BREAKFAST CONSUMPTION AND THE RELATIONSHIP TO SOCIO-DEMOGRAPHIC AND LIFESTYLE FACTORS OF UNDERGRADUATE STUDENTS IN THE SCHOOL OF HEALTH SCIENCES AT THE UNIVERSITY OF KWAZULU-NATAL

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ABSTRACT

Introduction: Breakfast is commonly regarded as the most important meal of the day. The consumption of breakfast has been linked to various health benefits, and is widely acknowledged in available literature. There is improved nutrient intake in those who consume breakfast compared to those who skip breakfast. Consumption of breakfast leads to positive health behaviour, improved stress management, feeling energetic and making less unhealthy snack choices. On the other hand, neglecting breakfast can have negative implications, such as fatigue and decreased concentration. Furthermore, skipping breakfast is positively correlated with obesity risk. The high prevalence of overweight and obesity in South Africa could be linked to poor breakfast consumption habits and requires further investigation.

Several studies have illustrated a high prevalence of breakfast skipping amongst the university student population worldwide, due to affordability and time management. It could be assumed that students studying towards qualifications in health sciences would be more inclined towards regular breakfast consumption, as part of a healthy lifestyle; however, further research is required to investigate this. Due to the paucity of data amongst South African university health science students, this study aimed to investigate breakfast consumption and the relationship to socio-demographic and lifestyle factors of undergraduate students in the School of Health Sciences, at the University of KwaZulu-Natal (UKZN).

Aim: To investigate breakfast consumption and the relationship to socio-demographic and lifestyle factors of undergraduate students in the School of Health Sciences at UKZN.

Objectives:

- To investigate breakfast consumption and the factors that influence breakfast consumption in undergraduate students in the School of Health Sciences at UKZN.
- To determine the socio-demographic and lifestyle profile of undergraduate students in the School of Health Sciences at UKZN.
- To determine if there was a correlation between breakfast consumption, socio-demographic profile, lifestyle indicators and Body Mass Index (BMI) among undergraduate students in the School of Health Sciences at UKZN.

Methods: A cross-sectional, descriptive study was conducted on undergraduate students in the School of Health Sciences at UKZN, based at the Westville campus. A self-administered questionnaire consisting mainly of close-ended questions was used to collect data. Weight and height measurements were taken and used to calculate BMI.

Results: Most participants were between 19 to 20 years of age, were females, lived at the university residence and were in their first year of study. Most reported their health status to be good or fair, did not smoke or consume alcohol and were physically active. Breakfast was consumed by 82.1% (n=284), however, only 50.5% (n=143) consumed it daily. Breakfast consumption was associated with lower levels of fatigue and higher levels of alertness. Ready to eat or instant breakfast cereals, tea or coffee, eggs and leftovers were popular breakfast choices. Reasons for consuming breakfast included: to satisfy hunger, for energy, to be alert, prevent fatigue and for health reasons. Breakfast was skipped due to a lack of time and a lack of appetite. A significant number of those who did not eat breakfast were in their third year of study, were smokers and consumed fast foods or take-away foods frequently. Daily breakfast intake was found among a significant proportion of Indian and white participants, those who lived at home and those whose parents or family were responsible for purchasing groceries. This study found no relationship between breakfast consumption and BMI.

Conclusion: The majority of students at the School of Health Sciences at UKZN consumed breakfast; however, not all consumed it regularly. Breakfast was consumed to achieve satiety, provide energy, be alert, prevent fatigue and for health reasons. Barriers to breakfast consumption included a lack of time and a lack of appetite. There was no relationship between breakfast consumption and BMI. Given its health and nutritional benefits, regular breakfast consumption should be encouraged among university students.

PREFACE

This dissertation was written under the supervision of Dr Kirthee Pillay using data collected from undergraduate students in the School of Health Sciences, University of KwaZulu-Natal, between August and October 2016.

Signed:  Date: 20 November 2017

Raeesa Seedat (candidate)

As the supervisor of the candidate, I agree to the submission of this dissertation.

Signed:  Date: 20 November 2017

Dr Kirthee Pillay (Supervisor)

DECLARATION OF ORIGINAL WORK

I, Raeesa Seedat, hereby declare that:

1. The research reported in this dissertation is my original work in its entirety, unless otherwise stipulated.
2. This dissertation, or any part of it, has not been submitted for any degree or examination at any other university.
3. Where previous research is reported it has not been copied and sources have been appropriately acknowledged.
4. This dissertation does not contain text, graphics or tables copied and pasted from the internet, unless explicitly acknowledged, and the source being detailed in the dissertation and in the reference section.

Signed:  Date: 20 November 2017

Raeesa Seedat (candidate)

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1.1 Importance of the study

Breakfast is an important part of the diet as it is a crucial contributor to daily nutrient intake (Cho, Dietrich, Brown, Clark & Block 2003). Those who consume breakfast have a better intake of both macronutrients and micronutrients, compared to those who skip breakfast. With breakfast consumption, there is an improved intake of energy, protein, iron, vitamin A and vitamin C (Anigo, Owolabi, Sule & Oluloto 2013). Consumption of breakfast leads to positive health behaviour, improved stress management, feeling energetic, and making less unhealthy snack choices (Goon & Islam 2014). Conversely, the consequences of skipping breakfast include fatigue and suboptimal concentration levels (Ackuaku-Dogbe & Abaidoo 2014), as well as an increased risk for developing obesity (Goon & Islam 2014; Sedibe, Feeley, Voorend, Griffith, Doak & Norris 2014; Nurul-Fadhilah, Teo, Huybrechts & Foo 2013).

Several researchers have shown an association between weight and breakfast consumption (Goon & Islam 2014; Sedibe *et al* 2014; Nurul-Fadhilah *et al* 2013). Studies by Goon & Islam (2014) and Sedibe *et al* (2014), demonstrated that breakfast consumption is an important factor in the risk for obesity. Furthermore, Goon & Islam (2014) showed that obesity is more prevalent among those who skip breakfast. Additionally, breakfast skipping was found to be associated with obesity, adiposity or fat accumulation, while regular breakfast consumption was deemed crucial in preventing excess weight gain (Nurul-Fadhilah *et al* 2013).

The South African National Health and Nutrition Examination Survey (SANHANES-1) showed a high prevalence of overweight and obesity amongst South African adults (Shisana, Labadarios, Rehle, Simbayi, Zuma, Dhansay, Reddy, Parker, Hoosain, Naidoo, Hongoro, Mchiza, Steyn, Dwane, Makoae, Maluleke, Ramlagan, Zungu, Evans, Jacobs, Faber & the SANHANES-1 Team 2014). Furthermore, trends between 2003 and 2013 indicate an increase in the prevalence of obesity in both men and women in South Africa [Shisana *et al* 2014; South African Demographic and Health Survey (SANDHS) 2003]. The rates of overweight and obesity among women was 24.8% and 39.2%, respectively. Comparatively, the rates of overweight and obesity among men was 20.1% and 10.6%, respectively (Shisana *et al* 2014). Considering that skipping breakfast is positively correlated with obesity risk (Goon & Islam 2014; Sedibe *et al* 2014; Nurul-Fadhilah *et al* 2013), it may be beneficial to improve breakfast consumption among the South African population.

