interview recordings and the transcription scripts.

Thematic analysis was used to analyse the data in the study. According to Braun and Clarke (2012), thematic analysis was a method for identifying, analysing, and reporting patterns within data. An inductive approach to data coding was applied. The six-phase approach to thematic analysis (Braun and Clarke, 2006; Kiger and Varpio, 2020) was followed to identify main themes and sub-themes. The steps were as follows:

Phase 1: Familiarisation with collected data.

The researcher familiarised herself with the data by listening to the recordings and reading the transcripts repeatedly to search for meanings and patterns. This gave the researcher time to immerse deeply into the content of the data, take notes and mark ideas on meanings that emerged.

Phase 2: Generating initial codes.

The researcher identified codes directly taken from the participants' data and applied content data coding. The researcher kept reading data to generate more codes. The process was repeated throughout each data item and the entire data set. A highlighter was used to colour the identified codes as it was manually done.

Phase 3: Searching for themes.

The researcher reviewed the coded data to identify areas of similarity and overlap between codes. All relevant data was compiled by the researcher, and codes were combined to form prospective themes. The researcher used tables to organise the codes into theme piles. A theme captured something important about the data in relation to the research question and represented some level of patterned response or meaning within the data set (Braun and Clarke, 2006).

Phase 4: Reviewing themes.

The researcher checked the collated extracts of data and explored if the themes work in relation to the data. The researcher revised the themes, which involved creating additional themes for the codes missed earlier or discarding themes that do not match the data. The researcher stopped when the refinements did not add anything substantial and had created a satisfactory thematic map of the data.

Phase 5: Defining and naming themes.

The researcher continued with data analysis to refine the essentials of each theme, and the overall story the analysis told, generated clear definitions and names of each theme. It was during this phase that the researcher identified the sub-themes within the generated themes.

Phase 6: Producing the report.

This was the final analysis stage for the researcher. The researcher selected intense, compelling extracts and illustrations, and related analysis to the research questions and literature producing an intellectual report of the analysis. After the data was analysed by the researcher, a meeting was then scheduled with the supervisor, and co-supervisor to discuss the results of the qualitative data analysis and agreement was reached regarding the main themes and the sub-themes that emerged from the data. The researcher, supervisor and co-supervisor reached consensus about the finalisation of the themes and sub-themes that had emerged from the one-on-one interviews. See Chapter 4 (Discussion and presentation of findings).

3.8 MEASURES TO ENSURE TRUSTWORTHINESS, VALIDITY AND RELIABILITY

In qualitative studies, trustworthiness was one way for researchers to persuade themselves and their readers that their research was significant. The terms credibility, dependability, confirmability and transferability were used in this study to describe various aspects of trustworthiness (Lincoln and Guba, 1985). Rigour referred to the extent to which the researchers went to improve the quality of their searches. This was accomplished in quantitative research by measuring validity and reliability (LoBiondo-Wood and Haber, 2013).

3.8.1 Credibility

Credibility determines whether the researcher had established trust in the accuracy of the findings with the participants and the circumstances under which the study was conducted (Botma, Greeff, Mulaudzi and Wright, 2010). This credibility of the study was enhanced by the selection of appropriate participants who best offered information and experience related to the topic under study, as well as the participation of both the supervisor and the co-supervisor during data collection.

3.8.2 Transferability

Tappen (2011) defined transferability as the degree to which the findings could be applied to different situations and people. In this study, participants were chosen using purposeful sampling to study the phenomenon. The researcher gathered a detailed account of data in the context and adequately reported it in order to allow the decision of how far the findings could be transferred to other individuals in similar situations (Tappen, 2011).

3.8.3 Dependability

Botma *et al.* (2010) defined dependability as the question of whether the study results would be consistent if the inquest was repeated with the same participants and in a similar setting. Polit and Beck (2008) defined dependability as the consistency and accuracy with which data was collected over time. For the dependability of this research project, my supervisor and co-supervisor exchanged transcripts and voice recordings, and came to an agreement on the emerging themes and subthemes. My supervisor and co-supervisor also reviewed the data, findings, interpretations and recommendations.

3.8.4 Confirmability

Confirmability referred to objectivity and implied that the data precisely represent the information provided by participants and that the researcher's interpretations of those data were not fabricated (Lincoln and Guba, 1985; Polit and Beck, 2012). Confirmability was ensured in this study by limiting the researcher's biases in shaping the conversation to certify that the results of the research project were participants' narratives and wording rather than the researcher's perspectives. A confirmability audit trail was left to allow the evaluator to determine whether the conclusions, interpretations and recommendations could be traced back to their sources and were supported by the researcher (Babbie and Mouton, 2009).

The supervisor and co-supervisor were given voice recordings, transcripts and notes, and they listened to the interview recordings. Thus, determining whether the data validated the general findings and led to the connotations was a qualitative fit standard (Polit and Beck, 2012).

3.8.5 Validity

According to Polit and Beck (2010), validity was the degree to which an instrument measures what was supposed to measure. In this study, validity was ensured by pre-testing the instrument on six participants with similar characteristics to the study population to see if the questions asked were relevant. The degree to which an instrument had an appropriate sample of items for the construct being measured and adequately covered the construct domain was referred to as content validity (Polit & Beck, 2010). In this study, content validity was established by using a structured questionnaire and a percentage indicator to assess students' nutrition knowledge and food insecurity.

3.8.6 Reliability

According to Tappen (2011), reliability was defined as the consistency of a measure or the degree to which a measure produced the same results over time. This means that if a valid measuring tool was used with different groups under different conditions, the results should be the same (Botma *et al.*, 2010). Before the main study, reliability in this study was ensured through questionnaire testing on six participants from various departments within the School of Health Care Sciences. To ensure dependability, the piloting process was examined. This enabled the researchers to test all aspects of the questionnaire as well as the logistics of conducting the study, identified potential issues that needed to be addressed prior to the study's implementation. The researcher was in charge of both the testing apparatus and the data collection. This was done to ensure that the findings were reliable. Piloting the questionnaire ensured reliability of the study.

3.9 SUMMARY

The third chapter of this study presented a detailed research design methodology. For the quantitative strand, the convenience sampling method was used, with participants completing a semi-structured self-administered questionnaire. In the qualitative strand, participants were chosen using a purposive sampling process, and data were collected until saturation was reached. One-on-one telephonic semi-structured interviews were also used to collect data, with one central question posed: "Could you please explain how you coped when you do not have enough food or money to buy food and the strategies you used to cope with the situation during the university term?"

The purpose of the probing was to encourage participants to share information and describe their experiences. Measures to ensure trustworthiness included credibility, dependability, transferability, and confirmability. Reliability and validity measures were observed. The six-phase approach of thematic analysis was used to analyse data for qualitative results, while STATA version 11.0 was used to analyse quantitative data. The next chapter discusses the results of the study.

CHAPTER FOUR: PRESENTATION AND DISCUSSIONS OF THE QUANTITATIVE FINDINGS

4.1 Introduction

The results of the study were grounded on the self-administered structured questionnaire. Participants were given codes for identification purposes. For example, P1 until the last participant, P1 meaning participant one. The findings of the study revealed the demographic information, the level of nutrition knowledge, and the food security status of the participants. The findings were displayed with the reinforcement of literature from previous studies and important sources to create meaning. They were discussed below. Figure 4.1 represents the study population data flow in the quantitative strand. The total number of questionnaires distributed was 285. Thirty-five (35) participants did not respond or return the questionnaire. Two hundred and fifty (250) participants responded and 13 were dropped due to non-completion of the survey questionnaire in full. The study remained with a total of 237 participants.

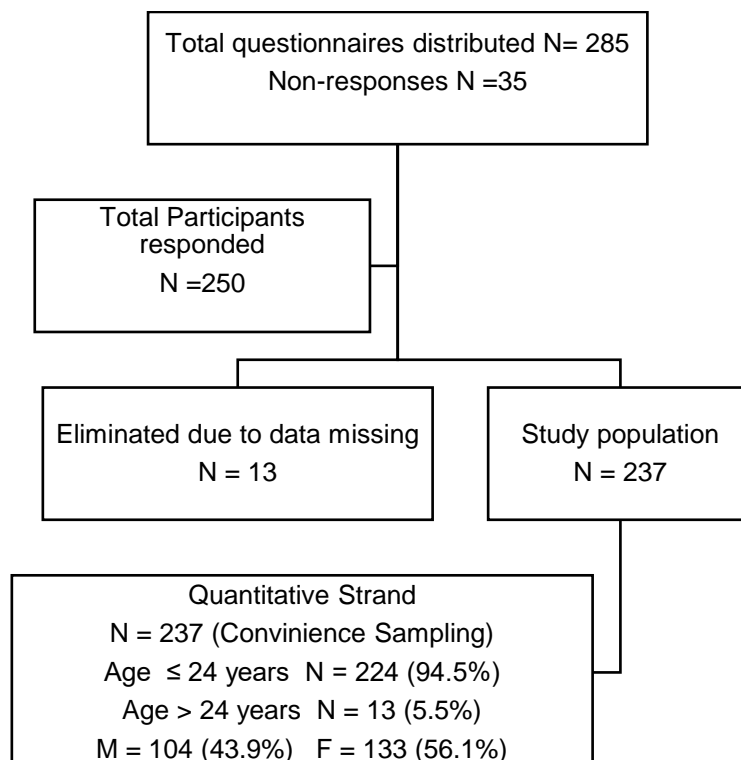


FIGURE 4.1: Study population data flow chart.

4.2. Demographic characteristics of the participants

Table 4.1 showed information about the student profile. The sample consisted of 237 undergraduate participants, 56.1% were females and 43.9% were males, with a mean age of 21 years ranged between 18 and 36 years.

Table 4.1: Demographic status of the study population

Variable description	Females (N = 133)	% 56.1	Males (N = 104)	% 43.9	Total (N=237)	%
Age (Median & Range) 21 (18 – 36)						
Age						
≤ 21	79	59.4	57	54.8	136	57.4
22 - 25	51	38.3	42	40.4	93	39.2
26 - 30	3	2.3	2	1.9	5	2.1
>35	0	0.0	2	1.9	2	0.8
Non-disclosure	0	0.0	1	1	1	0.4
Marital status						
In a relationship but not married	15	11.3	11	10.6	26	11
Married	0	0.0	2	1.9	2	0.8
Single	112	84.2	86	82.7	198	83.5
Non-disclosure	6	4.5	5	4.8	11	4.6
Levels of study (undergraduates)						
Level 2	49	36.8	44	42.3	93	39.2
Level 3	45	33.8	33	31.7	78	32.9
Level 4	38	28.6	27	26.0	65	27.4
Non-disclosure	1	0.8	0	0.0	1	0.4
Who pays for tuition						
Bank loan	1	0.8	1	1.0	2	0.8
DOH Bursary	0	0.0	1	1.0	1	0.4
NSFAS	111	83.5	78	75.0	189	79.7
Parents/ Relatives	13	9.8	16	15.4	29	12.2
Self	5	3.8	3	2.9	8	3.4
Non-disclosure	3	2.3	5	4.8	8	3.4
Part-time Job						
No	122	91.7	92	88.5	214	90.3
Yes	5	3.8	8	7.7	13	5.5
Non-disclosure	6	4.5	4	3.8	10	4.2
Hours worked						
1-2 hours	2	1.5	3	2.9	5	2.1
3-4 hours	2	1.5	3	2.9	5	2.1
Non-disclosure	129	97.0	98	94.2	227	95.8
Monthly Income						
R0-R1000	8	6.0	4	3.8	12	5.1
R1000-R2000	44	33.1	45	43.3	89	37.6
R2000-R3000	14	10.5	6	5.8	20	8.4
R3000+	5	3.8	9	8.7	14	5.9
Non-disclosure	62	46.6	40	38.5	102	43.0
Credit Card						
No	94	70.7	58	55.8	152	64.1
Yes	23	17.3	27	26.0	50	21.1
Non-disclosure	16	12.0	19	18.3	35	14.8
Where do you live						
Campus	85	63.9	78	75.0	163	68.8
Off-Campus	47	35.3	26	25.0	73	30.8
Non-disclosure	1	0.8	0	0.0	1	0.4
Smoking						
No	121	90.9	88	84.6	209	88.1
Yes	11	8.3	15	14.4	26	10.9
Non-disclosure	1	0.8	1	1.0	2	0.8
Drinking alcohol						
No	87	65.4	55	52.9	142	59.9
Yes	46	34.6	47	45.2	93	39.2
Non-disclosure	0	0	2	1.9	2	0.8
General Health						
Bad	3	2.3	2	1.9	5	2.1
Fair	49	36.8	29	27.9	78	32.9
Good	79	59.4	72	69.2	151	63.7
Non-disclosure	2	1.5	1	1.0	3	1.3

This study included undergraduate students from levels II (39.2%), III (32.9%) and IV (27.4%). Ninety-four percent of the participants were aged ≤ 24 years and 5.5% >24 years. The majority of participants (83.5%) were single, with only 5.5% working 1–2 hours daily, and some worked 3–4 hours daily (2.1%). Twenty-one-point one percent of participants had credit cards. The majority of students were funded by NSFAS (79.7%) and came from low-income families with a monthly allowance of R1k–R2k (37.6%). The majority of students (68.8%) lived on campus, with 30.8% living off-campus. Eleven percent of the participants smoked, 39.2% drank alcohol, and 32.9% considered their health to be fair, while only 2.1% considered their health to be bad.

In South Africa, obligatory school attendance began at the age of seven. A child went to school for a total of 12 years (Mahery & Proudlock, 2011). As a result, the expected starting age for an undergraduate degree programme was 19 years, and the expected graduation age was 21 years. (Sabi *et al.*, 2019). However, statistics in Table 4.1 showed that more than 40% of the students were above the age of 21, indicating that they were unable to complete their studies on time. In this study, 16.9% of the participants were between the ages of 18 and 19 years and were already in level II. It meant that they began the university at the age of 17 and 18, an age earlier than expected. However, they were not able to complete their studies on time even if they were doing a four-year undergraduate programme. Only 5.5% were in level IV at the age of 21 years. The rest were more than 21 years. These findings were consistent with the report by Sabi *et al.* (2019), which indicated that more than 30% of the students were over 21 years of age, signifying that they were not completing their studies in the set time.

The age range of the current study population was between 18 and 36 years. Alaimo (2005), Gaines, Robb, Knol and Sickler, 2014, Mugiki *et al.* (2018) regarded this population as emerging adults. As a result, they do not have the ability and knowledge with regard to food management, thus raising vulnerability to food insecurity. Food insecure students rated their health status as fair and poor (32.9% and 2.1%) compared to food secured students. Our results were comparable with previous studies on health-related findings, indicating that food-insecure students rated themselves as fair or poor (Hughes *et al.*, 2011; McArthur, Ball, Danek and Holbert, 2018; Knol *et al.*, 2017).

This might be because they skip meals, are unable to eat healthily, and often went without eating the whole day, which impacted the quality of diet and the role it plays on their mental and physical health (Tarasuk, Mitchell and Dachner, 2013; Bocquier *et al.*, 2015; Davison, Gondara and Kaplan, 2017).

4.3 Nutritional knowledge

Figures 4.2 to 4.6 demonstrated nutritional knowledge by gender and age difference of the study population. Most participants (69%) had moderate nutritional knowledge, while an equal number had both poor and good nutritional knowledge (15%) each. Figure 4.2 showed that 1% of the participants did not disclose their nutrition knowledge; one answered only two of the twenty-five questions, while the other did not answer any of them.

This study revealed that 14% of the females had poor nutritional knowledge, 69% had moderate nutrition knowledge and 16% had good nutritional knowledge. Figure 4.3 illustrated that 17% of the male participants had poor nutritional knowledge, 69% had moderate nutrition knowledge, and 14% had good nutrition knowledge.

There were 94.5% of the participants under the age of 24 years and 5.5% over the age of 24 years. In the under-24 age group, 16% had poor nutritional knowledge, 69% had moderate nutritional knowledge, and 15% had good nutritional knowledge. Figure 4.4 demonstrated that among participants over the age of 24 years, 77% had moderate nutrition knowledge and 23% had good nutrition knowledge.

The participants' nutritional knowledge was further classified into levels of study, 38.8% were in level II and 61.2% were in level III and above. Twenty-three percent of study level II participants had poor nutritional knowledge, 66% had moderate nutritional knowledge and 10% had good nutritional knowledge. Figure 4.5 demonstrated that 10% had poor nutritional knowledge, 71% had moderate nutritional knowledge, and 18% had good nutritional knowledge. Figure 4.6 summarised the nutritional knowledge status of the study population in terms of gender, age difference (≤ 24 years and > 24 years) and study level (two years and more than two years). Table 4.2 depicted the correct responses of students to questions about nutritional knowledge.

The majority of participants did not perform well on the following nutritional knowledge questions: question 5, WHO's recommendations about daily consumption of fruits and vegetables (37%), question 14, recommended salt intake per day for the general population (27.8%) and question 23, what would happen to our bodies if we do not eat enough starches (43.5%). This was based on FBDGs, food groups, nutritional benefits and food deficiencies.