University students are particularly prone to skipping breakfast and poor dietary habits. Several studies have illustrated a high prevalence of breakfast skipping amongst university students (Ackuaku-Dogbe & Abaidoo 2014; Ganasegeran, Al-Dubai, Qureshi, Al-abed, Rizal & Aljunid 2012; Nola, Jelinic´, Matanic´, Pucarin-Cvetkovic´, Markovic´ & Senta 2010). Breakfast skipping is common amongst university students (Ackuaku-Dogbe & Abaidoo 2014; Ganasegeran *et al* 2012; Nola *et al* 2010; Satalic´, Baric´ & Keser 2007). Some of the reasons given by students for skipping breakfast include to lose weight, lack of time, waking up late, not having any food to eat and not being hungry (Anigo *et al* 2014).

The lifestyle and behavioural habits of future health care professionals is an area of interest amongst researchers. Many studies have been conducted worldwide to determine if students studying towards health-related qualifications follow healthy lifestyles. At a Malaysian university, the bulk of students in health sciences consumed breakfast between one to three times per week (Isa & Masuri 2011). At the Saudi Arabian College of Health Sciences, most students consumed only two main meals a day, with breakfast being eaten three to four times a week by 38.7% and daily by 49.9% (Al-Rethaiaa, Fahey & Al-Shwaiyat 2010). In Ghana, the prevalence of breakfast skipping among medical students was 72% (Ackuaku-Dogbe & Abaidoo 2014) and 52% among Iranian female students at the Isfahan University of Medical Sciences (Azadbakht & Esmaillzadeh 2012). The prevalence of breakfast skipping among male and female students was 41.7% and 23.5% respectively among Mongolian medical students (Sun, Yi, Liu, Wu, Bian, Wu, Eshita, Li, Zhang & Yang 2013). Similar results were found in separate studies conducted in Turkey and Bangladesh. The prevalence of breakfast skipping was 47.7% among Turkish students (Neslisah & Emine 2011) and 46.7% among Bangladeshi students (Shill, Karmakar, Kibria, Das, Rahman, Hossain & Sattar 2014).

At the University of Free State, in South Africa, the majority of health science students (93.2%), consumed breakfast regularly. However, food items such as bread, porridge and cereal were not commonly eaten (Van den Berg, Abera, Nel & Walsh 2013). Comparatively, research conducted among health science students in Port Elizabeth, South Africa, indicated that 51% consumed breakfast less than five times per week (Gresse, Steenkamp & Pietersen 2015).

The quality of daily nutritional intake of most university students has been found to be suboptimal. Various studies reported a poor intake of fruit and vegetables among students (Gresse *et al* 2015; Van den Berg *et al* 2013; Van den Berg, Okeyo, Dannhauser & Nel 2012;

Al-Rethaiaa *et al* 2010) and a low intake of milk and dairy products (Gresse *et al* 2015; Van den Berg *et al* 2013; Van den Berg *et al* 2012). A high frequency of purchasing food and beverages from vending machines was found (Spanos & Hankey 2009), while a high fat, high cholesterol and low dietary fibre intake was also reported (Satalic´*et al* 2007). Furthermore, there was a high intake of sweets, chocolates, crisps, cakes, biscuits and soft drinks (Van den Berg *et al* 2013), as well as a high intake of convenience foods (Gresse *et al* 2015).

Although several studies have been conducted among students worldwide, there is a paucity of information on the breakfast consumption of South African university students. It would be assumed that students studying towards a qualification in the health sciences would be more inclined towards regular breakfast consumption, as part of a healthy lifestyle; however, further research is required to investigate this. Considering the role of breakfast in the prevention of obesity and subsequently chronic diseases of lifestyle, this study aimed to investigate breakfast consumption and the relationship to socio-demographic and lifestyle factors of undergraduate students in the School of Health Sciences at the University of KwaZulu-Natal (UKZN).

1.2 Type of study

This was a cross-sectional, descriptive study.

1.3 Aim of the study

To investigate breakfast consumption and the relationship to socio-demographic and lifestyle factors of undergraduate students in the School of Health Sciences at UKZN.

1.4 Objectives

1.4.1 To investigate breakfast consumption and the factors that influence breakfast consumption in undergraduate students in the School of Health Sciences at UKZN.

1.4.2 To determine the socio-demographic and lifestyle profile of undergraduate students in the School of Health Sciences at UKZN.

1.4.3 To determine if there was a correlation between breakfast consumption, socio-demographic profile, lifestyle indicators and Body Mass Index (BMI) among undergraduate students in the School of Health Sciences at UKZN.

1.5 Hypotheses

1.5.1 A high prevalence of breakfast consumption exists amongst undergraduate students in the School of Health Sciences at UKZN.

1.5.2 The following factors influence breakfast consumption: gender, where students live during the university term, state of health, alcohol consumption, cigarette smoking, physical activity and access to appliances.

1.5.3 Students who skip breakfast have a higher BMI than those who consume breakfast.

1.5.4 There is a correlation between socio-demographic profile, lifestyle indicators and BMI among undergraduate students in the School of Health Sciences at UKZN.

1.6 Study parameters

Only undergraduate students registered for qualifications in the School of Health Sciences at UKZN, were eligible to participate in this study. Postgraduate students registered for a qualification in the School of Health Sciences at UKZN, were not eligible to participate in this study.

1.7 Assumptions

1.7.1 It was assumed that all subjects would answer the questionnaire honestly.

1.7.2 It was assumed that subjects would understand the language (English) used in the questionnaire.

1.8 Definition of terms

Body Mass Index (BMI): Calculated by dividing weight in kilograms by the height in metres squared and is used to classify overweight and obesity (WHO 2015a).

Breakfast: For the purpose of this study, breakfast was defined as the first meal eaten from the time of awakening up until 09:00.

Health Science: At UKZN, health science incorporates all of the following disciplines: audiology, biokinetics, dental therapy, occupational therapy, optometry, pharmacy, physiotherapy and speech therapy (UKZN 2016b).

Undergraduate student: Any student at a university or college who is studying towards their first degree (Cambridge Dictionaries Online 2016).

University of KwaZulu-Natal: An institution of higher learning encompassing several campuses throughout the province of KwaZulu-Natal (UKZN 2016a).

1.9 Abbreviations

BMI:	Body Mass Index
HIV/AIDS:	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
NCD:	Non-Communicable Disease
NMMU	Nelson Mandela Metropolitan University
RTECs	Ready to eat breakfast cereals
SANDHS:	South African Demographic and Health Survey
SANHANES-1:	South African National Health and Nutrition Examination Survey
TB:	Tuberculosis
UFS:	University of the Free State
UKZN:	University of KwaZulu-Natal
USA:	United States of America

1.10 Summary

Breakfast is considered an important part of a healthy, balanced lifestyle. It is known to be an essential meal of the day that provides nutrients and energy and assists with concentration and alertness. Breakfast consumption has also been shown to affect weight and consequently the BMI of an individual. University students are particularly prone to skipping breakfast for a variety of reasons. It is assumed that students studying towards qualifications in the field of health sciences would make more prudent dietary choices; however, research has shown that this is not always the case. Studies have shown that besides a high prevalence of breakfast skipping among students, other dietary habits are also poor. There is a lack of published literature on the dietary and breakfast consumption habits of South African students, especially health science students. The aim of this study was to investigate breakfast consumption and the relationship to socio-demographic and lifestyle factors of undergraduate students in the School of Health Sciences at UKZN.

CHAPTER 2: LITERATURE REVIEW

This chapter presents a review of relevant literature. It defines breakfast, discusses the benefits of consuming breakfast and the implications of neglecting breakfast. The factors influencing breakfast consumption are also described. It also reviews the dietary and lifestyle profile as well as nutritional status of university students. It also illustrates the prevalence of breakfast skipping in various population groups and discusses the relationship between BMI and non-communicable diseases.

2.1 Definition of breakfast

It is difficult to define breakfast as there is no universally accepted definition and the studies that were reviewed, defined it differently. For many, breakfast is a customary morning tradition that is consumed regularly either first thing each morning or mid-morning. Others may choose to omit breakfast and consume the first meal of the day at lunchtime, instead (Harvey-Golding, Donkin, Blackledge & Defeyter 2015). In a Malaysian study, breakfast was defined as the first meal of the day, eaten within two hours of waking, before 10:00, prior to or at the start of daily activities (Moy, Johari, Ismail, Mahad, Tie & Wan Ismail 2009). Similarly, in an Iranian study breakfast consumers were defined as those who consumed any food or drink, with the exception of water, before 10:00 in the morning, at least five times per week. Furthermore, skipping breakfast was defined as not having any food or drink before 10:00 in the morning or consuming breakfast at a frequency of less than five times per week (Azadbakht, Haghighatdoost, Feizi & Esmaillzadeh 2013). Krishnan & Sharmila (2016), who chose to define breakfast as the meal consumed between 06:00 and 09:00, used a slightly earlier timeframe. In an Australian study, the breakfast timeframe used was between 5:30 to 9:30 (Fayet-Moore, Kim, Sritharan & Petocz 2016). In an Indian study, no timeframe was given, however, breakfast consumers were defined as those who consumed breakfast at a frequency of more than four days per week, while breakfast skippers were defined as those who consumed breakfast at a frequency of less than four days per week (Pandey & Vora 2015). For the purpose of this study, breakfast was defined as the first meal eaten from the time of awakening, up until 09:00. The benefits of breakfast consumption are discussed next.

2.2 Benefits of breakfast consumption

The benefits of consuming breakfast, including nutritional benefits and benefits to mental health are discussed in this section.

2.2.1 Nutritional benefits of breakfast

Breakfast is regarded as the most important meal of the day (Harvey-Golding *et al* 2015). A substantial amount of research has examined the nutritional effects of various breakfast items. Breakfast consumption, irrespective of the type of breakfast, has been linked to higher mean intakes of calcium and folate and lower intakes of fat (Fayet-Moore *et al* 2016). However, in an Australian study among children, those who consumed cereal for breakfast had higher mean intakes of carbohydrates, fibre, calcium, iron, folate and lower total fat and sodium intakes (Fayet-Moore *et al* 2016). In a randomised, placebo-controlled, double-blind intervention trial conducted among school and college-going girls in the United Kingdom (UK), the consumption of cereal and milk was shown to improve micronutrient status. Unfortified cereal improved the intake of vitamins B_1, B_2 and B_6 while fortified cereal improved the intake of vitamins B_1, B_2, B_3, B_6, B_{12}, vitamin C and D, folate and iron (Powers, Stephens, Russell & Hill 2016).

Maize porridge, bread, milk as well as ready to eat breakfast cereals (RTECs) were commonly consumed breakfast items among South African adolescents (Tee, Botha, Laubscher & Jerling 2015). Ready to eat breakfast cereals were also a commonly chosen breakfast item among university students due to its desirable taste, perceived nutritional value and its fibre content (Savlak, Kahya, Unal & Ates 2016). Moreover, RTEC's were shown by Barr, DiFrancesco & Fulgoni (2012) to be beneficial in terms of nutrient content. Those who had RTECs for breakfast had higher intakes of fibre, thiamin, riboflavin, iron, magnesium, phosphorus, potassium, carbohydrate, sugar, vitamin B_6, vitamin D, zinc and calcium compared to those who consumed other breakfast items. Those who consumed RTECs also had a lower fat, saturated fat and cholesterol intake. Understandably, BMI was lower in the group who consumed RTECs, compared to those who consumed other breakfast items (Barr *et al* 2012).

Breakfast cereal containing insoluble wheat bran was found to have a beneficial effect on the digestive system. In this study, adults in the UK with low intakes of fibre were recruited. After a two-week period, during which the fibre containing cereal was consumed, participants reported a reduced incidence of digestive problems such as bloating, constipation, digestive discomfort and improved bowel movement (Lawton, Walton, Hoyland, Howarth, Allan, Chesters & Dye 2013).

Protein is an important component of breakfast as it plays a role in satiety (Fallaize, Wilson, Gray, Morgan & Griffin 2013). Protein was found to be associated with decreased activity in

the prefrontal and limbic areas of the brain, which is associated with food motivation, hunger and desire to eat (Leidy, Lepping, Savage & Harris 2011). Higher scores of subjective satiety, as measured by hunger, desire to eat and increased satiety was associated with a higher protein containing breakfast (Fallaize *et al* 2013). In addition, a higher protein intake at breakfast was linked with higher energy levels (Kamada, Truman, Bold & Mortimore 2011) and a lower energy intake during lunch and supper (Fallaize *et al* 2013). Higher energy levels were also reported benefits of a breakfast meal with a lower glycaemic load (Kamada *et al* 2011). An experimental study conducted among healthy adults showed that a breakfast with a low glycaemic index (GI), helped with regulating blood glucose levels by reducing hyperglycaemia and hypoglycaemia (Pereira, Erickson, McKee, Schrankler, Raatz, Lytle & Pellegrini 2010).