Nutritional knowledge could be an influential factor in improving nutritional status, as it could ultimately lead to good nutritional attitudes and practices. Students with greater nutritional knowledge ate less unhealthy fats and cholesterol (Yahia *et al.*, 2016). Wilson, Matthews, Seabrook and Dworatzek (2017) found that university students had poor cooking skills and tended to develop a poor diet that promoted weight gain. Advanced knowledge of how to cook could help reduce the intake of processed foods and could increase the intake of freshly prepared foods (Wang, Rauzon, Studer, Martin and Graig *et al.*, 2010, Murray *et al.*, 2016).

The current study reports that 69% of students had moderate nutritional knowledge, and an equal number of students (15%) each had poor and good knowledge. Similarly, Rivera, Briones, de Jesus Espinosa and Toledo Lope (2020) found that the level of nutritional knowledge varied between 22.1% and 91.7% among students. According to the rating scale used in their survey, the majority of students (68.8%) revealed insufficient knowledge levels, followed by 17.2% with satisfactory levels, and 14% with sufficient knowledge levels.

Table 4.3 of the study did not find a significant association between age ($p < 0.22$) and gender ($p < 0.70$) with nutritional knowledge. Similarly, Chalmun *et al.* (2018) at Dental College in Telangana State found that males and females had the same nutritional knowledge. However, three previous studies reported that female students had higher nutritional scores than males (Labban, 2015; Yahia *et al.*, 2016; Ozdogan *et al.*, 2018). This might be due to various roles, and health-related programmes, including nutrition-related matters that females are more involved and interested in than males. There was a significant association between the study level and nutritional knowledge ($p < 0.02$). This might be attributed to the fact that students got to attend nutrition modules as they proceed with their studies.

As students enter university, they will inevitably encounter new environments for meal preparation, planning and consumption. Many students understand the significance of meeting nutritional needs, but their knowledge and attitude could prevent them from changing their behaviour.

Many other factors influenced decision-making, but they always resulted in healthy food choices (Abraham *et al.*, 2018). Stockton and Baker (2013) discovered that while college students understood that eating fast food could lead to illness, this knowledge did not influence their food choices. Similarly, some students developed poor eating habits and tend to select foods based on convenience, taste, time and available prices rather than nutritional value (Brown, Flint and Fuqua, 2014).

When students were interviewed in the second part of the survey, they confirmed that they bought food based on affordability, and that, even if they have nutrition knowledge, a lack of money hindered their ability to buy healthy foods.

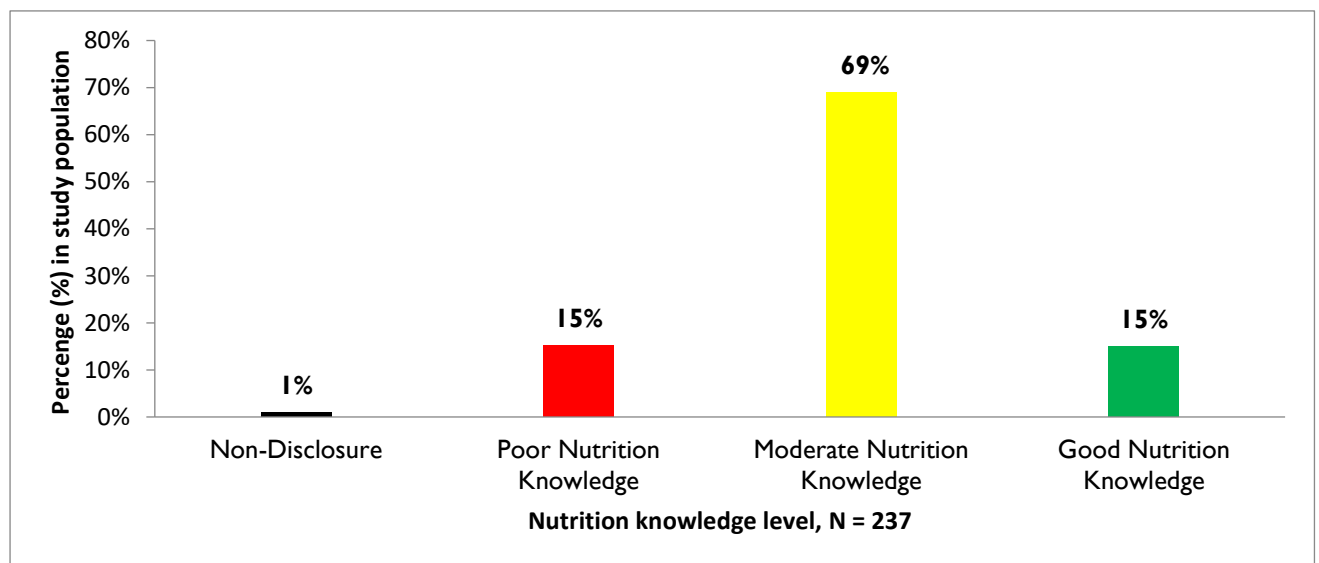


Figure 4.2: Nutritional Knowledge of the study population

Figure 4.2 showed the overall nutritional knowledge of the study population. Majority of the participants (69%) (n=163) had moderate nutritional knowledge, whereas an equal number of participants had both poor and good nutritional knowledge, n=36 (15%) each. 1% (n=2) of the participants did not disclose their nutritional knowledge.

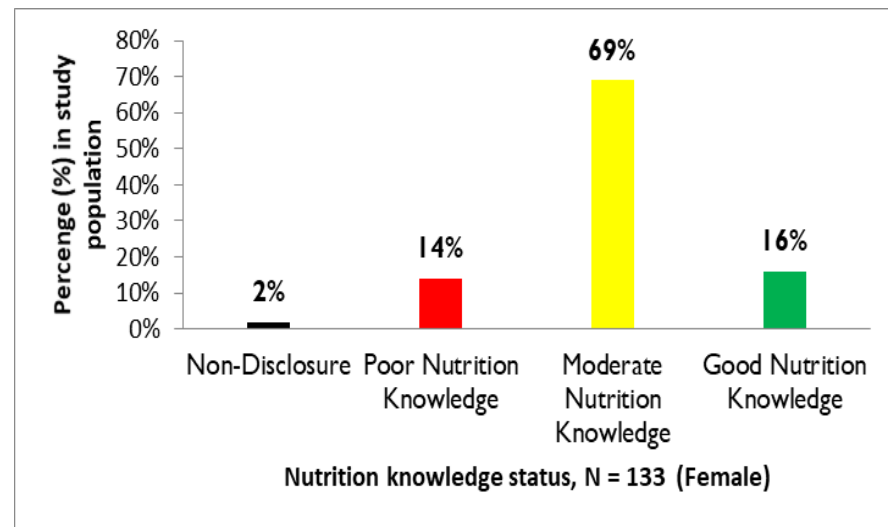
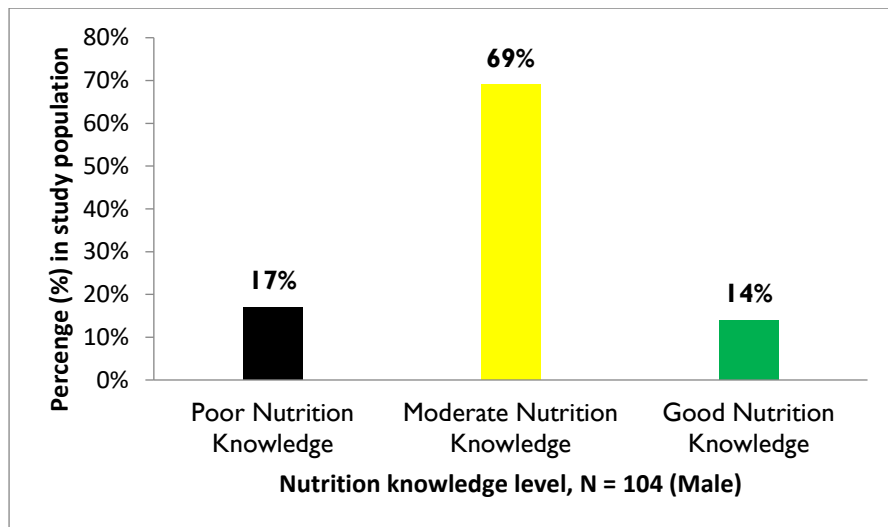


Figure 4.3: Nutritional Knowledge of the Males and Females of the study population

Figure 4.3 depicted the nutritional knowledge of the 104 males and 133 females of the study population. Seventeen percent (n=18) of the male participants had poor nutritional knowledge, 69% (n=72) had moderate nutritional knowledge and 14% (n=14) had good nutritional knowledge. For the female counterparts 2% (n=2) did not disclose their information, 14% (n=18) had poor nutritional knowledge, 69% (n=92) had moderate nutritional knowledge and 16% (n=21) had good nutritional knowledge.

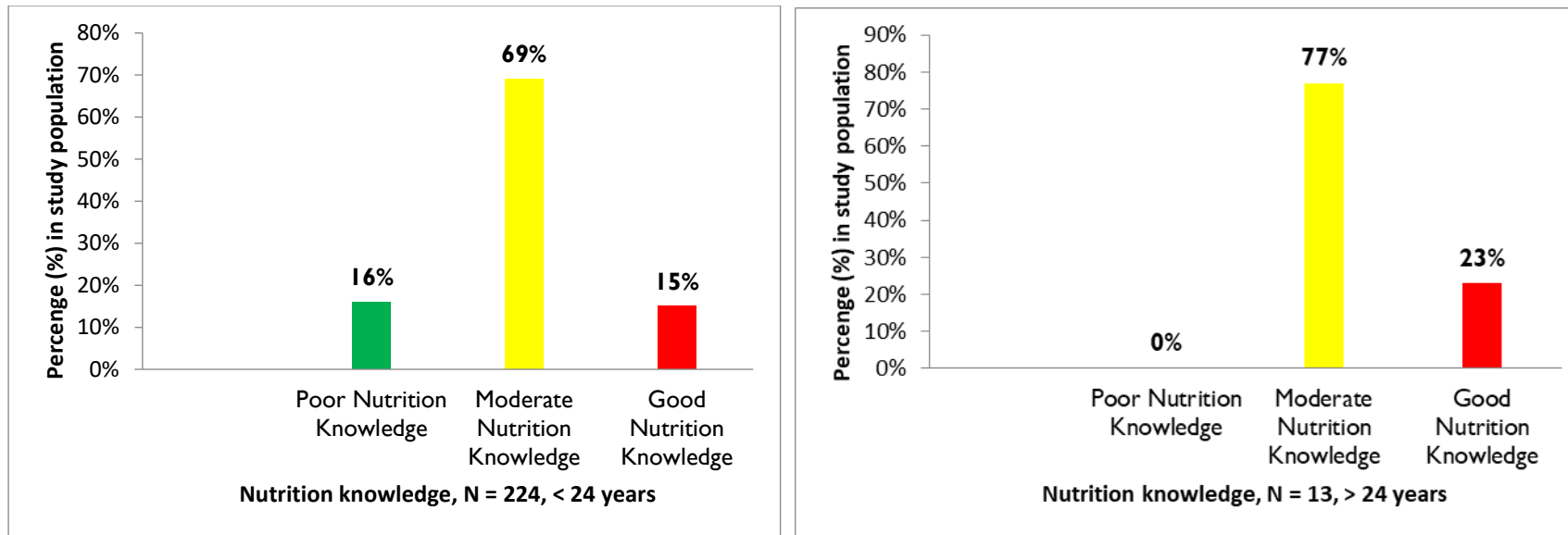


Figure 4.4: Nutritional Knowledge of the study population aged \leq and $>$ 24 years

Figure 4.4 demonstrated the nutritional knowledge of the study population of participants aged less or equal and more than 24 years. In age $<$ 24 years, 16% (n=36) had poor nutritional knowledge, 69% (n=155) had moderate nutritional knowledge and 15% (n=33) had good nutritional knowledge. While in age $>$ 24 years, 77% (n=10) of the participants had moderate nutritional knowledge and 23% (n=3) had good nutritional knowledge.

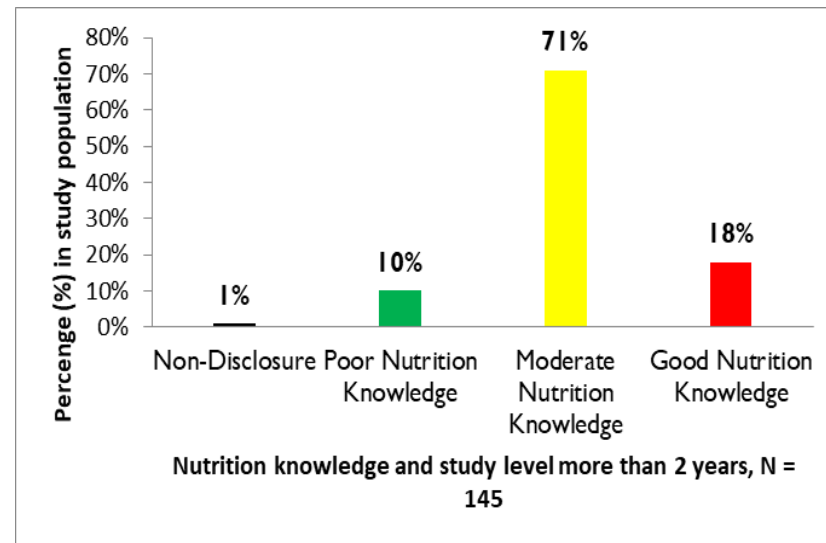
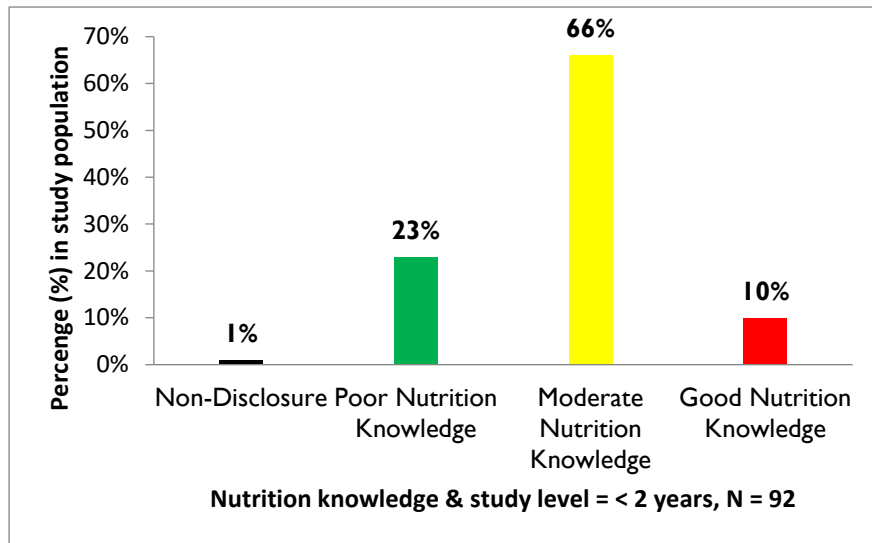


Figure 4.5: Nutritional Knowledge and study level of the population \leq and $>$ 2 years

Figure 4.5 represented the nutritional knowledge of participants who were in study level 2 and above. In study level II, 23% (n=21) had poor nutritional knowledge, 66% (n=61) had moderate nutritional knowledge and 10% (n=9) had good nutritional knowledge. While in study level III and above, 1% (n=1) did not disclose their information, 10% (n=15) of the participants had poor nutritional knowledge, 71% (n=103) had moderate nutritional knowledge and 18% (n=26) had good nutritional knowledge.

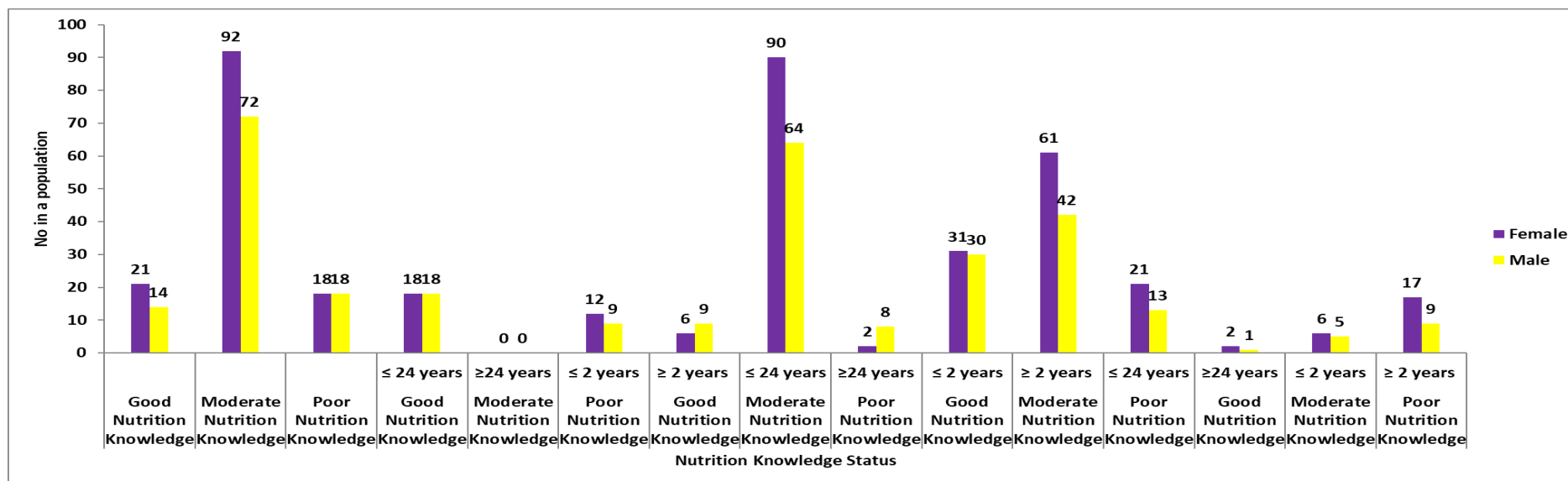



Figure 4.6, Summary of the nutritional knowledge status of the study population in numbers with regards to gender difference, age difference ≤ 24 years & > 24 years, and study level ≤ 2 years & > 2 years.