2.2.2 Benefits to mental health

Consumption of breakfast has been significantly associated with improved cognitive ability (Pandey & Vora 2015; Arshad & Ahmed 2014; Pivik, Tennal, Chapman & Gu 2012). A study conducted on 81 schoolchildren aged 8-11 years old to determine the effect of breakfast on mental arithmetic performance, compared children who consumed breakfast to those who did not. Children who ate breakfast were found to have an improved efficiency of neural networks. The authors reported that breakfast consumption improved brain activity required for mental arithmetic (Pivik *et al* 2012). Equivalently, Arshad & Ahmed (2014) found that consuming breakfast improved mathematical problem solving ability, while breakfast skipping was associated with poor concentration and lethargy during lectures, amongst university students. Among adolescents, regular breakfast consumption has been associated with reduced stress, anxiety and depression, as well as higher attendance at school (Richards & Smith 2015).

In the study where breakfast cereal containing wheat bran was consumed, breakfast was reported to improve perception of health and vitality. Increased fibre intake through breakfast, resulted in participants feeling less overweight and less physically and mentally fatigued. It was also reported to improve alertness, ability to concentrate and general feelings of happiness and wellbeing (Lawton *et al* 2013).

There seems to be an important relationship between breakfast consumption and mental and psychological health of university students in particular. The lives of university students present a period during which there is an increased susceptibility to impaired mental health and elevated levels of stress, anxiety and depression (Lovell, Nash, Sharman & Lane 2015). In a study

conducted among college students in India, consumption of breakfast was linked to improved cognitive ability, memory and intelligent quotient (IQ), while skipping breakfast was linked to negative effects on the same measures (Pandey & Vora 2015). In another large cross-sectional study conducted among 758 Australian university students to investigate their mental health and health behaviour, symptoms of depression, anxiety and stress presented in 21.8%, 28.5% and 26.5% of the sample, respectively. Symptoms of depression were linked to breakfast skipping and poor sleeping patterns in both males and females, while in females it was linked to inadequate physical activity. Overall, this study indicated that breakfast skipping was associated with mental illness (Lovell *et al* 2015). Breakfast skipping has also been associated with increased mental distress and poor mindful awareness (Khanna, Dharap & Gokhale 2016).

To further illustrate the beneficial effect of breakfast on mental health, Ackuaku-Dogbe & Abaidoo (2014) reported that breakfast skipping was directly linked to higher levels of alertness and the ability to concentrate during lectures. Those who consumed breakfast were less fatigued and more alert, compared to those who skipped breakfast in a medical school in Ghana (Ackuaku-Dogbe & Abaidoo 2014). Additionally, breakfast skipping was associated with the following symptoms in university students in Pakistan: fatigue, impaired concentration, headache, dizziness and feeling cold (Ozdogan, Ozcelik & Surucuoglu 2010). Similarly, breakfast intake was negatively associated with cognitive failure, minor injuries, accidents and stress at work, in a study conducted among healthcare workers (Chaplin & Smith 2011). The implications of neglecting breakfast are discussed next.

2.3 Implications of neglecting breakfast

Omitting breakfast has been shown to have negative and even harmful effects on the health and wellbeing of various populations. This includes compromised nutrient intake, reduced satiety and negative health impacts. This is discussed further in this section.

2.3.1 Nutritional requirements of students

There are no specific guidelines for university students as such, however, because most fall into the age category of 14-18 and 19-30 years, the Dietary Reference Intakes (DRI) values for this age could be used. According to the Food and Nutrition Board of the Institute of Medicine, National Academy of Sciences (2005), DRI is a collective term for reference values of various nutrients and includes the Recommended Dietary Allowance (RDA), Estimated Average Requirement (EAR), Adequate Intake (AI) and the Tolerable Upper Intake Level (UL). The

RDA is the daily nutrient intake that is sufficient to meet the nutrient requirements of nearly all individuals in a group, according to gender and life stage. The RDA is used by individuals as a guide to achieve adequate intake. The EAR is the amount of a nutrient that is estimated to meet the requirements of almost half of the individuals in the same gender and life stage group. The AI is used when there is insufficient scientific evidence to set the EAR and calculate the RDA, and is used as a goal for individual intake. The UL is the highest quantity known to be safe for consumption in normal healthy individuals. It represents total intake from food, fortified foods and supplements that should not be exceeded on a daily basis (Institute of Medicine, Food and Nutrition Board 2006). Table 2.1 depicts the RDA for selected nutrients for males and females between 19 to 30 years of age.

Table 2.1: Recommended Dietary Allowance values for adult males and females between 19 to 30 years of age (Institute of Medicine, Food and Nutrition Board 2005).

Nutrient	**RDA**	
	Males	**Females**
Carbohydrates (g/day)	130	130
Fibre (g/day)	38	25
Protein (g/day)	56	46
Fat (g/day)	Not determined	Not determined
Vitamin A (μg/day)	900	700
Vitamin C (mg/day)	90	75
Vitamin E (mg/day)	15	15
Thiamin (mg/day)	1.2	1.1
Niacin (mg/day)	16	14
Folate (μg/day)	400	400
Calcium (mg/day)	1000	1000
Iron (mg/day)	8	18
Phosphorus (mg/day)	700	700
Potassium (mg/day)	4.7	4.7

2.3.2 Contribution of breakfast to daily nutrient intake

Skipping breakfast has implications on the daily nutrient intake of an individual. Studies have shown that daily carbohydrate, fat (Min, Noh, Kang, Sim, Baik, Song, Yoon, Park & Joung 2011) and protein intake (Chung, Lee, Lee & Choi 2015; Watanabe, Saito, Henmi, Yoshimura, Maruyama, Yamauchi, Matsuo, Kato, Tanigawa, Kishida & Asada 2014) were negatively affected by breakfast skipping. Those who skipped breakfast had a lower intake of energy or an energy deficit (Chung *et al* 2015; Watanabe *et al* 2014; Azadbakht *et al* 2013; Levitsky & Pacanowski 2013; Barr *et al* 2012; Min *et al* 2011). Daily protein intake was also lower in those who skipped breakfast (Chung *et al* 2015; Watanabe *et al* 2014). In addition, the proportion of energy from carbohydrates was found to be lower, while the proportion of energy from fat was higher (Min *et al* 2011). On the contrary, Asao, Marekani, Van Cleave & Rothberg (2016), showed that those who skipped breakfast consumed a higher percentage of energy from carbohydrates and there was no difference in the percentage contribution of fat towards energy intake. Those who consumed breakfast were found to have a lower cholesterol intake (Azadbakht *et al* 2013).

Breakfast seems to provide an important source of nutrients including carbohydrates (Min *et al* 2011; Min *et al* 2011) which subsequently contributes to energy intake (Chung *et al* 2015; Watanabe *et al* 2014; Azadbakht *et al* 2013; Levitsky & Pacanowski 2013; Barr *et al* 2012; Min *et al* 2011). Dietary carbohydrates, including fibre play an important role in the body. As shown in a randomized study by Brinkworth, Noakes, Clifton & Bird (2009), dietary carbohydrates including fibre is important for regular bowel movement, sufficient stool mass, large intestinal fermentation of short chain fatty acids and a favourable balance in gut microflora. In the same study, participants on a low carbohydrate diet had a mean fibre intake of 13 grams of fibre per day, while participants on a high carbohydrate diet had a mean fibre intake of 32 grams per day (Brinkworth *et al* 2009).

Considering that macronutrient intake was affected by skipping of breakfast, as reported by Min *et al* (2011), Chung *et al* (2015) and Watanabe *et al* (2014), it would be assumed that micronutrient intake would be affected too. The following studies showed that the intake of various vitamins and minerals were affected by breakfast skipping (Chung *et al* 2015; Barr *et al* 2012; Azadbakht & Esmaillzadeh 2012; Min *et al* 2011; Satalić *et al* 2007). Those who did not consume breakfast regularly, had micronutrient intakes below the Estimated Average Requirement (EAR) (Min *et al* 2011). Vitamin A and C intakes were low in those who skipped

breakfast (Chung *et al* 2015; Barr *et al* 2012). Breakfast skippers also had lower intakes of the following nutrients: niacin, folate (Barr *et al* 2012), calcium (Chung *et al* 2015; Min *et al* 2011), fibre (Watanabe *et al* 2014; Min *et al* 2011), potassium (Min *et al* 2011), thiamin, phosphorus and iron (Chung *et al* 2015). Furthermore, the prevalence of iron deficiency was higher among those who failed to consume breakfast (Shill *et al* 2014). This may be of concern as university students, particularly females were found to have a low intake of iron and folate (Azadbakht & Esmaillzadeh 2012) and intakes of iron and folate were below the RDA in this group (Satalić *et al* 2007). A low intake of calcium (Azadbakht & Esmaillzadeh 2012) as well as suboptimal intakes of calcium, vitamin E and vitamin A below the RDA were reported (Satalić *et al* 2007).

2.3.3 Reduced satiety

Skipping breakfast has been found to affect hunger and satiety (Levitsky & Pacanowski 2013; Leidy & Racki 2010; Ozdogan *et al* 2010; Pereira *et al* 2010). Those who skipped breakfast reported higher hunger ratings mid-morning and prior to lunch, in an experimental study on undergraduate students in the United States of America (USA) (Levitsky & Pacanowski 2013). In a randomised, cross-over study by Leidy & Racki (2010), conducted on adolescents in the USA, breakfast consumption was found to have a positive effect on postprandial appetite and satiety. Additionally, those who skipped breakfast had a constant elevated appetite and hunger throughout the trial period (Leidy & Racki 2010). Another experimental study conducted on children reported a significantly higher level of hunger and fatigue among those who skipped breakfast, compared to those who consumed breakfast (Pereira *et al* 2010). Pakistani students who skipped breakfast also reported that hunger was the most commonly experienced side-effect of breakfast skipping (Ozdogan *et al* 2010). Hunger has been subsequently linked with poor concentration, fatigue and unease among university students (Munro, Quayle, Simpson & Barnsley 2013).

2.3.4 Health impacts

Those who either skip breakfast or consume it infrequently have an increased risk of developing metabolic syndrome (Marlatt, Farbakhsh, Dengel & Lytle 2016; Chung *et al* 2015; Kim Shin, Kim, Jeong, Kim & Son 2015; Shafiee, Kelishadi, Qorbani, Motlagh, Taheri, Ardalan, Taslimi, Poursafa, Heshmat & Larijani 2013). Metabolic syndrome is a common medical condition, comprising of a cluster of symptoms including abdominal obesity, hypertension, dyslipidaemia and abnormal fasting blood glucose levels or insulin resistance (Merck Manual 2016a). According to Kim *et al* (2015) the following factors were linked with metabolic syndrome: age,

gender, BMI, sleep duration, breakfast consumption, cigarette smoking, alcohol intake, education level and financial status. Shafiee *et al* (2013) found a significant relationship between breakfast consumption and metabolic syndrome. This study demonstrated that those who seldom ate breakfast had higher levels of cardiometabolic risk factors such as higher triglycerides, higher levels of low density lipoprotein (LDL), higher systolic blood pressure and lower levels of high density lipoprotein (HDL) (Shafiee *et al* 2013). Similar results emerged from a study conducted among adolescents in the USA, whereby those who consumed breakfast on a more regular basis, had a lower risk of metabolic syndrome (Marlatt *et al* 2016). In line with the previous studies discussed, higher total cholesterol, higher LDL and lower insulin sensitivity was associated with breakfast skipping in an older study by Farshchi, Taylor & Macdonald (2005). According to Watanabe *et al* (2014), subjects who skipped breakfast had a higher blood pressure, fasting blood glucose and triglyceride levels, compared to those who consumed breakfast. In another large prospective study, male subjects who skipped breakfast had a higher risk of developing coronary heart disease (CHD) (Cahill, Chiuve, Mekary, Jensen, Flint, Hu & Rimm 2013).

In a large cohort study conducted in Japan, 34 128 men and 49 282 women were followed up for eleven years to determine the effect of skipping breakfast on mortality from cancer and circulatory diseases. Results from this study indicated that the risks of mortality due to circulatory diseases were higher among those who skipped breakfast (Yokoyama, Onishi, Hosoda, Amano, Otani, Kurozawa & Tamakoshi 2016; Uemura, Yatsuya, Hilawe, Li, Wang, Chiang, Otsuka, Toyoshima, Tamakoshi & Aoyama 2015). Moreover, studies showed a link between the prevalence of diabetes and breakfast skipping (Uemura *et al* 2015; Nishiyama, Muto, Minakawa & Shibata 2009).

In a large cross-sectional study conducted among Japanese adults, diabetes and borderline diabetes were more common among those who skipped breakfast, in addition to being smokers (Nishiyama *et al* 2009). Additionally, Uemura *et al* (2015) reported a positive relationship between the prevalence of type 2 diabetes and breakfast skipping among both males and females. Breakfast skipping has also been linked with symptoms of gastroesophageal reflux disease (GERD) (Yamamichi, Mochizuki, Asada-Hirayama, Mikami-Matsuda, Shimamoto, Konno-Shimizu, Takahashi, Takeuchi, Niimi, Ono, Kodashima, Minatsuki, Fujishiro, Mitsushima & Koike 2012). A positive correlation between skipping breakfast and the symptoms of GERD was observed among healthy adults, in this cross-sectional study. A

frequency scale for the symptoms of GERD (FSSG) was used to describe symptoms and included an increased occurrence of the following symptoms: heartburn, burping, bloating and reflux (Yamamichi *et al* 2012).