Gender difference in nutritional knowledge	Age difference in nutritional knowledge	Study level and nutritional knowledge
<p>More females were found to have good and moderate nutritional knowledge than males, (n=21 vs n=14) and (n=92 vs n=72). Both gender had equal numbers of poor nutritional knowledge classification, (n= 18 vs n= 18).</p>	<p><u>Age ≤ 24 years</u> Both genders had equal numbers of good knowledge classification (n=18 vs n=18). More females were moderately knowledgeable than males (n =90 vs n=64). On the other hand, more females were found to have poor knowledge than their counterparts (n= 21 vs n= 13).</p> <p><u>Age > 24 years</u> With regards to poor nutritional knowledge classification, there were more males than females (n= 8 vs n= 2), while 2 females and one male had good nutritional knowledge.</p>	<p><u>Study level ≤ 2 years</u> Nutritional knowledge was further classified according to the level of study, more females in level II were found to have poor knowledge than males, (n= 12 vs n= 9). Almost equal number of both gender had moderate and good knowledge, (n= 5 vs n= 6) and (n= 31 vs n= 30) respectively.</p> <p><u>Study level > 2 years</u> With regards to the level of study more than 2 years, more males had good knowledge than females, (n= 9 vs n= 6), while more females had moderate and poor knowledge than males, (n=61 vs n= 42) and (n= 17 vs n= 9) respectively.</p>

Table 4.2 Correct Knowledge responses regarding questions related to Nutrition.

The table below showed the majority of students' correct answers to nutrition knowledge questions. The following questions were answered correctly, but only by a few students: 5, 14, and 23. Items in bold indicate the questions with the least number of correct answers.

Nutrition Knowledge Questions (Multiple Choice)	Female (N=133)		Male (N=104)		Total (N=237)	
		%		%		%
1. What does it mean to eat a diverse range of foods?	128	96.2	98	94.2	226	95.4
2. What is the recommended daily water intake?	104	78.2	84	80.8	188	79.3
3. What does "be active" mean?	106	78.9	87	82.7	193	81.4
4. What are the health benefits of exercise?	113	85	76	73.1	189	79.7
5. WHO recommends that people aim to eat how many grams of fruits & vegetables per day?	47	35.3	27	26.0	74	31.2
6. How often should we eat starchy foods per day?	78	58.6	63	60.6	141	59.5
7. Which foods are high in starch?	126	94.7	102	98.1	228	96.2
8. How can you include more plant proteins into the diet?	96	72.2	77	74.0	173	72.9
9. Do you have to eat fish, chicken, lean meat, or eggs every day?	73	54.9	68	65.4	141	59.5
10. What can you do to increase your daily intake of fruits and vegetables?	76	57.1	85	55.8	161	67.9
11. What are examples of sugary foods?	122	91.7	88	84.6	210	88.6
12. What are some examples of foods that have a lot of fat?	108	81.2	78	75.0	186	78.5
13. How often should we have milk, maas, or yogurt?	91	68.4	56	53.8	147	62.0
14. What is the recommended dietary intake of salt per day for the general population?	34	25.6	32	30.8	66	27.8
15. What does this logo stand for? 	111	83.5	85	81.7	196	82.7
16. What can you do to reduce saturated fat intake?	72	54.1	60	57.7	132	55.7
17. Which foods contain vitamin A?	80	60.2	62	59.6	142	59.9
18. What is the main food source of calcium?	120	90.2	95	91.3	215	90.7
19. Which group of foods contains the most iron?	121	91.0	89	85.6	210	88.6
20. In which group of foods do we find the most protein?	122	91.7	101	97.1	223	94.1
21. What does protein do for our body?	85	63.9	81	77.9	166	70.0
22. What is the function of vitamin A in the body?	99	74.4	75	72.1	174	73.4
23. What would happen if we did not eat enough starches?	63	47.4	40	38.5	103	43.5
24. What vitamin/ mineral helps to prevent weak bones and teeth?	118	88.7	90	86.5	208	87.7
25. What do you get from fruits and vegetables?	106	79.7	79	76.0	185	78.1

4.4 Food security status

Figures 4.7 – 4.11 below represented the food security status, the gender difference in food security status, the age difference, and the participants' study level. Forty percent of participants were classified as food insecure, 24% as moderately food insecure, and 16 % as severely food insecure. Figure 4.7 showed that 60% of the participants were classified as food secure or having mild food insecurity. In terms of gender differences in food insecurity, 23% of males were moderately food insecure, 13% were severely food insecure, and 64% were food secure or mildly food insecure.

Figure 4.8 revealed that 25% of females were moderately food insecure, 17% were severely food insecure, and 57% were food secure or mildly food insecure. Twenty-eight-point three percent reported food insecurity with hunger. In terms of gender differences in hunger, more females (31.5%) were affected than males (24.0%). The frequency of occurrence was rated as equal for both females and males.

Participants were further classified by age and study level. Twenty-four percent of participants under the age of 24 years were moderately food insecure, 16% were severely food insecure, and 60% were food secure or mildly food insecure. Figure 4.9 represents participants over the age of 24 years. Thirty-one percent (31%) were moderately food insecure, 15% were severely food insecure, and 54% were food secure or mildly food insecure.

Figure 4.10 demonstrated the status of food security and the study level equal to two years and more. In study level II, 15% of participants had severe food insecurity, 27% had moderate food insecurity, and 55% were either food secure or had mild food insecurity. For those students who had been studying for more than two years, 54% of the participants were food secure or experienced mild food insecurity, 31% experienced moderate food insecurity, and 15% experienced severe food insecurity. Figure 4.11 summarised the study population's food security status in numbers with regard to gender difference, age difference (≤ 24 years & > 24 years) and study level (2 years & > 2 years). Table 4.2 depicted food insecurity questions and participants' affirmative responses.

The number of participants who said yes to FIES questions in the previous 12 months were as follows: 59.5% said they ate a variety of foods and that it happened more frequently, 47.7% were worried about running out of food, 43.9% were unable to eat healthy and nutritious food, 42.2% ate less food, 40.1% ran out of food, 51.0% males admitted to ate less food, 28.3% were hungry but did not eat, 27.5% skipped meals, while an equal number of both males and females admitted they went the entire day without eating; 18.3% and 14.3% respectively.

Food insecurity existed in 40% of the students surveyed in the study. Twenty-four percent of them experienced moderate food insecurity, while 16% were severely food insecure. The findings of the current study on food insecurity were slightly higher, compared to the national rates, where 23.6% of South Africans in 2020 suffered moderate to severe food insecurity and 14.9% experienced severe food insecurity (Cafiero, 2020). When comparing the findings of the study with Limpopo's food insecurity status in 2019 and 2020, the results of the current study were higher than the 2019 but lower than the 2020 provincial results. The province had 5.4% moderate to severe food insecurity and 2.1% severe food insecurity, and in 2020 the province had 28.9% moderate to severe food insecurity with 18.2% severe food insecurity (FAO, 2020).

These results contrast with the percentage of food insecurity found among Australian universities (48.1%), 24.9% having low food security, and 23.2% with very low food security (Micevski *et al.*, 2014). This was also comparable with the study done by McArthur *et al.* (2018) at Appalachia University where, 46.2% of students experienced food insecurity, 21.9% were low food secure and 24.3% were very low food secure. In South African universities, food insecurity reports revealed rates ranging from 11% to 38.3% (Rudolph *et al.*, 2018). The results of the current study are in contrast with the findings by Nazmi *et al.* (2018), where 44% of students were found to be food insecure. Another related study done at the City University of New York revealed that 39.2% of students reported experiencing food insecurity, with 22.7% reporting food insecurity with hunger (Freudenberg *et al.*, 2011). In the current study, 28.3% of students were found to be food insecure with hunger. More females were found to be food insecure than males (42% versus 36%). However, there was no association between gender and food insecurity ($p < 0.82$). These findings were in contrast with Ukegbu, Nwofia, Ndudiri, Uwakwe and Uwaegbute (2019) at Southeast Nigerian University.

Nonetheless, studies from developed countries alluded that females are more prone to experience food insecurity than males (Alaimo, 2005; Jyoti, Frongillo and Jones, 2005). The reason was that young men are likely to be hired; and therefore, these resources could be used to buy food outside the home.

Again, young males spent significantly more time away from home, so they could look for food elsewhere than young females (Poluha, 2004; Mains, 2007). In the present study, NSFAS provided funding to 79.9% of the students. Previous research in South Africa showed that students from low-income families who received financial aid at higher education institutions ran the risk of food insecurity because of poor money management (Letseka, 2007; Gwacela, 2013). Previous studies also reported that students who were recipients of funding from NSFAS were at high risk of being food insecure when compared to non-funded students (Munro *et al.*, 2013; Sabi *et al.*, 2019).

The current study revealed that 12.2% of the students were funded by parents or relatives and that the money was not sufficient to cover all the necessities required for survival at the university. Similarly, Job (2014) at UKZN found that students who depended exclusively on parents or guardians for funding were likely to have inadequate money to buy food as compared to those who have multiple sources of salary. Food insecurity in this study might also be attributed to the fact that 21.1% of students had credit cards, and that repaying them would leave them with little money for food.

Furthermore, 11% of students were smoking while 39% were drinking alcohol, which might contribute to less money available to purchase food. Larson, Laska and Neumark-Sztainer (2020) reported that binge drinking and substance use were elevated among food insecure emerging adults, but observed differences were not of a magnitude to suggest expenditures for alcohol. Substances were a cause of insufficient money for food. In the next chapter, one participant alluded that he used his money to buy alcohol and cigarettes, this left him with less money to buy food. Twenty-seven percent of the participants in this study were involved in a relationship but not married while only 2% were married. This also might affect how funds were distributed for food and other things. Mugiki *et al.* (2018) concluded that marital status and spending patterns were also risk factors for food insecurity.

In the present study, there was no significant association between age, study level and food insecurity. Comparably, three previous studies did not find any association between age, gender, and academic year with food insecurity (Ukegbu *et al.*, 2019; Hagerdon *et al.*, 2018; Raskind *et al.*, 2018).

This study found that 16% of both male and female participants affirmed that they went without eating the whole day when responding to FIES question number 8. This concurred with the findings by Freudenberg *et al.* (2011), where food-insecure students went all day without eating.

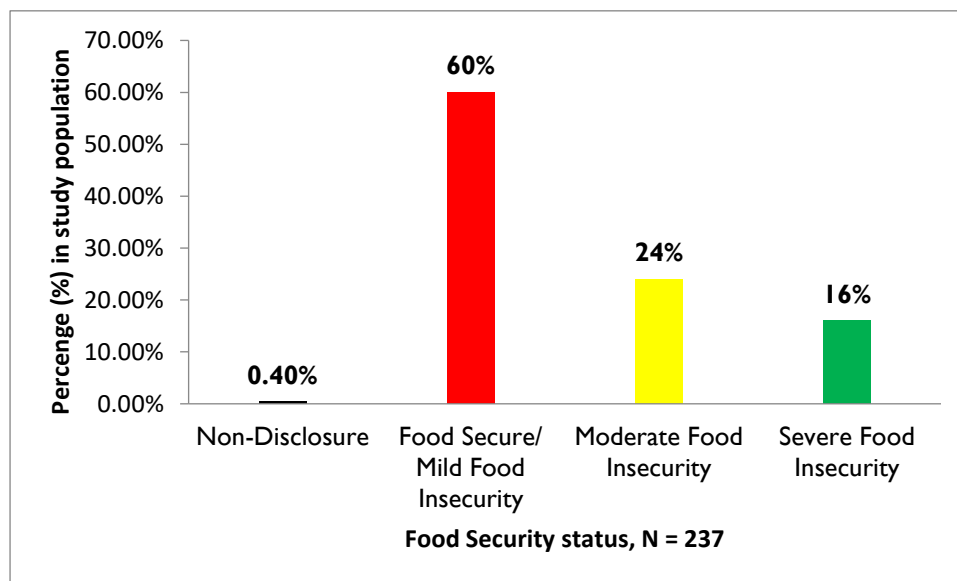


Figure 4.7: Food Security Status of the study population

Fig. 4.7 demonstrated that 60% (n=142) of participants were either food secure or had mild food insecurity, 24% (n=57) experienced moderate food insecurity and 16% (n=37) experienced severe food insecurity. Zero-point four percent (n= 1) did not want to reveal their food security status.

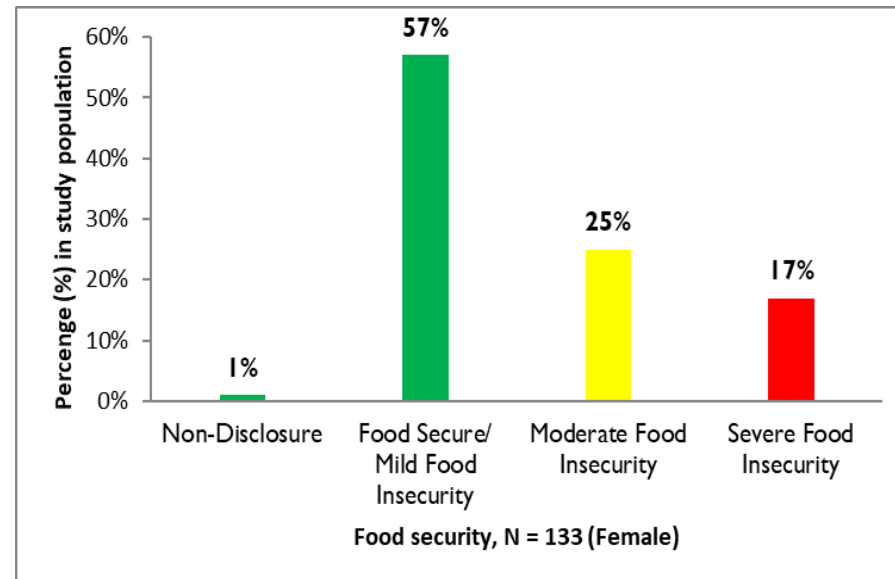
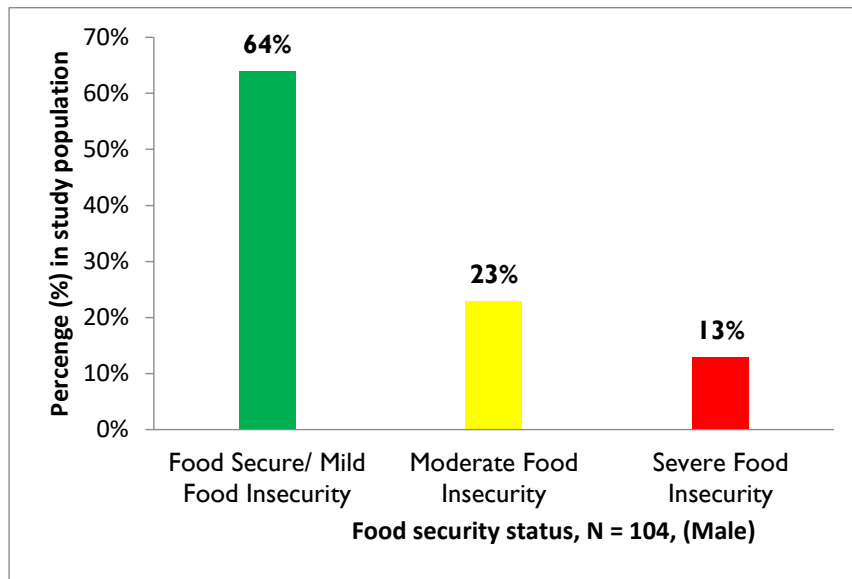


Figure 4.8: Food Security status of Males and Females study population

Figure 4.8 illustrated food security status amongst male and female participants, where 64% (n=66) of males were either food secure or had mild food insecurity, 23% (n=24) had moderate food insecurity and 13% (n=14) had severe food insecurity. For females, 1% (n=1) of the participants did not disclose their food security status, 57% (n=76) were either food secure or had mild food insecurity, 25% (n=33) had moderate food insecurity and 17% (n=23) were severely food insecure.