Multiple studies suggest that there is a directly proportionate relationship between breakfast skipping and obesity (Chung *et al* 2015; Shafiee *et al* 2013; Smith, McNaughton, Cleland, Crawford & Ball 2013; Boo, Chia, Wong, Chew, Chong & Loo 2010). There was an increased risk of obesity as well as abdominal obesity, as measured by waist circumference, among those who skipped breakfast, compared to those who consumed breakfast (Chung *et al* 2015; Shafiee *et al* 2013). Similarly, studies showed that a higher number of overweight and obese students tended to skip breakfast or consume it irregularly (Azadbakht *et al* 2013; Boo *et al* 2010; Hingorjo, Syed & Qureshi 2009). A positive relationship was found between breakfast skipping and adiposity, particularly intra-abdominal adiposity, in a cross-sectional sample of overweight youth in the USA. Further, this study reported that breakfast skippers had higher intra-abdominal adiposity compared to those classified as breakfast eaters, as well as occasional breakfast eaters. This indicates that even occasional consumption of breakfast is more beneficial than skipping it altogether (Alexander, Ventura, Spruijt-Metz, Weigensberg, Goran & Davis 2009).

2.4 Factors influencing the consumption of breakfast

2.4.1 Breakfast behaviours

Harvey-Golding *et al* (2015) published research on breakfast behaviours and the factors that influence these behaviours. Breakfast behaviour such as the consumption of breakfast or the skipping thereof was reported to be affected by internal and external factors. Figure 2.1 shows breakfast behaviours in a model adapted from Harvey-Golding *et al* (2015).

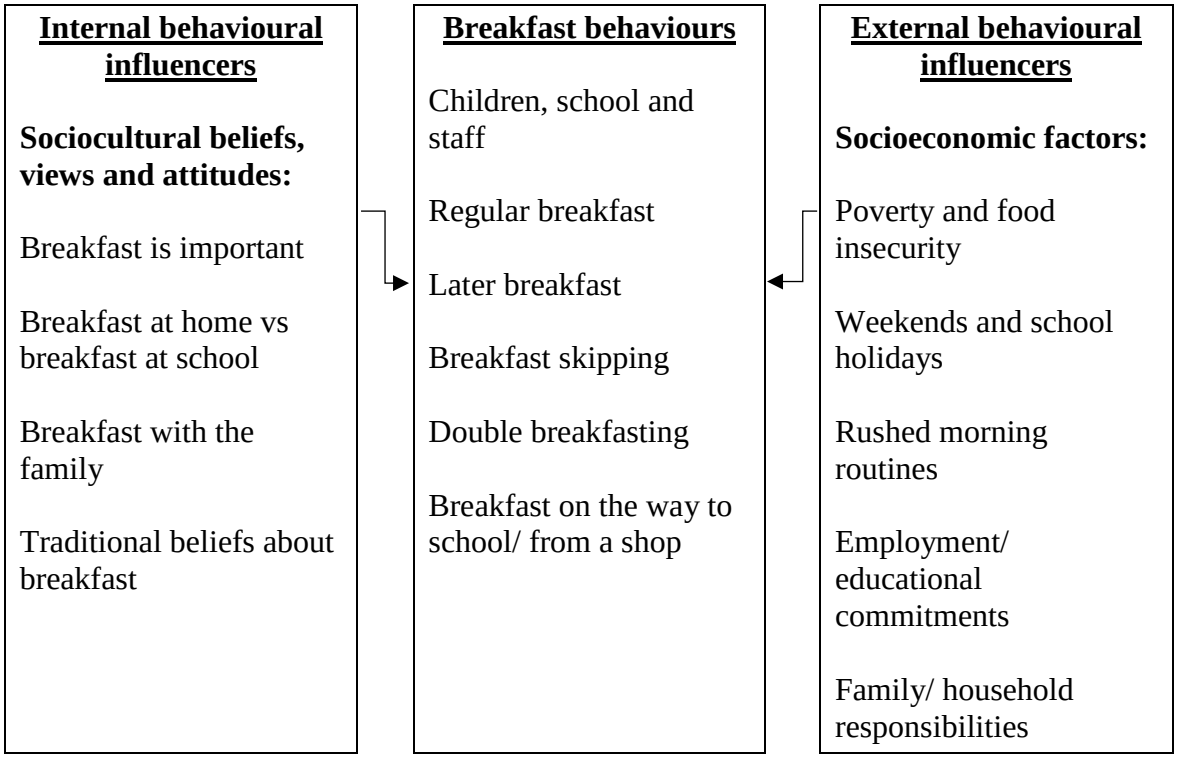

Figure 2.1: Qualitative model for breakfast behaviours (after Harvey-Golding *et al* 2015)

As depicted in Figure 2.1, external factors that influence breakfast skipping include poverty and food insecurity, rushed morning routines and educational commitments (Harvey-Golding *et al* 2015). These factors can also be applied to university students and is in line with the reported reasons for breakfast skipping. There were commonly reported reasons for students skipping breakfast in multiple studies conducted worldwide. This includes: a lack of appetite in the morning, a lack of time (Khanna *et al* 2016; Hisam, Rahman, Mashhadi, Bilal & Anam 2015; Onyiriuka, Umoru & Ibeawuchi 2013; Ozdogan *et al* 2010; Moy *et al* 2009), oversleeping (Ackuaku-Dogbe & Abaidoo 2014; Moy *et al* 2009), do not like to eat too early (Khanna *et al* 2016; Ozdogan *et al* 2010; Moy *et al* 2009), waking up late (Khanna *et al* 2016) and inadequate money to purchase food (Ackuaku-Dogbe & Abaidoo2014). In terms of diet, it is interesting to note that both the consumption of breakfast (Reeves, Halsey, McMeel & Huber 2013) and the skipping of breakfast have been reported as dietary methods to lose weight (Onyiriuka *et al* 2013). There are multiple factors that influence the decision to omit breakfast, particularly among university students, where the lack of breakfast is only one of many poor dietary choices. This is reviewed in the next section.

2.5 Factors influencing breakfast skipping

Factors that influence breakfast skipping include dietary and lifestyle factors, socioeconomic factors as well as physiological factors. These factors are discussed in this section.

2.5.1 Diet and lifestyle factors

Prudent lifestyle behaviours associated with maintenance of a healthy weight and lifestyle include: the consumption of regular meals; a daily intake of fruit, vegetables and calcium; minimising daily sedentary behaviours such as watching television or sitting at a computer to less than two hours a day, moderate physical activity and more than six hours sleep daily (Hingorjo *et al* 2009). Health and level of wellbeing ratings have been previously linked to the consumption of regular breakfast (Reeves *et al* 2013), while the skipping of breakfast has been associated with suboptimal health status and less attention towards personal health (Smith *et al* 2013).