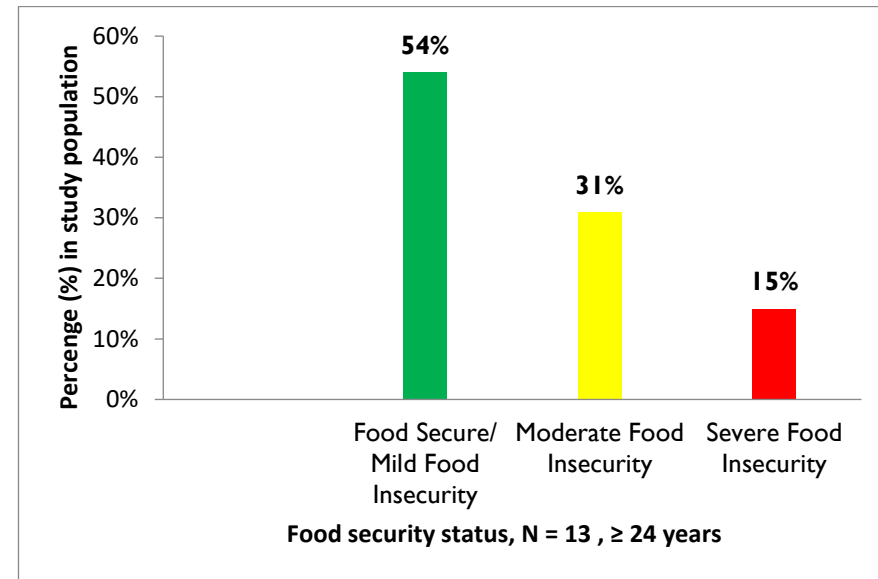
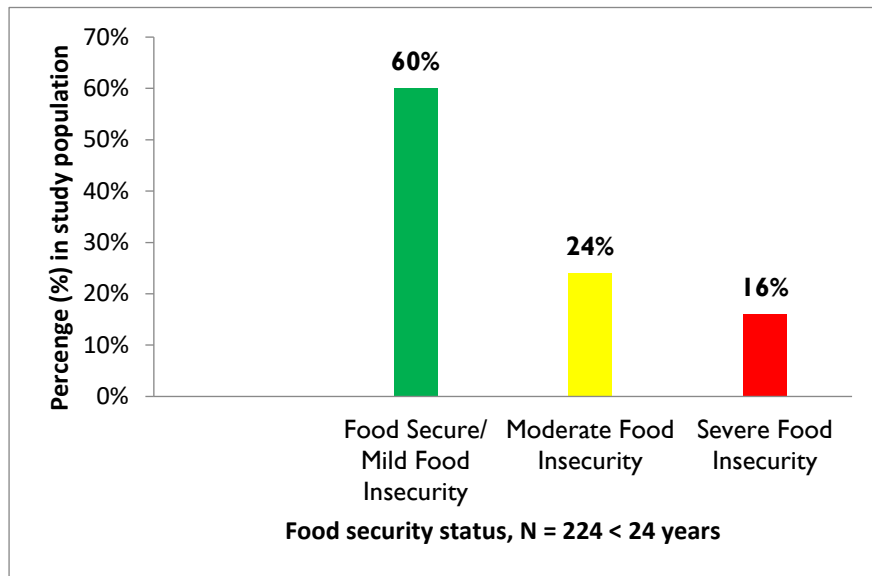


Figure 4.9: Food Security status of the study population aged ≤ and ≥ 24 years.

Figure 4.9 represents the food security status of participants aged less or equal and more than 24 years, where 60% (n=134) of participants < 24 years were either food secure or had mild food insecurity, 24% (n=54) were moderately food insecure, and 16% (n=36) had severe food insecurity. For participants ≥ 24 years, 54% (n=7) were food secure or had mild food insecurity, 31% (n=4) were food insecure to a moderate degree, and 15% (n=2) were extremely food insecure.

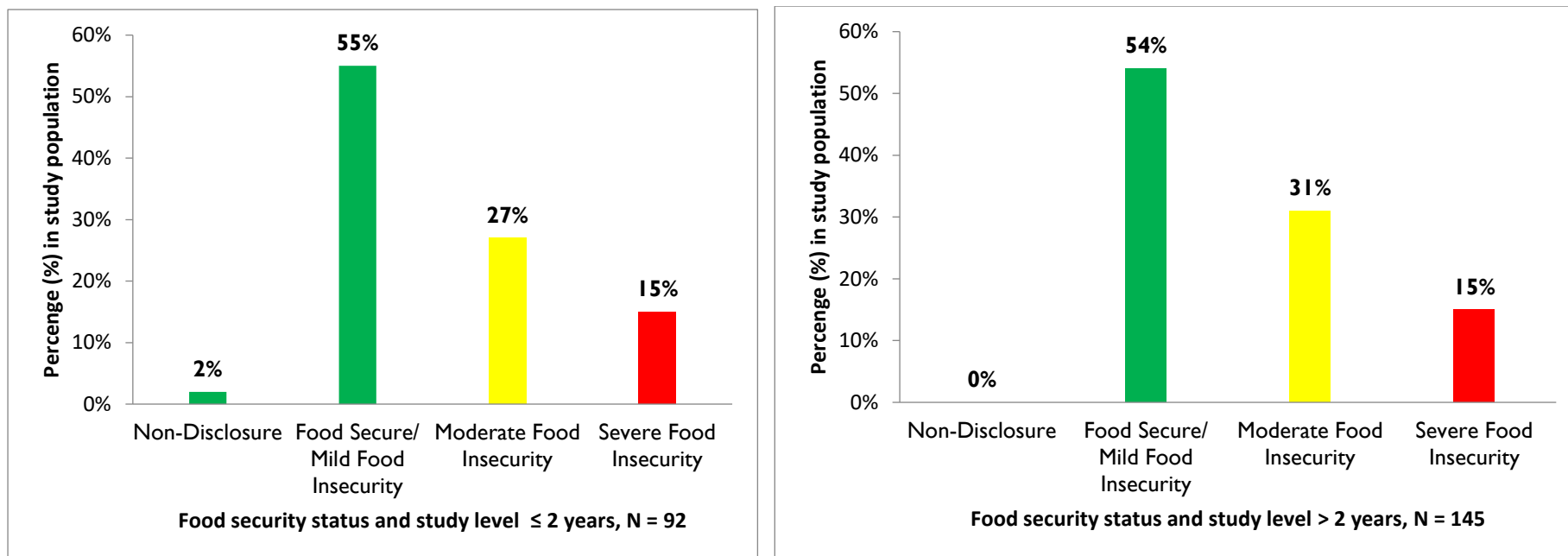


Figure 4.10: Food security status and the study level \leq and $>$ 2 years

Figure 4.10 depicted food security status and the study level less or equal to 2 years. For study level \leq 2 years, 2% (n=2) of the participants did not disclose their information, while 55% (n=51) were food secure or had mild food insecurity, 27% (n=25) had moderately food insecurity and 15% (n=14) had severe food insecurity. For study level for more than 2 years, 54% (n=78) of the participants were food secure or had mild food insecurity, 31% (n=45) had moderate food insecurity while 15% (n=22) were severely food insecure.

Table 4.3 Food Insecurity Questions and Affirmative answers by Gender difference of the Participants (N = 237)

Food Insecurity Experience Scale Questions	Females (N=133)	%	Males (N=104)	%	Total (N=237)	%
During the last 12 months, was there a time when you:						
1. Were worried that you would not have enough food to eat because of a lack of money or other resources?						
Yes	72	54.1	41	39.4	113	47.7
Often	10	7.5	3	2.9	13	5.5
2. Were unable to eat healthy and nutritious food because of a lack of money or other resources?						
Yes	67	50.4	37	35.6	104	43.9
Often	12	9.0	8	7.7	20	8.4
3. Ate only a few kinds of foods because of a lack of money or other resources?						
Yes	85	63.9	56	53.8	141	59.5
Often	20	15.0	5	4.8	25	10.5
4. Had to skip a meal because there was not enough money or other resources to get food?						
Yes	40	30.1	25	24.0	65	27.4
Often	12	9.0	12	11.5	24	10.1
5. Ate less than you thought you should because of lack of money or other resources?						
Yes	47	35.3	53	51.0	100	42.2
Often	7	5.3	7	6.7	14	5.9
6. Ran out of food because of a lack of money or other resources?						
Yes	57	42.9	38	36.5	95	40.1
Often	4	3.0	3	2.9	7	3
7. Were hungry but did not eat because there was not enough money or other resources for food?						
Yes	42	31.6	25	24.0	67	28.3
Often	12	9.0	12	11.5	24	10.1
8. Went without eating for the whole day because of a lack of money or other resources?						
Yes	19	14.3	19	18.3	38	16.0
Often	4	3.0	2	1.9	6	2.5

A high percentage of affirmations came from female participants in the following order, ate few kinds of foods, worried, unable to eat healthily, ran out of food, ate less food, hungry and both males and females had an equal number of affirmations and went without eating the whole day.

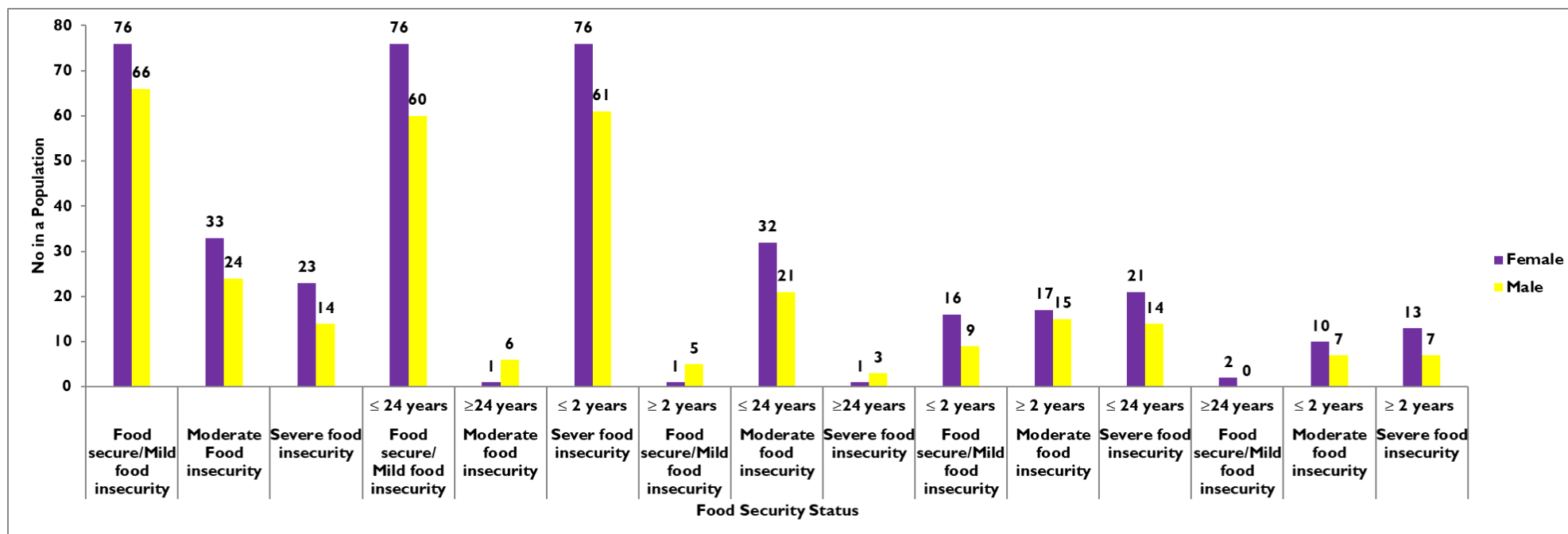


Figure 4.11 Summary of the food security status in gender and age differences \leq and $>$ 24 years, and study level \leq and $>$ 2 years.

Food insecurity gender difference	Food insecurity age difference	Food Insecurity and study level difference
<p>More females were found to be either food secure or mild food insecure (n=66) than males. More females than males were reported to have moderate to severe food insecurity, (n=33 & n=23 respectively).</p>	<p><u>Age \leq 24 years</u> More females than males were reported to have moderate to severe food insecurity (n= 32 vs n=21) and (n=21 vs n=14) respectively.</p> <p><u>Age \geq 24 years</u> More males were found to be moderately and severely food insecure than females, (n=6 vs n=1) and (n=3 vs n=1) respectively.</p>	<p><u>Study level \leq 2 years</u> There were more females in the severe food insecurity category than males, (n=76 vs n=61) and not much difference in the moderate food insecurity category (n=10 vs n=7).</p> <p><u>Study level \geq 2 years</u> Severe food insecurity was observed to affect more women than men (n=13 vs n=7), and not much difference in the moderately food insecure category for both (n=17 and n=15).</p>

4.5 Association between age, gender, study level with food insecurity and nutritional knowledge

Using Fischer's exact test to determine the connection between food security and nutritional knowledge in relation to age, gender, and study level, food security was not associated with age ($p < 0.70$), gender ($p < 0.82$), or study level ($p < 0.40$). Furthermore, nutritional knowledge level was not associated with age ($p < 0.22$) or gender ($p < 0.70$). However, a significant association was found between study level and nutritional knowledge with a P-value of 0.02 in Table 4.4 below.

Table 4.4: Association between age, gender, study level with food insecurity and nutritional knowledge

Variable	Food Security					Nutritional knowledge				
	0	1	2	Total	P-Value	0	1	2	Total	P-value
Age 0 ≤ 24 Years	134	50	31	215	0.70	36	154	32	222	0.22
1 > 24 Years	7	4	1	12		0	10	3	13	
Gender 0 Female	75	30	19	124	0.82	18	92	21	131	0.70
1 Male	66	24	13	103		18	72	14	104	
Study level 0 ≤ 2 Years	51	25	14	90	0.40	21	61	9	91	0.02
1 > 2 Years	90	29	18	137		15	103	26	144	

Food Security status, 0 = Food Secure/Mild food insecurity, 1 = Moderate food insecurity, 2 = Severe food insecurity

Nutritional knowledge level, 0 = Poor nutritional knowledge, 1 = Moderate nutritional knowledge, 2 = Good nutritional knowledge

4.6 Summary

This chapter presented the results and discussion of the quantitative strand by focusing on the nutritional knowledge and the food insecurity status. It also explained the relationship between nutritional knowledge and study level. The results were further classified according to gender differences. The findings of the qualitative strand are displayed in the next chapter.

CHAPTER FIVE: PRESENTATION AND DISCUSSIONS OF THE QUALITATIVE FINDINGS

5.1 Introduction

The results of the study were built on the recordings of the semi-structured one-on-one telephonic interviews. Using an inductive coding approach, thematic content was extracted from the interview transcripts. Italicised quotations from participant responses were accompanied by themes and subthemes derived from the data. Participants were assigned interview numbers for identification began with P1 and ended with P14. P1 referred to participant number 1. The findings of the study revealed the factors that contributed to food insecurity, the negative effects of food insecurity on academic performance as well as the physical, social, and mental health of students who were food insecure. It also discovered the level of nutritional knowledge, food insecurity and strategies used by food insecure students to cope with a lack of funds to buy food or a food shortage during their university term.

A total of fourteen students were purposively chosen for interview. These figures were determined by saturation, which occurred when no new information could be obtained from all of the questions asked. Saturation was regarded as the foundation of rigour in determining sample size in qualitative studies, and it could be attained through nine to seventeen interviews or four to eight focus group discussions in the same research studies (Hennink and Kaiser, 2021). With eleven interviews, saturation was reached, but interviews were continued to ensure that no new themes emerged. In fourteen interviews, data repetition was achieved.

5.2 Demographic profile of participants

The age of the participants who were interviewed ranged from 19 to 24 years old, as shown in Table 5.1. Participants were from levels II, III and IV. The majority of the participants were funded by NSFAS, while three had part-time jobs and seven lived off-campus. Eight participants drank alcohol, and one participant considered himself to be in poor health. Eleven participants were severely food insecure, while nine had only a basic understanding of nutrition.

Table 5.1 Participants' Characteristics

Demographic Information	N (%)
The total number of students interviewed	14 (100%)
Gender	
Females	7 (50%)
Males	7 (50%)
Age	
< 20	2 (14.3%)
20 – 24	12 (85.7%)
Marital Status	
Single	12 (86%)
In a relationship but not married	2 (14%)
Level of Study	
Level 2	7 (50%)
Level 3	4 (29%)
Level 4	3 (21%)
Who pays for your Tuition	
National Student Financial Aid Scheme (NSFAS)	9 (64%)
Parents/ Relatives	4 (29%)
Self	1 (7%)
Part-Time Job	
Yes	3 (21%)
No	11 (79%)
Credit Card	
Yes	4 (29%)
No	10 (71%)
Living arrangements	
Campus	7 (50%)
Off-Campus	7 (50%)
Smoking	
Yes	3 (21%)
No	11 (79%)
Drink Alcohol	
Yes	8 (57%)
No-	6 (43%)
Self-Reported Health Status	
Good	8 (57%)
Fair	5(36%)
Bad	1 (7%)
Food Insecurity status	
Moderate	3 (21%)
Severe	11 (79%)
Nutrition Knowledge	
Poor	4 (29%)
Moderate	9 (64%)
Good	1 (7%)

5.3 Main themes and sub-themes emerged.

Table 5.2 illustrated six themes, i.e., 1) coping strategies; (2) health triangle effects; (3) nutritional knowledge; (4) effects of hunger on academic performance; (5) factors contributing to lack of money to buy food; and (6) competing expenses and 29 subthemes that surfaced from the interviews.

Themes and sub-themes are listed below in Table 5.2.

MAIN THEMES	SUB-THEMES
1. Coping strategies	1.1 Food Support Systems 1.2 Borrowing money 1.3 Seek help from friends, family, relatives or parents. 1.4 Sharing 1.5 Cost-cutting types of unhealthy foods 1.6 Skipping meals 1.7 Planning and budgeting 1.8 Application of destructive actions 1.9 Quality of food 1.10 Quantity of food 1.11 Compromised cooking style. 1.12 Employment
2. Health Triangle effects	2.1 Social health 2.2 Mental health 2.3 Physical health
3. Nutrition knowledge	3.1 Training in Nutrition 3.2 Knowledge about a balanced diet 3.3 General knowledge
4. Effects of hunger on academic performance	4.1 Negative effects 4.2 No effects
5. Factors contributing to lack of money to buy food	5.1 Termination of support systems for free meals 5.2 Home responsibilities 5.3 Lack of financial assistance or bursary 5.4 Lack of budgeting skills 5.5 Entertainment 5.6 Late allocation of bursary funds
6. Competing Expenses	6.1 Rental, personal, and unexpected expenses 6.2 Uniform and clothing 6.3 Book allowance

5.3.1 THEME 1: COPING STRATEGIES

During the interview, participants described various strategies of dealing with food scarcity. Twelve sub-themes emerged under this theme. When asked what they do when they do not have enough food or money to buy food, the following responses were common: shared foods, reduced portion sizes, bought cheap food, asked for help from friends, parents/family/home, or relatives, skipped meals, ate few meals per day, borrowed money, and bought basic staple food. Participants sought inexpensive and simple-to-prepare foods such as noodles. One participant (P13) mentioned using non-branded food items due to cost. The consumption of fruits and vegetables was limited due to monetary constraints. However, very few participants mentioned the intake of spinach, cabbage, onions, tomatoes and apples. Meat was not a regular type of food consumed by participants; instead, eggs, tin fish, *inkomazi*¹, soya mince and beans were everyday protein sources accessible to them.

P4: "Uhm, me when I don't have like enough money I buy, uh, I like meat in general, but if I don't have enough money, I buy eggs, uh tin fish and macaroni, these kinds of stuff".

On a daily basis, staple foods such as maize meal, macaroni, spaghetti, bread and potatoes are commonly consumed. Some participants mentioned snacking on chips, atchar², bunny chow³, vetkoek⁴ and biscuits or Doritos⁵.

P6: "Okay, uh I will eat pap with eggs, atchar, basic food you know, uh pap with tin fish, things like that you know."

Fatty foods are prioritised because they are less expensive and more affordable to participants than healthy foods. Some participants expressed their dissatisfaction with the quality of food they purchased but felt that their options were limited and that they needed to buy to avoid going hungry. They ate in order to survive. The types of food they bought to eat are determined by the following factors: access, affordability, duration (how long will the food last), preparation method (easy-to-prepare foods such as noodles were preferred), and locality (distance and transportation to supermarkets around).

P10: "uh noodles, snacks (Doritos), cereal and eggs, yeah because is cheaper", P12 further said "Uh food I would buy like I said bread, I will buy bread, eggs, spaghetti, those sorts of things, you find that I am going to eat them for like three days then bread for another two days just to push a week."

Participants had a monotonous diet intake due to a lack of sufficient funds to purchase food, resulting in a limited variety and choice of food they would like to eat. Two participants (P11 and P12) mentioned having to look for work as a way to deal with food insecurity.

¹Inkomazi is a maas (sour milk). ²Atchar is a pickled food made of raw mangoes, oil, spices, herbs, and salt. ³Bunny chow is a street food known as Kota, it is made from a hollowed-out quarter loaf of white bread filled with a variety of ingredients, often potato chips, sausages, egg, beef patty, cheese, polony and atchar. ⁴Vetkoek is a fat cake or deep-fried bread. ⁵Doritos is a seasoned potato chips eaten as a snack.

Sub-theme 1.1: Food support system

One participant (P1) identified food support systems as one of the coping mechanisms for food insecurity, citing two programmes: one from a university where students were offered one meal a day, with the option of having supper or lunch, with the majority opting for lunch. The second programme was a church soup kitchen. P1 was affiliated with this church, where she would be offered a meal for the day. This was a huge relief because she would have at least one or two meals a day from the campus and church programmes. The findings were consistent with previous research, which found that food-insecure students used a variety of coping strategies, including support networks, among others (Rudolph *et al.*, 2018). A similar study conducted by Nikolaus *et al.* (2019) discovered that food-insecure students sought social support from friends and acquaintances, even went so far as to attend gatherings or meetings that provided free meals on campus. Food assistance programmes are excellent resources for students who are food insecure.

P1: "I used to be affiliated to a church that has a soup kitchen, and then uh, after that uh during the day during the week, there was uh program on campus that was called meal a day, that uh students will apply to get food."

Sub-theme 1.2: Borrowing money

When participants ran out of food or did not have enough money to buy food, they would call home or someone close to them to borrow money. Maynard *et al.* (2018) reported similar findings in which participants borrowed money from friends, relatives, or family as a coping strategy used by food insecure students.

P7: "Uh okay, what do I do if I don't have like enough money or maybe I ran out of money, I am not having food, I can sometimes ask someone close to me at least borrow me some money."

P10: "I call my mother or relative to send money yeah that's how I cope".

P13: "I will just uh ask some friends to just at least lend me money like buying things that I know will become helpful that time."

Sub-theme 1.3: Seek help from friends, family, relatives or parents

Participants described asking for help, particularly from friends, or calling home as a way to cope with the stress of not having enough food in their rooms or money to buy food. Friends appear to be the first line of defence before they can call home.

P6: "Uh I am always with my friend you know, so we always help each other, she helps me a lot, at home where they can if they do have money, they give me then I will buy something yeah".

The results of the present investigation concurred with those by Nikolaus *et al.* (2019), who discovered that students who were food insecure sought financial and dietary assistance from social networks (i.e., friends, family and community members). When he ran out of food, one participant (P2) appeared embarrassed to call anyone, including his family, for assistance. *"Uh, I didn't say anything, and I wouldn't even call anyone,"* he explained. According to Meza, Altman, Martinez, and Leung (2018), some students expressed concern about disappointing their families as a result of their food insecurity. It could be a similar case with participant 2, given that he would not call or speak to anyone.

Similarly, Mukigi *et al.* (2018) discovered that the majority of food insecure students were unwilling to seek or accept food assistance from friends, families, or food support networks. In the current study, this report went on to say that the main reason students were unwilling to accept assistance was that they saw hunger as a normal practice that did not warrant relief; they wanted to be self-sufficient and were embarrassed to ask for help. Furthermore, Fong, Wright, and Wimer (2016), Tsang, Holt and Azevedo (2011), and King (2017) discovered similar barriers between the general population and students at higher education institutions. Some of the participants' responses to seeking assistance from friends or family were as follows:

P5: "Okay, when I do not have enough food in my room or money to buy food I kind of ask a favour from my friends or maybe call family members to help me".

P9: "Uh if I don't have like food or money to buy food most of the time like I used to ask my friends and eat in their room yeah".

Sub-theme 1.4: Sharing

Sharing was caring and food brings people together, fostering trust. Most participants lived in self-catering apartments as a means of coping with food insecurity; they pool their resources to purchase necessities for survival. They bought cheap staple foods and shared the meals. According to Oh, Erinosh, Dunto, Perna and Berrigan (2014), one typical survival strategy utilised by these students was sharing meals with friends, relatives, or colleagues. According to Manboard, Johnson, Thornton and Biediger-Friedman (2021), participants' primary method of coping with food insecurity was to share food and other food-related resources, such as appliances, recipes and utensils. Similarly, Henry (2017) reported that students used food sharing with flatmates as a coping strategy in response to food insecurity. These were some of the responses from some of the participants:

P1: "We put money together kind of to buy bulk groceries. We just uh as a group we decided to buy only the basic staple foods, we buy uh a lot of maize meal 10kg usually and we usually sometimes buy samp. We don't usually buy meat uh, we buy soya mince, beans, yeah, and we alternate between beans and soya mince and cabbage, sometimes spinach because it is easy to access".

P2: "Uh most of the time because I have friends, we usually share including food".

Sub-theme 1.5: Cost-cutting types of unhealthy foods

When participants were asked what kind of food they bought when they could not afford to eat healthy and nutritious food, chips, *atchar*, *bunny chow*, *vetkoek*, biscuits, *Doritos* and *pop shots*⁶ topped the list. Despite the fact that unhealthy food posed a risk to their health and may lead to overweight and obesity, participants associated junk food with affordability and ease of access to food, (Mello, Gans, Risika, Kirtania, Strolla and Fournier, 2010). These findings were consistent with previous research, which found that the majority of students consumed fast food on a regular basis (Bergeron, Al-Saiegh and Ip, 2017). Bruening *et al.* (2016) discovered a lack of reliable access to reasonably priced healthy food as the cause of unhealthy eating habits. Furthermore, El Ansari *et al.* (2012) and Deliens, Clarys, De Bourdeaudhuij and Deforche (2013) discovered that students ate fast food, sweets, fizzy drinks and fried food due to their accessibility and affordability.

Abraham *et al.* (2018) also confirmed that some students acquire poor eating habits and preferred food based on accessibility, palatability, time and affordability rather than nutritional benefits. Participants' responses included the following:

P2: "Uh most of the time is just junk food, uh examples like we buy a lot of fatty food like chips⁶".

P7: "I can say because of lack of the money, uh I buy somethings like bunny chow because they are cheaper and some snacks like pop shots somethings like that, so you eat unhealthy food because they are at least cheaper".

P11: "Okay normally I will buy bunny chow from around then eat with uh, bunny chow that's what we eat or buy chips with bread and atchar".

It was clear that they had to cut costs by buying unhealthy food because they were cheaper even though they were aware that the food was not good for their health.

Sub-theme 1.6: Skipping meals

Participants who were food insecure frequently skipped meals in order to reduce the frequency of meals eaten per day because they cannot afford to eat three main meals per day. Meal skipping rates might be high during young adulthood, a period of transition and growth, according to Dubois, Girard, Kent, Farmer and TatoneTokuda (2009). The age group interviewed in the current study ranged between 20 and 24 years, with only a few under 20 years old, which agrees with previous studies that meal skipping was common among young adults. Similarly, Silliman, Rodas-Fortier and Neyma (2004) and Sakamaki, Toyama, Amamoto, Liu and Shinfuku (2005) found a high rate of meal skipping among young adults ranging from 24% to 87%. Participants in the current study skipped either breakfast or lunch because they would be gone to practical, library, or classes for the entire day during lunch. In some ways, that served as a food destruction strategy. Although breakfast was regarded as the most significant meal of the day as part of a healthy, balanced diet, 50% of the study participants skipped breakfast (Marangoni, Poli, Agostoni, Pietro and Cricelli *et al.*, 2009). Another study conducted among college students at the University of North Carolina at Charlotte discovered that nearly half (44.2%) of the students never ate breakfast as compared with lunch (3.5%) and super (2.3%), (De Bate, Topping and Sargent 2001).

⁶Pop-shots are maize snack chips. ⁷Chips are deep fried potatoes.

Phillips (2005) discovered that 65.5% of students who took part in his study and ate breakfast performed better on the exam than those who skipped breakfast. Skipping a meal increases energy intake at the next meal; those who skipped breakfast consumed more energy at lunch, and those who skipped lunch consumed more energy at supper (Mohiuddin, 2019). Skipping a meal had a negative impact on diet quality because nutritious foods are more likely to be consumed at specific meals (such as dairy and whole grains at breakfast and vegetables and proteins at supper), according to Zeballos and Todd, (2020).

One participant (P1) in the current study claimed that lack of time was the main justification for skipping breakfast. This was consistent with the findings of a study conducted by Afolabi, Towobola, Oguntona and Olayiwola (2013), which discovered that 48% of Nigerian university students skipped meals due to a lack of time. In comparison, Danquah, Odjodji, Graham-Acquaah and Steiner-Asiedu (2010) discovered that 57 % of Ghanaian University students skipped breakfast due to a lack of time, which was mentioned as a challenge for one participant when preparing breakfast.

P1: “Yes, I usually skip breakfast because I don’t have time to wake up every morning and make porridge with the available ingredients”.

P8: “Yeah, I skip breakfast because uh no during the day you have distractions yeah, cause you to be having to attend classes or to be with friends, but at night you have to eat because it is going to be tough, mind you at night you have to study, and you can’t study on an empty stomach”.

P12: “I usually skip lunch; I eat breakfast then go to class and eat dinner”.

P13: “Uh I usually skip breakfast so I would start my meal around 12h00, yes and after that, I will just eat again at night, I will just eat two meals yeah that’s what I do”.

Sub-theme 1.7: Planning and budgeting

Despite the fact that food insecurity posed some challenges to participants, there were those who were knowledgeable about planning and budgeting for the things needed for that month. To deal with their situation of not having enough food or money, they became innovative and creative.

One participant (P5) stated that he would create a budget and plan how he would spend the money for the month, whereas the other participant (P13) stated that he would look for discounts and buy non-branded food items because they are much cheaper. These findings were consistent with the findings by Mukigi *et al.* (2018), who found that when funds are limited, participants budget for meals and make a grocery list. Budgeting and financial skills were essential in managing limited resources (Mukigi *et al.*, 2018). Two participants described how they dealt with their situation as follows:

P5: "I each month draw a budget and plan how I am going to spend the funds that are allocated to me, for example, I can say I will take R1000 for grocery, and then R1000 for rent for example, and then the remaining I will use for my pocket money, or I can just buy other things such as clothes and other accessories".

P13: "Okay, uh what I do is I try to look at some special and I also try to buy uh non-branded food as they are much cheaper. So yeah, and I also try to save money every month so that at least I know, if uh next month something is likely to happen, I have something that I can use yes just to balance from uh school and things that I might need aside like food".

Sub-theme 1.8: Application of destructive actions

One participant (P8) explained how using destructive actions as a coping mechanism helped him manage the state of not having enough food. He would go so far as to drink more water than usual in order to feel full. Similarly, Nikolaus *et al.* (2019) reported one student drinking water instead of eating and avoiding food stimuli in order to avoid hunger. Subsequently, Henry (2017) discovered that students suppressed hunger with excessive fluid intake as a coping mechanism for food insecurity.

P8: "I was going to the library to study for maybe a lot of hours, so studying for maximum hours will require me to drink water more than I usually do. So, I will be at the library for that entire time for me not see food. So, for the days that I don't go to the library to study, and I am in my room I watch series on my PC yeah, that series will take my entire attention".

Sub-theme 1.9: Quality of food

When asked how the quality of their food was affected by a lack of money to buy food, participants said their options were limited, ending up eating anything. They were unable to choose what they eat because they bought what was affordable to them in order to avoid going to bed hungry. Participants were more concerned with price and affordability than with the quality of the food they purchased.

These findings back up previous research that found that people who were food insecure bought less expensive processed foods and ate less food when their resources were limited (Mukigi *et al.*, 2018; Bruening *et al.*, 2012). Their responses were as follows:

P1: "Our obligated store is a supermarket and then when we get to the supermarket, we are not happy with the freshness, especially of the vegies, so it is hard to find fresh ones, we end up settling for I don't know the better looking one, even though they are not satisfactory to you".

P8: "On quality aah, you won't eat quality food because you always focused on the price, you be like that one is R19.99 that one is R29.99 okay let me go for the R19.99 even though you see the quality is not uh conducive to your body".

Sub-theme 1.10: Quantity of food

When participants were asked to explain how a lack of food or money to buy food had affected the amount of food they ate, the responses indicated that they were eating smaller meals than usual compared to when they were financially stable because they needed to save for the next day. As much as participants wanted to eat, they could not because they had to eat fewer meals than expected (i.e., two meals or less per day) and cut meal size in preparation for the following day.

The findings of this study were consistent with previous research, which found that students who were food insecure reduced their intake by cutting meal size or skipping meals (Mukigi *et al.*, 2018; Nikolaus *et al.*, 2019). A typical meal pattern was perceived to be three meals per day, with the flexibility to allow for additional snacks (Nikolaus *et al.*, 2019).

P3: “Uh lack of food, yeah it did affect me badly, the quantity I don’t have as much as I usually have, as I am trying to save for tomorrow. I only eat to survive and not to supplement my body with other nutrients”.

P5: “When I don’t have enough maybe I will eat twice trying to save for tomorrow, yes meaning that when I don’t have enough the quantity reduces”.