Those who skip breakfast are more likely to indulge in undesirable lifestyle behaviour such as smoking (Asao *et al* 2016; Yokohama *et al* 2016; Uemura *et al* 2015; Cahill *et al* 2013; Smith *et al* 2013; Barr *et al* 2012; Nishiyama *et al* 2009) and consuming alcohol (Asao *et al* 2016; Yokohama *et al* 2016; Uemura *et al* 2015*;* Cahill *et al* 2013). Breakfast skippers are also prone to low physical activity levels (Chowdhury, Richardson, Holman, Tsintzas, Thompson & Bett 2016; Yokohama *et al* 2016; Richards & Smith 2015; Cahill *et al* 2013; Smith *et al* 2013; Nishiyama *et al* 2009) and increased sedentary behaviours such as sitting or watching television (Smith *et al* 2013).

Poor quality of sleep has been reported to be more prevalent among breakfast skippers (Nishiyama *et al* 2009). Interestingly, a lack of sleep has been associated with obesity (Hisam *et al* 2015; Pérusse-Lachance, Tremblay & Drapeau 2010), which was previously shown to be strongly linked to breakfast skipping (Chung *et al* 2015; Shafiee *et al* 2013; Smith *et al* 2013; Boo *et al* 2010). Those who skipped breakfast were more likely to indulge in undesirable dietary practices such as eating take-away foods or at restaurants (Nishiyama *et al* 2009), eating at bedtime (Asao *et al* 2016), indulging in late night snacks (Watanabe *et al* 2014), consuming fast food at least once a week (Moy *et al* 2009) and consuming sugar-sweetened drinks (Uemura *et al* 2015). They were also more likely to have a lower fruit and vegetable intake (Uemura *et al* 2015; Smith *et al* 2013; Moy *et al* 2009).

2.5.2 Nutrition knowledge

Breakfast skipping has previously been associated with poor nutrition knowledge. Adult women who skipped breakfast were less able to identify foods that were low in fat, low in energy or high in fibre (Smith *et al* 2013). A study conducted on nursing students in the Eastern Cape showed that most students did not know the quantity of fruit, vegetables, milk and dairy products that should be consumed per day. This study also reported that nutrition knowledge was positively associated with being normal weight rather than overweight or obese (Van den Berg *et al* 2012).

2.5.3 Socioeconomic factors

A relationship appears to exist between socioeconomic factors and breakfast consumption. Socioeconomic factors include food insecurity, poverty, living conditions, food preparation skills and access to food and retailers.

2.5.3.1 Food insecurity and poverty

It has been reported that those who skip breakfast are more likely to be unmarried (Van den Berg & Raubenheimer 2015; Smith *et al* 2013; Cahill *et al* 2013), have a lower monthly income in the household or be food insecure (Smith *et al* 2013). A considerable level of food insecurity was reported among UKZN students (Munro *et al* 2013). This three-year study reported the following figures, representative of vulnerability to food insecurity: 20.8% were moderately vulnerable, 16.1% were severely vulnerable and 4.5% critically vulnerable. These figures suggest that obtaining daily meals would be a source of concern for a substantial proportion of university students. They would have no choice but to eat food that is of poor nutritional value, low in diversity and quality and rationing their food to extend it (Munro *et al* 2013). In a study conducted among students at the UFS, a high prevalence of food insecurity was reported. Food insecurity with hunger was reported by 25% of students, while food insecurity without hunger was reported by 59% of students (Van den Berg & Raubenheimer 2015). Similarly, in an Australian cross-sectional study conducted among university students, 25.3% were food insecure with hunger, while 46.5% were food insecure without hunger (Hughes, Serebryanikova, Donaldson & Leveritt 2011).

Furthermore, students receiving financial aid were at an increased risk for being food insecure and in addition to university expenses, were already financially constrained rendering them increasingly vulnerable to food insecurity (Munro *et al* 2013). This was also reported in an

American study by Gaines, Robb, Knol & Sickler (2014) who reiterated that the reception of financial aid was associated with increased risk for food insecurity. The authors also reported that personal finances and time management influenced food choices of food insecure students. Food insecure students were less likely to report their health status as 'good' (Hughes *et al* 2011). The cost of food as well as budget available to spend on food by students plays a substantial role in food choices and unhealthy food is reportedly more affordable than healthy foods (Deliens, Clarys, Bourdeaudhuij & Deforche 2014).

2.5.3.2 Living conditions

Eating behaviour exhibited by students while studying at university is affected by whether the student lives off campus or on campus residence. According to Tanton, Dodd, Woodfield & Mabhala (2015), students who lived away from home and on campus indulged more in unhealthier dietary practices, including a lower consumption of fruit and vegetables. This phenomenon has also been reported by a large European study, conducted among 2402 undergraduate students in four countries, where students living away from home were shown to consume less fruit and vegetables compared to those who resided with their parents (El Ansari, Stock & Mikolajczyk 2012). Students living in university residences commonly consume unhealthy foods and this can be a source of negative influence for other students. Students living in university residences are subsequently exposed to the eating behaviors of their peers, which may affect their own food choices (Deliens *et al* 2014). As reported by previous authors (Van den Berg & Raubenheimer 2015; Munro *et al* 2013), accessing food presents a problem among university students and food insecurity is also a serious threat. This is particularly true for students living away from home who are at a greater risk for food insecurity (Hughes *et al* 2011). It is assumed that students with limited funds would rather purchase affordable food items with a longer shelf life, as opposed to perishables such as fruit and vegetables.

2.5.3.3 Food preparation skills and access to food and retailers

According to Gaines *et al* (2014) limited resources has implications on the food security status of university students (Gaines *et al* 2014). In their study, food preparation skills and access to resources was associated with higher food security status among undergraduate students in the USA. In a focus group study, conducted among university students in Europe, eating choices were reported to be affected by options provided by the campus cafeteria or restaurant. Students reported a limited access to food and cooking supplies, which subsequently affected food

choices. Further, students also reported that when options were available at the student restaurant between French fries, potato and rice, the most popular option was French fries. The availability of unhealthy foods and vending machines serves as a temptation for students to make unhealthy food choices (Deliens *et al* 2014). Food preparation skills and access to resources was associated with higher food security status among undergraduate students in the USA (Gaines *et al* 2014).

2.5.4 Physiological factors

Physiological factors also influence breakfast consumption and involve a hormonal response. Leptin is a hormone stored in adipose tissue and is involved in signalling for fat storage. The levels of leptin in circulation are directly proportionate to body fat; however, it functions as an appetite suppressant in individuals of normal weight (Merck Manual 2016b). Leptin levels are reported as a good marker for determining obesity, as the level of leptin is strongly associated with adiposity. In a large cross-sectional study, a high body fat percentage was significantly associated with elevated leptin levels (Shah & Braverman 2012). Those with elevated levels of leptin in the morning were more likely to skip breakfast. The authors proposed that a higher leptin level in the morning causes a decrease in appetite, which may be the reason why these individuals skip breakfast (Asao *et al* 2016).

2.6 Eating behaviour and lifestyle profile of university students

This section explores the eating behaviour and the lifestyle profile of university students.