Sub-theme 1.11: Compromised cooking style

One participant (P8) described how he sacrificed food quality in order to increase the quantity of the meal so that it would last him for days. It was about surviving for days on that particular food rather than the nutrients it provided to the body. Similarly, McArthur *et al.* (2018) reported that as a coping strategy for food insecurity, food insecure students stretch food to make it last longer. He said it like this:

P8: “Okay, I could buy tin fish because I will open and eat it for 3 days or more than 3 days because uh, I would not cook it like in a restaurant or something no, I will pour a lot of water for it to be uh enough for 3 days or more you know”.

Sub-theme 1.12: Employment

Two participants stated that they worked off-campus to raise funds for sustainability. According to Van den Berg *et al.* (2015), students pursued employment to manage budgetary weight. One of the participants (P11) also stated that if his employer required him to work the entire day, he would miss classes. Food insecurity creates an imbalance between work and academic activities, and as a result, participants' ability to focus on their academic work was hampered (Hughes *et al.*, 2011).

Subsequently, findings by Mukigi *et al.* (2018) revealed that students who laboured for multiple jobs to complement their salary to make ends meet and buy food voiced that working disturbed their classwork due to limited time to study and finish their projects. The other participant (P12) did his part-time job during school holidays which did not tempered with the class schedule. This was what they said:

P11: “Instead of me studying I will be out there trying to organise meals, some things that I could eat for quite a several days that would mean I have to look for some part-time job. I have to go out and work and skip classes, sometimes even tests. Sometimes I have to request a doctor’s letter or pretend to be sick.

P11: "It will depend on whether they needed assistance, sometimes if they say full day from 08h00-18h00 working and I will skip class".

P12: "Oh, no I usually do my part-time job during school holidays as soon as we close two weeks then I go do the part-time".

5.3.2 THEME 2: HEALTH TRIANGLE EFFECTS

For some university students, food insecurity was a physically, emotionally, and socially stressful event (Hattangadi, 2018). When asked to describe how worrying about food shortages affected them mentally, socially, and physically, participants described a variety of emotions. Three sub-themes emerged under the health triangle effects: social, mental, and physical health.

Sub-theme 2.1: Social Health

As a result of a lack of food, most students described the following feelings: being unable to socialise, locking themselves in, not feeling comfortable around friends, difficulty interacting with friends, being annoyed by people, and lacked the energy to go out. Some even ended relationships and were unable to communicate freely with friends. These findings were consistent with findings by Mukigi *et al.* (2018), who found that participants avoided hanging out with friends during mealtime because they did not have their own money to spend. Similarly, Henry (2017) reported feelings of social shame and embarrassment, as well as a lack of ability to engage in social activities with friends, such as going out to eat due to food insecurity.

P5: "I could say because I keep on worrying too much and then lock myself in my room and feel helpless and sorry for myself for not doing anything about the situation".

P8: "Socially I have to go and ask my friend or someone close to me to lend me R100 and that thing will always uh put that kind of an impression towards people when they see you, they will be like aah you will need R100. You end up having situation relationships with people whereby they describe you in terms of a person who is always in need of help, and you end up terminating the relationship with people because you feel you are a burden to them".

P11: "Socially like you turn to be like you can't even think clearly you can't speak how you want because you know you didn't have food, you just have to listen and obliged to whatever that they are doing".

Sub-theme 2.2: Mental Health

Participants reported feelings of stress, helplessness, depression and emotional exhaustion, as well as decreased concentration and focus. They were more concerned with where their next meal would come from than about their studies and studying on an empty stomach. This was also related to the fact that participants skipped meals, particularly breakfast, which was considered the most significant meal of the day, providing energy for fuel and strength for whatever activities were planned for the day (O'Neil, Byrd-Bredbenner, Hayes, Jana, Klinger and Stephenson-Martin, 2014). Other studies discovered a link between a lack of breakfast consumption and depression in adults from various socioeconomic backgrounds (Lee, Park, Yu, Lee, Han, and Kim, 2017; Mohiuddin, 2019). In contrast, skipping breakfast and eating irregularly was linked to fatigue episodes in medical students (Lee *et al.*, 2017). Improved students' access to healthy, affordable foods and dietary quality could improve their mental health and thus their academic success (Lauren, Silver, Faye, Rogers and Woo-Baidal, 2021). When asked how worrying about food affected them mentally, the following were their responses:

P5: "Uh it kind of makes me suffer from depression".

P6: "And uh mentally is like I am always breaking down, I cannot cope because I have to deal with academics, now the expenses of food and it's a lot yeah".

P9: "Mentally I can say that it causes stress and sometimes you cannot think well".

Sub-theme 2.3: Physical Health

Participants discussed how their body image was affected by not eating well due to a lack of food or money to buy food. They have unintentional weight loss. This was consistent with the findings by Hughes *et al.* (2011), who found that students who experienced food insecurity reported losing weight and rating their health as fair or poor when compared to food secure students. In the current study, 36% rated their health as fair, while 7% rated it as poor.

P8: "Physically you could get lean, you don't gain weight. I was wearing size 28 then there were these other three months that I was suffering and that 28 was very huge for me. So, I will take it to the tailor; imagine taking size 28 to the tailor that was very bad for my side".

P14: “Physically myself I am a person of like uh big body, so you lose weight obviously if you don’t eat Yeah”.

5.3.3 Theme 3: Nutrition Knowledge

Nutrition knowledge was an important factor in choosing healthy and nutritious foods (Worsley, 2002). Students with more nutritional knowledge practice healthy eating habits and consumed fewer unhealthy fats and cholesterol (Yahia *et al.*, 2016). However, in this study, some participants had moderate nutritional knowledge but ate cheap and unhealthy foods due to a lack of money. Fifty-seven percent (57%) of the participants drank alcohol, while only 21% smoked.

University students were at a stage in their lives when risky behaviours like drinking and smoking could lead to health problems (Stockdale, Dawson-Owens and Sagrestano, 2005). Overindulging in drinking and substance use was reported among food-insecure emerging adults, but the observation was not significant enough to suggest that spending on alcohol and substances was a cause of a lack of money for food (Larson *et al.*, 2020). The current study did not delve deeper to determine whether smoking and alcohol expenses were a direct cause of food insecurity. However, drinking and alcohol consumption increases the risk of food uncertainty.

During the interview, it was discovered that there were four categories of participants in terms of nutrition literacy. Some participants acquired training on nutrition as a lecture from a class module. This involved those who had the knowledge from high school as part of life science classes, those that had the general knowledge from growing up and lessons from home, and those that did not have any knowledge of nutrition at all. Participants shopped at large supermarkets, and those with nutritional knowledge knew what to buy as part of their groceries. When they had enough money for food and wanted to balance their meals, knowledgeable participants included carbohydrates, proteins and occasionally fruits and vegetables.

Sub-theme 3.1: Training in Nutrition

Some participants had nutritional knowledge gained through formal classroom training, as evidenced by their nutritional knowledge assessment scores. P1 received 68%, P6 -84%, and P11 received 72%.

A score of less than 60% was considered poor knowledge, a score of 60–79% was considered moderate knowledge, and a score of 80–100% was considered good knowledge, according to Bloom's modified cut-off points.

Even though participants were knowledgeable about nutrition, applying that knowledge to day-to-day life was difficult due to a lack of food or money to purchase food. Some students develop poor eating habits and tend to select foods based on accessibility, taste, time and affordability rather than nutritional value (Brown *et al.*, 2014). As a result, it was concluded that a high level of knowledge did not always imply healthy eating habits (Abraham *et al.*, 2018).

P1: “Yes, I did have nutrition knowledge because in class there was a time when we were taught about a balanced diet”.

P6: “uh well I do know, nutrition knowledge but then I do not follow that line, but I do buy food that I know will last me”.

P11: “Yes, I think so, uh is something that I attended in-class training; it was part of the module and also offered by someone from the Department Dietitian”.

Sub-theme 3.2: Knowledge about a balanced diet

Some participants were aware of what a balanced diet entailed. They understood that starchy foods provide energy, and that protein, fruits, and vegetables should be included in a well-balanced diet. In this study, 64% of participants had moderate nutritional knowledge. When they had enough money for food, those with nutritional knowledge knew what to buy to balance their meals, including carbohydrates, proteins, fruits and vegetables.

They understood that fast food and takeaways should be avoided. There was a positive relationship between participants' eating habits and knowledge, indicating that they are aware of the dangers of eating unhealthy foods, and their behaviour reflects their knowledge (Abraham *et al.*, 2018).

P5: “I make sure I buy food containing starch so that I can be full and have the energy to do other activities and also, I make sure I have food with protein and not forget the fruits and veggies. And avoid those junk foods and stay away from takeaways and other yeah”.

P7: "I know I must always have some fruits and some veggies, and I also buy some oats because is healthy, yeah milk".

Sub-theme 3.3: General Knowledge

Some participants had a general understanding of nutrition from childhood or from lessons at home or in high school. Nutritional knowledge had a direct impact on people's well-being, and it was possible to prevent many health problems by becoming acquainted with healthy nutritional principles and applying them (Beslenme, 2017). It was therefore critical to provide nutrition education to university students because nutritional knowledge influenced the nutritional behaviour of families and communities (Beslenme, 2017).

P3: "Yeah, I have a bit of knowledge of what kind of food I should buy when I have enough money yeah".

P13: "No I really don't have that knowledge of having uh some balance uh nutritious food but at least I then have like uh my salad and my meal like just try to have one side like beetroot just for my blood and then yeah cabbage one day".

5.3.4 Theme 4: Effects of hunger on academic performance

Academic performance had been impacted by participants' hunger as a result of food insecurity. It has affected them in two ways: those who expressed negative feelings such as losing focus and concentration in class, being unable to study for an extended period of time, skipped classes, had no energy to open books, and paid less attention in class.

Others were not affected by hunger; instead, they ignored the hunger and pretended to be strong. Under the heading of the effects of hunger on academic performance, two sub-themes emerged: negative effects and lack of impact.

Sub-theme 4.1: Negative effects

The majority of participants reported that hunger caused by food insecurity had an impact on their academic performance. They described the effects as follows: they did not have the energy to open books; they were unable to study for an extended period of time; they lost focus, attention, sleep, and occasionally skipped classes.

Food insecurity had a negative impact on academic activities like class attendance, which could jeopardise academic performance and educational outcomes of students (Sabi *et al.*, 2019). Students' schoolwork was negatively impacted by hunger to the point where they would sleep in class and lose focus, resulting in lower grades (Mukigi *et al.*, 2018).

P5: "Okay, obviously you will struggle when you are studying while hungry, cause you won't be able to focus, you won't be able to concentrate cause you are very hungry and you are weak, see and you don't even have that energy to open books, so what you can do is just to sleep yeah".

P9: "It has affected my academic performance negatively cause I wasn't likable to focus on some points because like I have to think about what I will eat and sometimes it becomes so difficult to go to class. Yes, I skipped classes sometimes".

Sub-theme 4.2: No effects

Even though food insecurity has affected other participants negatively, there were those who reported that they did not let it affect their academic performance. They were stressed, but they persisted in order to secure their future. P8 stated that he received over 80% of his first-year marks while hungry, and that he would spend more time studying to distract his mind from hunger. He also believed that hunger motivated him to study. Munro *et al.* (2013) reported that students had concentration deficit and fatigue due to hunger resulting from food insecurity. On the other hand, Wagner, Kaneli and Masang (2021) discovered that students who suffered food insecurity with hunger were less likely to progress compared to students who did not experience hunger. However, some participants in the current study were hungry but did not allow the effects of hunger from food insecurity to affect them academically.

P2: "Personally, I didn't let it affect my academic performance. I will just keep going, yeah keep being strong".

P3: "Uh it has never got to a point where it affected my academic performance as far as I think yeah".

P4: "Uh personally, it didn't affect me academically. Uh obviously I will be stressed but I have to study so that uh my kids will not experience what I am experiencing. So, I am positive and remain strong".

P8: "At 1st level, I would get over 80% although I was hungry, I stay a lot of time on my books for me to distract my mind from hunger, so I don't what is happening, maybe hunger was the motivation I don't know. But right now, I got everything, but I don't get over 70%".

5.3.5 Theme 5: Factors contributing to lack of money to buy food

Participants described various factors that contributed to their inability to buy food. The following sub-themes emerged: termination of free meal support systems, home responsibilities, lack of financial assistance or bursary, lack of budgeting skills, entertainment, and late allocation of bursary funds. Previous studies reported factors that contribute to students' food insecurity such as entertainment, mismanagement of funds due to lack of budgeting skills, home responsibilities and late allocation of bursary funds (Maynard, Meyer, Perlman and Kirkpatrick, 2018; Adeniyi and Durojaye, 2020; McArthur *et al.*, 2018 and Van den Berg *et al.*, 2015).

Sub-theme 5.1: Termination of support systems for free meals

One participant (P1) was a beneficiary of the kitchen soup and the university free meal programme, where free meals were provided. But due to COVID-19, the support system was interrupted, and the participant was forced to struggle to obtain food. While one participant (P1) had no difficulty accessing free meals from the aforementioned programme. Previous research has found that students in higher education had a negative perception of food insecurity as a "shameful secret" (Sabi *et al.*, 2019). Another study at the University of Free State, which had nearly 60% of food insecure students, found that some students were hesitant to request university food security intervention because they feared it would reveal their underprivileged financial status and create stigma around them (Van den Berg *et al.*, 2015). Interventions for improving food security are available in higher education institutions.

It provides an opportunity for food-insecure students, and the termination of such interventions causes frustration for those students who want to benefit, as well as those who are still ashamed of receiving assistance. A need for awareness and reassurance of food support programmes is critical.

P1: "The inconvenience that we have right now is uh the other support systems are no longer in place right now for free food".

Sub-theme 5.2: Home responsibilities

Although the majority of participants received NSFAS funding for their studies and food, they still had responsibilities at home and frequently shared their NSFAS funds with their families. This adds to participants' stress because they must balance school and family expenses with money earmarked solely for their studies. It was a black culture to financially support one another, especially in disadvantaged families, even when members are unemployed. These findings were consistent with the findings of a study by Van den Berg *et al.* (2015) at the University of KwaZulu-Natal, in which underperforming students had their allowances redirected from their bursaries to their home, leaving them with little to live on. Furthermore, previous research had found that, while NSFAS was awarded to eligible South African students, it was insufficient to meet other necessities like food security. (Letseka and Maile, 2008). Despite funding from NSFAS and participants' incurred home responsibilities, food insecurity remained a challenge.

Even though funding for food-insecure students was available in South Africa, Sabi *et al.* (2019) found that students on financial assistance were more likely to be food insecure than those who had additional funding for their studies. The explanation in this study could be due to the poverty-related burden that they carried from their family background (Munro *et al.*, 2013, Chapman, Love and Tatman, 2010).

P1: "On top of that uh usually the responsibilities at home that you must send the money at home that we usually get from NSFAS".

P5: "Yeah like they are depressed and stressed, some even have kids at home, so they are feeding those kids with the money from the bursary and if they are not being cleared it's a problem".

Sub-theme 5.3: Lack of financial assistance or bursary

When asked what factors contributed to them not having enough food or money to buy food, participants cited their social background and a lack of financial assistance. It was difficult to pay for tuition while also having enough money for food. According to a study conducted at the University of KwaZulu-Natal (Pietermaritzburg campus), students who relied solely on their parents or guardians for income were less likely to have enough money to buy adequate food than those who have other sources of income (Job, 2014).

P14 stated that she came from a low socioeconomic background and that they did not have enough money at home, which was consistent with the findings by Ramos, Magbanua, Flores, de Dios, Bugtong and Almonia (2017), who discovered that lower income was associated with food insecurity. Similarly, Nord and Hopwood (2008) demonstrated that food insecurity and family income were directly related with poor families being more vulnerable to food insecurity than others.

P7: "I can say for myself one thing that I noticed I only depend on my parents' money because I do not have NSFAS. So, the money that they send me I just accept it".

P8: "Uh first of all I think it's uh family status, yes socio-economic status, when you are coming from that a disadvantaged family and when there is no one from home working".

P14: "Uh I am from a low socio-economic family, so they don't get enough money at home, so with that, I don't ask much to survive through the month and, I am a non-funded student, I don't get an allowance from bursary or something else those are the factors that are affecting my situation".

Sub-theme 5.4: Lack of budgeting skills

One NSFAS-funded participant (P10) reported that when she received the money at the beginning of the month, she spent it recklessly and without proper planning. She would buy junk food and clothes she did not need. These findings were consistent with those by McArthur *et al.* (2018), who discovered that students' mismanagement of their limited resources might have played a substantial part in their food access dwindling, given that they spent money on non-food goods rather than food.

Similarly, studies in South Africa found that students from low socioeconomic families supported by IHL were exposed to food insecurity due to poor handling of funds (Letseka 2007; Gwacela 2013). Poor money management resulted in the misallocation of income to other unnecessary products rather than the purchase of healthy meals. According to Letseka (2007), the majority of undergraduate students wasted their money on luxury items like designer brands, alcohol and partying.

P10: "Uh maybe not spending my money in the right way when the month starts when you have the money you buy lots of takeaways instead of real groceries, so the money gets finished or buying clothes that you didn't need yeah".

Sub-theme 5.5: Entertainment

One participant (P4) stated that his lack of money to purchase food was due to entertainment. He would spend his money on weekends by going out, he smoked and drunk alcohol. He would spend the larger part of his money over the weekend, leaving less for food. It was like ignoring the budget and satisfying one heart's desires. According to McArthur *et al.* (2018), 21% of food-insecure newcomers frequently spent their money on entertainment. The participant (P4) was in his second year, just a year later, which confirms McArthur's previous report.

P4: "Personally, its entertainment, I like going out on the weekend so some of the things you do something and think later. Yeah, I smoke, so even smoking sometimes contributes and yes, I also drink".

Sub-theme 5.6: Late allocation of bursary funds

Most NSFAS-funded students expressed disappointment that funds were not allocated on time and that they had to find alternative means of support during the months that funds were not cleared. It was a nightmare for students who come from poor families to come up with a plan while waiting for funds to clear. Funding influences students' academic performance and success (McMillan and Barrie, 2012). Students who received NSFAS funding were more likely to experience food insecurity than non-funded students (Munro *et al.*, 2013; Micevski *et al.*, 2014; Sabi *et al.*, 2019). The findings of the study on delayed NSFAS fund payments were consistent with the previous report by Adeniyi and Durojaye (2020).

P5: "If I am relying on bursary like they might not allocate those funds on time, for example maybe we were supposed to get that money around the 1st the beginning of the month and you find that they will allocate those funds around the 20th or two months after, see it means you have to find another way of surviving for those months yes".

P13: "Uh number one I can say is my family background and that one is I can say it's so bad, uh the issue of NSFAS, uh it is cleared after few months".

5.3.6 THEME 6: COMPETING EXPENSES

The participants in the study described various monetary demands that compete with their food budgets. The list included the following items: rental, personal, unexpected expenses, clothing, uniform and book allowance. Priority was placed on competing expenses, and any remaining funds would be used to purchase food.

Sub-theme 6.1: Rental, personal, and unexpected expenses

Participants explained how rent, personal expenses and unexpected expenses reduced their food budget allocation. It was always difficult to strike a balance between these expenses and food. Fifty percent of those polled stayed away from campus. Previous research found a link between student food insecurity and housing. It was also stated that off-campus students were at a higher risk of food insecurity than on-campus students (Hughes *et al.*, 2011; Gaines *et al.*, 2014). Ukegbu *et al.* (2019) discovered a link between marginal food insecurity and off-campus student residence.

P6: "I stay off-campus so it will be rent and then you know like during the month uh something breaks, like a kettle, iron I must buy you know. I have to do my hair things like that, I have to buy toiletry you know; so is food and the landlord is increasing rent like crazy, it's difficult".

P7: "You see you must buy groceries you buy some sanitary pads and also leave money some money like when you want to buy some bread, things like that yeah".

Sub-theme 6.2: Uniform and Clothing

While some participants strived to present a professional image during their practical sessions, others desired nice clothes for personal satisfaction. Participants gave various reasons why they did not have enough money for food.

Some people were required to dress in a certain way during their practical sessions, while others simply want to look nice. Students wasted their rationed funds by spending them on non-food items rather than on food (McArthur *et al.*, 2018), which was consistent with the findings of this study.

P1: "Since we stay here the whole time, we want to be warm and get dressed and we don't have uh, support in terms of dressing up uniform, we go to a place professional setting, so you have to dress a certain way".

P12: “Uh to be the contributing factors uh is that sometimes I would want to buy things like okay I want to add things like clothes, personally for me that is why I will find a T-shirt that looks nice then I would want to buy it”.

Sub-theme 6.3: Book allowance

Most NSFAS-funded participants expressed dissatisfaction, claiming that they were not informed in advance that if they took a laptop the previous year, they would have to buy books on their own the following year. Participants prioritised books over food, and the little money that remained was then spent on food. Similar findings by McMillan and Barrie (2012) revealed that three-quarters of rural students could not afford access to required study materials, including textbooks, having a significant negative impact on academic performance.

P1: “This year we did not get book allowance from NSFAS because they said if you took a laptop last year then you cannot get the allowance this year, a lot of money that we have planned on using for our daily needs like lunch box and stuff, have gone to this saving for the books. After all, they are brand new books and we have never done these modules before”.

P8: “So this year it’s a problem, you pay money for a lot of things, you travel a lot, you need money to buy things, books and whatsoever and I took a PC last year, I didn’t know they will take my books allowance, so you see, now I need to buy books with my own money, it’s not enough”.

The discussion below is about the integration of quantitative and qualitative findings that aid in building deeper understanding of the study.

5.4 Integration of Quantitative and Qualitative findings

Integration refers to one or more stages of the research process in which quantitative and qualitative methods are combined or integrated (Tashakkori and Teddlie 1998; Creswell *et al.*, 2003). The current study used an explanatory sequential design, with the connection between the two methods occurring while selecting participants for the qualitative follow-up analysis based on phase one quantitative results (John & David Creswell 2018). This quantitative and qualitative findings of the study were integrated during the interpretation stage (Onwuegbuzie and Teddlie, 2003).

Table 5.3 below displays the integration of qualitative and quantitative findings:

Quantitative	Qualitative	Comments
<p>Demographic</p> <p>Five-point-five percent (5.5%) of participants had jobs, working either 1- 2 hours or 3 – 4 hours per day.</p>	<p>Employment</p> <p>Participants indicated that they had a part-time job off-campus to raise money for sustainment.</p>	<p>The results correspond and demonstrate that participants coped by looking for employment for sustainability.</p>
<p>Thirty-two percent (32.0%) of participants reported themselves as in a fair state of health with only 2.1% as bad.</p>	<p>Physical Health</p> <p>Participants rated their health status as fair and bad.</p>	<p>Not eating well due to lack of food or money to buy food resulted in some unintentional weight loss and hence participants ranked their health as fair or bad as compared to food secure students.</p>
<p>Seventy-nine-point-nine percent (79.9%) of students were funded by NSFAS.</p>	<p>Home responsibilities</p> <p>NSFAS recipients had home responsibilities and they often share their money with their families.</p>	<p>This demonstrates that NSFAS money will never be enough to cover students' needs as it is shared or redirected to do what it is not meant to be.</p>
<p>Thirty-nine-point two percent (39.2%) of participants consumed alcohol and 11% smoked cigarettes.</p>	<p>Entertainment</p> <p>One participant confirmed that he spends money on weekends on entertainment, including buying alcohol and cigarette.</p>	<p>This indicates that entertainment and consumption of alcohol and cigarette smoking pose risks to food insecurity as less money is spent on food.</p>
<p>Food security status</p> <p>Forty-two-point two percent (42.2%) of the participants ate few kinds of food due to a lack of food or money to buy food.</p>	<p>Quantity of food</p> <p>Participants had to reduce the meal size and a few kinds of food thinking about tomorrow.</p>	<p>This indicates that lack of food resulted in participants eating few kinds and cutting meal sizes as a way of coping with food shortages.</p>
<p>Forty-three-point nine percent (43.9%) were unable to eat healthy and nutritious food.</p>	<p>Cost-cutting types of unhealthy food</p> <p>Participants reported eating junk food because they were affordable and easier to access.</p>	<p>This shows that lack of money leads to poor food choices due to costs versus nutritional value.</p>
<p>Twenty-seven-point five percent (27.5%) skipped meals due to lack of food or money to buy food.</p>	<p>Skipped meals.</p> <p>Participants experiencing food insecurity had to skip meals to reduce the frequency of meals eaten per day to cope with the situation.</p>	<p>This demonstrates that skipping meals was a way of survival and coping with food insecurity by students.</p>
<p>Nutrition knowledge</p> <p>Sixty-nine percent (69%) of the students had moderate nutrition knowledge. 15% of the students had good knowledge.</p>	<p>Nutrition knowledge</p> <p>Participants did their shopping from big supermarkets and those who had knowledge knew what to buy as part of groceries, this included carbohydrates, proteins, fruits, and vegetables.</p>	<p>This indicates that nutrition knowledge plays a role in the selection of healthy and nutritious meals.</p>

<p>Sixty- six percent (66%) of participants in the level II study had moderate nutrition knowledge, whereas 10% had good knowledge. In study level III 71% had moderate knowledge while 18% had good knowledge.</p>	<p>Training on nutrition Some participants had nutrition knowledge that was acquired from a formal class module. This becomes even better per level of study; level III students are more informed than level II.</p>	<p>This shows that the majority of students had moderate nutrition knowledge, and this improves with progression to the next upper study level.</p>
	<p>Knowledge about a balanced diet Participants were knowledgeable about what a balanced diet entails. They knew that junk food and takeaways should be avoided.</p>	<p>This indicates that the majority of participants had knowledge about nutrition based on the scores obtained from the nutrition assessment questions.</p>

Following the integration of quantitative and qualitative findings, the researcher felt that they should explore the association of the theoretical framework to the study. The discussion below assumed that people consider the consequences of their behaviour before engaging in that behaviour and use attitudes and norms to predict behaviour intentions.

5.5. Application of Theoretical Framework

In this study, the Theory of Reasoned Action (TRA) developed by Martin Fishbein and Icek Ajzen in 1975 was used. The theory sought to explain the connection between attitudes and behaviours in human actions. The framework assumed that people consider the consequences of their actions before acting on them. The TRA was concerned with behaviour; it predicted behaviour intention using attitudes and norms. It also recognised that there were situations in which attitude had a limited influence on behaviour and distinguished behavioural intention from behaviour (Fishbein and Ajzen, 1975).

5.5.1 Attitude

Attitude referred to a person's positive or negative feeling about performing a specific behaviour.

The participants of the study went so far as to reduce portion size, ate less, or skipped breakfast or lunch to save food for the next day. The behavioural belief was that reducing portion size, skipping meals, or eating less than usual was a coping mechanism for food insecurity.

5.5.2 Behavioural Beliefs

Behaviour beliefs stipulated the association of certain performance of behaviour with a certain set of outcomes.

Participants of the study described how hunger had a negative impact on them. Despite this, they continued to study to ensure their academic success. Some stated that they borrowed money from friends, which resulted in stigma. But they continued to do so because they had no other options to deal with food insecurity.

5.5.3 Evaluation

Evaluation referred to the way people perceived and evaluated the potential outcome of a performed behaviour.

Some participants came from low socioeconomic backgrounds where no one in their family worked, and they relied solely on NSFAS funds. Because of the situation at home, they would distribute their NSFAS funds to family members as a means of dealing with food insecurity. Other participants described how they would buy things they want, and how they would spend their food budget on things like clothes to satisfy their desire.

5.5.4 Subjective Norm

Subjective norm referred to the way perceptions of relevant groups or individuals such as family members, friends, and peers might affect one's performance of the behaviour or perceived social pressure to perform or not to perform the behaviour.

Participants of this study stated that while they were dissatisfied with the quality of food they purchased, they ate for survival due to a lack of funds. They had to choose between quality and price, so they bought cheaper food that was unhealthy and high in fats in order to avoid going hungry.

5.5.5 Motivation to Comply

Motivation to comply addressed the fact that individuals might or might not comply with the social norms of the referent groups surrounding the act.

Participants stated that when they had enough money, they bought food containing starch, proteins, fruits and vegetables. However, when money was scarce, they only bought what was affordable and accessible at the time.

Some participants stated that they had nutritional knowledge but were unable to follow a balanced diet due to a lack of funds.

5.5.6 Behavioural Intention

Behavioural intention referred to a person's attitude and subjective norms towards the behaviour or perceived likelihood of performing the behaviour.

One participant stated that one of the factors contributing to their inability to purchase food was entertainment, and that he would go out on weekends, spent money and have little left over for food.

5.6 Summary

This chapter presented the six themes and sub-themes that described the perspectives of the participants, and the integration of the results from both qualitative and quantitative strands. These points of view corresponded with the Theory of Reasoned Action's five concepts: attitude, behavioural beliefs, evaluation, subjective norm, motivation to comply and behavioural intention.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.

6.1 INTRODUCTION

This section summarised the research report, based on the objectives, conclusions and recommendations on the outcomes of the study.

6.2 SUMMARY

The study aimed to investigate the level of nutritional knowledge, food insecurity, and coping strategies amongst students in the School of Health Care Sciences at the University of Limpopo. The summary is based on the study objectives as discussed below.

6.2.1 To determine the level of nutritional knowledge of students in the School of Health Care Sciences by completing a self-administered semi-structured questionnaire comprising of 25 multiple choice questions: 1 – 5 about food-based dietary guidelines, 6 – 15 about food groups, 16 – 20 about nutrient contents and 21 – 25 about nutrients benefits

- Sixty-nine percent of the students had moderate nutritional knowledge with no significant association between age, gender, and nutritional knowledge. A significant association between study level and nutritional knowledge was discovered in the study. This was an indication that as levels progresses students attended nutrition modules which enabled them to improve their dietary knowledge to distinguish between healthy and unhealthy food choices. However, students acknowledged that even if they had knowledge of nutrition, they could not apply it on day to day basis, because they did not have enough money to buy healthy and nutritious foods, instead they relied on cheaper and unhealthy food options based of affordability.
- Fruit and vegetable consumption was limited due to financial constraints; however, very few participants mentioned eating spinach, cabbage, onions, tomatoes, apples, and pears. Participants did not consume meat on a regular basis; instead, eggs, tin fish, inkomazi, soya mince, and beans were common protein sources available to them.

6.2.2 To assess the level of food insecurity among School of Health Care Sciences students using an 8 questions Food Insecurity Experience Scale asking about the past 12 months of experience with response options of no or yes and frequency response options of rarely (if it happened once or twice), sometime (3 – 10 times) and often (> 10 times)

- Forty percent of students experienced food insecurity. Out of the 40%, 24% were moderately food insecure while 16% were severely food insecure. These findings were higher than the South African national range of 23.6%. There was no association between age, gender and study level with food insecurity.
- Food insecurity was a “shameful secret” as a results some students found it difficult to seek assistance when they ran out of food, while others could ask for help from support networks. Both female and male participants in this study affirmed that went all day without eating and 28.3% were food insecure with hunger.
- Even though 79% of the participants were funded by NSFAS they were still at risk of food insecurity due to home responsibilities. The money was shared with the members of the family at home. and this worsened the state of their food insecurity. Others resorted to have a job while studying to meet the end needs but this interfered with their studies because they couldn’t balance work and attending a class.

6.2.3 To assess the association between food insecurity and nutritional knowledge with regard to age, gender and study level among students in the School of Health Care Sciences by using Fischer’s test

- There was no significant association between age, gender and nutrition level. However, a significant association was discovered between study level and nutrition knowledge. On the other hand, no significant association was found between age, gender, study level and food insecurity.

6.2.4 To explore the coping strategies of food-insecure students in the School of Health Care Sciences by using an interview guide with one central question and 8 follow-up probing questions

- Participants described the following coping strategies to deal with food insecurity: shared foods; reduced portion sizes; bought cheap food; asked for help from friends, parents/family/home or relatives; skipped meals; ate few meals per day; borrowed money; and bought basic staple food. Some bought inexpensive, simple to prepare food such as noodles, and use non-branded food items. One participant had a budget planned to ensure that the money for that month was utilised appropriately to cater for other unforeseen situations should they arise.

6.3 CONCLUSIONS

Nutrition knowledge was an important factor in choosing healthy and nutritious food. However, a lack of money to buy nutritious food can be a challenge to students. In the present study, it was revealed that both males and females had moderate nutritional knowledge. There was a significant association between the study level and nutrition knowledge. There were other factors that contributed to students' food insecurity which included lack of budgeting skills, delayed allocation of bursary funds, unexpected expenses and home responsibilities. Twenty-four percent (n=57; 24%) and 16% (n=37) of participants experienced moderate and severe food insecurity, respectively. These figures were higher than the South African national rates of food insecurity in 2020. Twenty-eight-point three percent of participants experienced food insecurity with hunger.

Participants affirmed that during the past 12 months they ate few kinds of foods (n= 141; 59.5%). Forty-seven-point seven percent (n=113; 47.7%) were worried that they would not eat enough, 43.9% (n=104) were unable to eat healthy and nutritious food, 40.1% (n=95) ran out of food, 42.2% (n=100) ate less food while 16% (n=38) went an entire day without eating due to a lack of food or the ability to buy food. The participants employed various coping strategies such as borrowing money from friends, sharing food, buying cheap food, and reducing portion size in order to deal with food insecurity.

6.4 RECOMMENDATIONS

Based on the current findings and other published literature on the subject, food insecurity was clearly a pressing issue among students in institutions of higher learning.

Nutrition education interventions and programmes addressing food insecurity are important in strengthening existing support systems to ensure that students cope and succeed. Future research is needed to cover a large scale of students including postgraduate students and to explore if drinking alcohol and smoking could contribute to food insecurity. To further explore if there could be any association between nutritional knowledge and food insecurity. Recommendations were developed based on the overall outcomes of the study, as well as the level of nutrition knowledge, food insecurity and coping strategies.

6.4.1 THEME 1: COPING STRATEGIES

- Strengthen the existing support system of one meal a day and make it two meals a day (where breakfast and supper can be offered).
- Establishment of support systems such as food banks to alleviate food insecurity among eligible students and access to healthy food at an affordable price.
- Collaborate with School of Agriculture to establish communal gardens.

6.4.2 THEME 2: HEALTH TRIANGLE EFFECTS

- Development of programmes to assist students who are affected by food insecurity on a mental, social and physical level. The institution should collaborate with student representatives and other stakeholders to provide emotional and academic support to the affected student, which ensures academic success.
- Strengthen referrals to student counselling and support division.

6.4.3 THEME 3: NUTRITION KNOWLEDGE

- Collaborate with the Department of Human Nutrition and Dietetics to create programmes that assist students in developing important skills such as cooking, meal planning and budgeting. During the orientation of first-year students, nutrition education should be highlighted.
- This will provide students with basic nutrition knowledge, allowing them to make more informed food purchases.

6.4.4 THEME 4: EFFECTS OF HUNGER ON ACADEMIC PERFORMANCE

- The Student Representative Council should expand existing awareness campaigns and provide training programmes to educate students about the dangers of hunger and its impact on academic outcomes.
- To reduce stigma, hungry students should be helped anonymously.

6.4.5 THEME 5: FACTORS CONTRIBUTING TO LACK OF MONEY TO BUY FOOD

- Provision of students with financial and time management training should be done during orientation.
- The process of allocating NSFAS money to all eligible students at the beginning of the year should be speeded up.

6.4.6 THEME 6: COMPETING EXPENSES

- The Department of higher Education and Training should look into the issue of subsidised uniform, rental and book allowance as the current budget is insufficient to meet all of the university's requirements.

6.4.7 RECOMMENDATIONS FOR FUTURE STUDIES

- Further mixed method research is required to assess the level of food insecurity among university students, including students from other faculties; this will provide sufficient data to generalise the findings of the study.
- Exploring with other Limpopo neighbouring institutions of higher learning to generate enough evidence around food insecurity rate. This will assist policymakers and management of institutions to develop better approaches to support eligible students who are found to be food insecure.

6.5 LIMITATIONS OF THE STUDY

The current study had limitations. Firstly, the findings of this study were limited to three departments under Health Care Science (i.e., Nursing, Optometry, and Pharmacy) due to the lockdown that resulted from the COVID-19 Pandemic.

Second, relying on students' self-reporting on food security questions may have resulted in recall bias and question misinterpretation, such as using a 12-month reference period for food insecurity rather than a 30-day reference period.

Thirdly, while some participants had credit cards, the current study did not investigate the use and effects of credit cards in purchasing necessities such as food, as well as how they were repaid. Despite its limitations, this study is the first in Limpopo Province, South Africa to use a mixed-method approach to understand lived experiences of food-insecure students. It will thus add to the existing literature.

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ANNEXURES

Annexure A Faculty proposal approval

ANNEXURE A



University of Limpopo
Faculty of Health Sciences
Executive Dean

Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2149, Fax: (015) 268 2685, Email:Kgagabi.letsoalo@ul.ac.za

DATE: 03 MARCH 2020

NAME OF STUDENT: MASHABELA ME
STUDENT NUMBER: 9607589
DEPARTMENT: DIETETICS
SCHOOL: HEALTH CARE SCIENCE
QUALIFICATION: MSc

Dear Student

FACULTY APPROVAL OF PROPOSAL (PROPOSAL NO. FHDC2020/2)

I have pleasure in informing you that your MSc proposal served at the Faculty Higher Degrees Meeting on 03 March 2020 and your title was approved as follows:

Approved Title: "Nutrition Knowledge, Food Insecurity and Coping Strategies Amongst Health Care Science Students at the University of Limpopo, South Africa".

Note the following:

Ethical Clearance	Tick One
Requires no ethical clearance Proceed with the study	
Requires ethical clearance (TREC) (apply online) Proceed with the study only after receipt of ethical clearance certificate	√

Yours faithfully

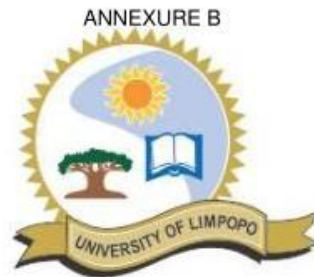

MR K.J. Letsoalo
Chairperson



CC: Supervisor: Ms ME Rapetsoa

CO-Supervisor : Prof BM Selepe

Annexure B Ethics clearance certificate



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 17 August 2021

PROJECT NUMBER: TREC/95/2020: PG - Renewed

PROJECT:

Title: Nutrition Knowledge, Food Insecurity and Coping Strategies amongst Health Care Science Students at the University of Limpopo, South Africa
Researcher: ME Mashabela
Supervisor: Ms ME Rapetsoa
Co-Supervisor/s: Prof MB Selepe
School: Health Care Sciences
Degree: Master of Science in Dietetics



PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Annexure C Approval letter to collect data.

ANNEXURE C



University of Limpopo

Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3376/3698, Fax: (015) 268 3256, Email:ditope.rabodiba@ul.ac.za
Faculty of Health Sciences, School of Health Care Sciences
DEPARTMENT OF HUMAN NUTRITION AND DIETETICS

TO: PROF. L SKAAL
ACTING DIRECTOR: SCHOOL OF HEALTH CARE SCIENCES

FROM: MRS. D.A RABODIBA
ACTING HEAD OF DEPARTMENT
DEPARTMENT OF HUMAN NUTRITION AND DIETETICS

DATE: 01 DECEMBER 2020

RE: PERMISSION TO COLLECT DATA FROM THE SCHOOL OF HEALTH CARE SCIENCES STUDENTS

The student, Mashabela ME a registered student in MSc(Dietetics) in the Department of Human Nutrition and Dietetics, hereby requests permission to collect data in the School of Health Care Sciences. The title of the research is "**Nutrition Knowledge and food insecurity status amongst Health Care Sciences students at the University of Limpopo, South Africa.**" The research proposal was granted permission to collect data by TREC, approval number TREC95/2020: PG.

The student requests the class list of all second to fourth level undergraduate level students in the following programs to select the sample size.

B.Optomety, B.Nursing Science, B. Pharmacy, and BSc(Medical Sciences).

Hoping that our request will be taken into consideration.

Warm regards,


Rabodiba DA

Acting HoD: Human Nutrition and Dietetics

APPROVED:

PROF L SKAAL: Acting director: SHCS



22/12/2020

Annexure D Consent Form

ANNEXURE D: RESEARCH CONSENT FORM

Name of Researcher	: Mashabela ME	
Contact details	: 082 500 4489	Email address : mohubee@gmail.com
Title of the study	: Nutrition Knowledge, Food Insecurity and Coping Strategies amongst Health Care Science Students at the University of Limpopo, South Africa.	

Statement concerning participants in research project

I am a student at University of Limpopo who is pursuing a master's degree of Science in Dietetics. As one of my course requirements I must carry out a research study. For this to be possible, I am inviting you to participate in this study. Participation is completely voluntary and you are free to withdraw at any time without providing any reasons. The Ethics committee of the University has granted approval for students to participate.

You will be requested to complete a self-administered questionnaire and you may be asked to participate in one on one interview. During the interview session an audio tape recorder will be used to capture all the discussions. The questionnaire might take about 35 minutes or less, whereas the interview might take about 40 minutes or less. Please provide your email address and cell phone number as the interview will be scheduled at the time is convenient to you. Your responses will be kept confidential.

Please read and complete this form carefully. Circle the appropriate response, sign and date the declaration at the end. If you do not understand anything and would like more information, please ask.

I have had the research satisfactorily explained to me in verbal/ or written form by the researcher.	Yes / No
I understand that the research will involve: completion of self-administered questionnaire which might take 35 minutes. I may be asked to participate in a 45 minutes one on one interview which will be audiotaped.	Yes / No

I understand that the interview might be scheduled when the time is convenient for me and I am willing to provide my cell number as follows: Cell Number: e-mail address:	Yes / No
I understand that this is voluntary participation and I may withdraw from this study at any time without having to give an explanation.	Yes / No
I understand that all information about me will be treated in strict confidence and	Yes / No

Annexure E Self-Administered Questionnaire

ANNEXURE E: SELF - ADMINISTERED QUESTIONNAIRE (IT CONSISTS OF SECTIONS A – C)

University of Limpopo Student Food Security Study

This is a study, not a test. Your responses will assist in finding answers to the research questions. It is critical that you complete it by yourself. Your responses will remain anonymous. Please answer all the questions by choosing the best response and tick in the box.

Section A: Demographic information

Tick the relevant box

1. Gender	F	M				
2. Your Age	20 - 35	35 - 45	45+			
3. Race	African	White	Coloured	Indian		
4. Marital Status	Single	Married	Divorced	In a relationship but not married		
5. Level of Study	Level 2	Level 3	Level 4			
6. Who pays for your Tuition	Self	Parents/ Relatives	Bank loan	NSFASS		
7. Do you have any part-time job?	Yes	No				
7.1 If yes, How many hours do you work?	1 – 2 hours	3 – 4 hours				
7.2 What is your monthly income?	R0 – R1000	R1000 – R2000	R2000 – R3000	R3000+		
8. Do you have a credit card debt?	Yes	No				
9. Where do you live?	Off-Campus	With parents/ relatives/ friend	Alone	On campus		
			Sharing			
10. Do you smoke?	Yes	No				
11. Do you drink alcohol?	Yes	No				
12. How would you describe your health in general?	Good	Fair	Bad			

1

Section B: Nutrition Knowledge

The following questions consist of knowledge on Food-based dietary guides (1 – 5), food groups (6 – 15), nutrient content (16 – 20) and nutritional benefits & deficiencies (21 – 25). Answer the below questions by choosing the best answer and ticking in the box.

1.	What does eat a variety of food mean?	Tick one
a.	Eat the same type of food every day.	
b.	To eat different kinds of foods from all the food groups at eat meal or eat day.	
c.	To eat a lot of food at each meal, it does not matter what type.	
2	What is the recommended daily intake of water?	Tick one

Annexure F Interview Guide

ANNEXURE F: INTERVIEW GUIDE

Introduction

The following steps will be followed during the interview:

The researcher will greet the participant and introduces herself.

Explain the purpose of the study, ethical considerations, and the significance of the study to the participant. The purpose of the study is to investigate the level of nutrition knowledge, food insecurity and coping strategies amongst Health Care Science Students at the University of Limpopo.

The interview will be conducted telephonically, and the call will be recorded for use during data analysis. Consent was signed during quantitative data collection.

Central question

- **Could you kindly explain how you cope when you do not have enough food or money to buy food and strategies you apply to cope with the situation during the course of the university term?**

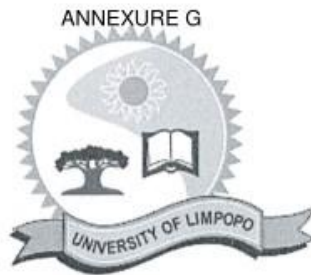
Follow-up questions

- Can you please explain how did worrying about food shortage affected you mentally, socially, and physically?
- What kinds of food did you buy when you were unable to eat healthy and nutritious food?
- Did you have nutrition knowledge of what kinds of food to buy should you have enough money? Where do you normally buy your food?
- Can you please explain how lack of food or money to buy food affected the quality and quantity of food you ate?
- What mealtime did you skip because of lack of food or money to buy food?
- What did you do when you ran out of food?
- How did hunger affect your academic performance?

According to you, what are the contributing factors that make you not to have enough food or money to buy food? **THE END ☺. Thank you for participating in this interview.**

Participants for telephonic interview

Annexure G Request letter to collect data.



University of Limpopo

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Hoping that our request will be taken into consideration.

Warm regards,



Rabodiba DA

Acting HoD: Human Nutrition and Dietetics

Annexure H Interview Script

ANNEXURE H (INTERVIEW SCRIPT)

Participant Two as P178

Male (M1)

Date: 04/10/2021

Duration: (09:19)

<p>Coping Strategies</p> <p>Uh most of the time because I have friends, we usually share including food. So sometimes we have a problem because we share a lot and may be sometimes like last year, I had a roommate so we will share almost everything, so it didn't because a challenge to me or any of my friends. So even if I was the one who was facing that situation, we could just share our things that is how we cope.</p>	<p>Worrying about food</p> <p>Uh mentally, I would say it does affect person like me because sometimes I just lock myself in, you don't wanna be seen by people, so just say hey guys, it's okay to be alone most of the time. I think that covers the whole social part, uh physically you wouldn't see the difference just because if you spend a day without eating you won't lose, so yeah, it doesn't really affected me.</p>	<p>Kinds of food</p> <p>Uh most of the time is just junk food, uh examples like we buy a lot of fatty food like chips, that are not even well cooked, so yeah sometimes you can even see that the person who cooked these uh was not that clean, but it becomes a problem. You cannot really say anything that is your last option as a person. Also, uh let me think, I doubt there is something else, I think the last thing I ate was, I am not sure if the food I ate was a problem or I was the problem, but I got sick after eating. It was uh I don't know chicken intestines, they were not cleaned, I got sick after eating them.</p>
<p>Nutrition Knowledge</p> <p>Yeah, yeah, I usually when I buy, I usually mix my stuff. I have uh like food for starch like potatoes and everything that I have my salad side, I buy spinach and everything, I just balance my food when I eat and that is when I don't have enough money.</p>	<p>Shopping</p> <p>Most of my groceries I buy at Checkers.</p>	<p>Quality and Quantity of food.</p> <p>It became a problem, it affected a lot because you end up just eating anything, you can't choose because you are limited, your options are limited. I can't sometimes I can't even afford the transport to go to Checkers where I buy food, so I just buy anywhere I just go to the nearest spaza shop and buy what they have there, you don't know if uh it safe to eat, clean, you just buy anything for the sake of eating.</p>
<p>Skipping meals</p> <p>Yeah, most of the time I skip breakfast and lunch.</p>	<p>Ran out of food.</p> <p>Uh I didn't say anything, I wouldn't even call anyone, I will just, with my friends, with my friends we usually eat, so will just eat whatever we are at and when I go back then that it.</p>	<p>Hunger and academic performance</p> <p>Personally, I didn't let it affect my academic performance. I will just keep going, yeah keep be strong.</p>
<p>Contributing factors</p> <p>Uh myself personally I don't have a bursary so sometimes my father gives me an allowance, that will contribute. Yeah, my father is paying, no he is still working.</p>		

ANNEXURE I



07 July 2022

Dear Sir/Madam

SUBJECT: EDITING OF DISSERTATION

This is to certify that the dissertation entitled 'Nutrition knowledge, food insecurity and coping strategies amongst health care science students at the University of Limpopo, South Africa' by Mashabela Mohube Elizabeth has been copy-edited, and that unless further tampered with, I am content with the quality of the dissertation in terms of its adherence to editorial principles of consistency, cohesion, clarity of thought and precision.

Kind regards

Prof. SJ Kubayi (DLitt et Phil)

Dissertation

by Me Mashabela

Submission date: 15-Jul-2022 11:05AM (UTC+0200)
Submission ID: 1870812654
File name: MASHABELA_ME_FINAL_DISSETARTION_-_Turnitin_2.docx (4.52M)
Word count: 31679
Character count: 171308

Dissertation

ORIGINALITY REPORT

23%
SIMILARITY INDEX

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INTERNET SOURCES

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8%
STUDENT PAPERS

LIST OF SUPPLEMENTARY TABLES

Supplementary Tables

1. Food security status of the study population

Variable	Number (N = 237)	Percentage (%)
1. During the last 12 MONTHS, was there a time when you were worried that you would not have enough food to eat because of a lack of money or other resources?		
No	124	52.3
Yes	113	47.7
1.1 If yes, how often did this happen?		
Often	13	5.5
Rarely	32	13.5
Sometimes	68	28.7
Non-disclosure	124	52.3
2. Still thinking about the last 12 MONTHS, was there a time when you were unable to eat healthy and nutritious food because of a lack of money or other resources?		
No	133	56.1
Yes	104	43.9
2.1 If yes, how often did this happen?		
Often	20	8.4
Rarely	32	13.5
Sometimes	52	21.9
Non-disclosure	133	56.1
3. And was there a time when you ate only a few kinds of foods because of a lack of money or other resources?		
No	96	40.5
Yes	141	59.5
3.1 If yes, how often did this happen?		
Often	25	10.5
Rarely	41	17.3
Sometimes	74	31.2
Non-disclosure	97	40.9
4. Was there a time when you had to skip a meal because there was not enough money or other resources to get food?		
No	172	72.6
Yes	65	27.4
4.1 If yes, how often did this happen?		
Often	7	3.0
Rarely	24	10.1
Sometimes	33	13.9
Non-disclosure	173	73.0
5. Still thinking about the last 12 MONTHS, was there a time when you ate less than you thought you should because of a lack of money or other resources?		
No	141	59.5

1/17

Yes	95	40.1
Non-disclosure	1	0.4
5.1 If yes, how often did this happen?		
Often	14	5.9
Rarely	30	12.7
Sometimes	53	22.4
Non-disclosure	140	59.1
6. And was there a time when you ran out of food because of a lack of money or other resources?		
No	141	59.5
Yes	95	40.1
Non-disclosure	1	0.4