2.6.1 Eating behaviour of university students

In general, university students tend to have poor dietary habits including a higher fat, higher cholesterol (Satalić *et al* 2007) and lower fibre intake (Azadbakht & Esmaillzadeh 2012; Kazi & Coopoo 2010; Satalić *et al* 2007). Multiple studies have shown a poor intake of fruit and vegetables among university students (Hadjimbei, Botsaris, Gekas & Panayiotou 2016; Gresse *et al* 2015; Lovell *et al* 2015; Ramírez-Vélez, Triana-Reina, Carrillo, Ramos-Sepúlveda, Rubio, Poches-Franco, Rincón-Párraga, Meneses-Echávez & Correa-Bautista 2015). At a Malawian university the intake of fruit and vegetables decreased as students progressed through the months of their first year of study (Takomana & Kalimbira 2012). On the contrary, Lebanese university students in their senior year showed healthier eating behaviour compared to students in their junior year (El-Kassas & Ziade 2016).

Students studying towards qualifications in health sciences at UFS showed a poor intake of fruit and vegetables, a high intake of red meat and a poor intake of legumes (Van den Berg *et al* 2013). A study conducted among students in the College of Health Sciences in Saudi Arabia also showed poor consumption of fruit and vegetables, aside from dates, which were eaten regularly by most students. A high intake of fried food and frequent snacking was also reported, although types of snacks consumed were not specified. Notwithstanding, an inverse relationship between the frequency of snacking and elevated BMI was found (Al-Rethaiaa *et al* 2010). The prevalence of daily snacking in the Saudi Arabian study was 31.7% (Al-Rethaiaa *et al* 2010). A similar figure was reported among medical students in Ghana, where 27% of students consumed snacks. However, this study specified that these were unhealthy snacks including carbonated drinks and pastry (Ackuaku-Dogbe & Abaidoo 2014).

The relationship between snacking and adiposity was explored in a large population-based study conducted on adults in England. On one hand, a higher frequency of snacking was linked to lower adiposity levels in normal weight men and women. On the other hand, in overweight or obese individuals, a higher frequency of snacking was positively linked to adiposity. This was attributed to the types of snacks consumed by overweight and obese subjects. When compared to normal weight subjects, overweight or obese subjects consumed a greater amount of unhealthy snacks such as chocolates, sweets, chips and ice cream and less yogurt and nuts (O'Connor, Brage, Griffin, Warhead & Forouhi 2015). Furthermore, snacking on unhealthy items such as chocolates, chips and biscuits has been linked to increased stress levels (Chaplin & Smith 2011).

It is widely accepted that fast foods are not nutritious. Nevertheless, an increase in fast food consumption has been reported between the adolescent and adult life stages (Niemeier, Raynor, Lloyd-Richardson, Rogers & Wing 2006). In a sample of healthy adolescents with a regular intake of fast foods, the following factors were elevated: BMI, body fat percentage, triglycerides, LDL and glucose. These subjects also presented with an increased risk for metabolic syndrome (Marlatt *et al* 2016). In the Asian region, there was a high intake of soft drinks among overweight or obese students in a study conducted among Malaysian medical students (Boo *et al* 2010). Furthermore, the prevalence of fast food intake at a frequency of once a week was reported by 35.3% of undergraduate students from various disciplines in a public university in Kuala Lampur (Moy *et al* 2009). In another study conducted in Bangladesh

among undergraduate students from different departments, 54% were found to consume junk food (Shill *et al* 2014).

A high intake of fried food has been reported among students in the Middle East. Specifically, 57.3% of students in Lebanon (Yahia *et al* 2008) and 46.8% of students in Saudi Arabia (Al-Rethaiaa *et al* 2010), reported consumption of fried food items more than three times per week (Al-Rethaiaa *et al* 2010; Yahia *et al* 2008). At the University of Medical Sciences in Iran, 42% of female students consumed fast foods twice weekly (Azadbakht & Esmaillzadeh 2012). In a Turkish study, 25.9% of students consumed fast food more than once per week (Hadjimbei *et al* 2016). In South Africa, students in grade twelve in Soweto high schools acknowledged the importance of breakfast; however, most of them skipped this meal. Instead, they purchased fast foods such as deep fried cakes or bread with cheese, processed meat and fried chips (Sedibe *et al* 2014). Similarly, students at UKZN were found to have a high intake of fried foods; 60% of students consumed fried foods between 1-2 times a week, while 23% consumed it three to four times a week (Kazi & Coopoo 2010). Gresse *et al* (2015) reported that about 75% of health science students at Nelson Mandela Metropolitan University (NMMU) regularly consumed convenience foods such as take-aways. In the study conducted at UFS there was a high weekly intake of the following: soft drinks (77%), chocolates and sweets (92.5%), chips (88.2%) and biscuits and cakes (87.6%) (Van den Berg *et al* 2013).

2.6.2 Lifestyle profile of university students

A high rate of physical inactivity has been observed among university students (Al-Nakeeb *et al* 2015; Lovell *et al* 2015; Kazi & Coopoo 2010; Pérusse-Lachance *et al* 2010). Being overweight or obese is linked to a sedentary lifestyle with a low level of physical activity (Pengpid, Peltzer, Kassean, TsalaTsala, Sychareun & Müller-Riemenschneider 2015). The risk for obesity was found to be higher among males who were physically inactive (Memish, El Bcheraoui, Tuffaha, Robinson, Daoud, Jaber, Mikhitarian, Al Saeedi, Al Mazroa, Mokdad & Al Rabeeah 2014). Among South African health science students at NMMU, 78% were physically inactive while 55% of students indulged in sedentary lifestyle behaviours (Gresse *et al* 2015). In a cross-sectional study conducted among university students in 23 different countries throughout the world, inclusive of South Africa, the overall prevalence of physical activity was 41.4% (Pengpid *et al* 2015).

Pengpid *et al* (2015) also showed that students who were physically active were more likely to follow other healthy lifestyle behaviours such as consuming more fruit, vegetables and fibre and less fat. An increased level of sedentary behaviour was found together with a simultaneous decrease in physical activity as students progressed through the years of study at university (Al-Nakeeb, Lyons, Dodd & Al-Nuaim 2015). Those who were more physically active were found to consume breakfast with higher nutritional quality (Tee *et al* 2015). Interestingly, physical inactivity was found to be associated with breakfast skipping among university students (Pengpid *et al* 2015). In terms of lifestyle habits, many studies reported alcohol consumption and smoking by university students. In the study conducted among health science students at UFS, most students consumed alcohol on a weekly basis and one in 10 students smoked (Van den Berg *et al* 2013). Additionally, Gresse *et al* (2015) reported a high prevalence of binge drinking among South African male and female students. Male students were more likely to smoke (Ramírez-Vélez *et al* 2015) and consume soft drinks (Pérusse-Lachance *et al* 2010), compared to female students.

2.7 Nutritional assessment and status of university students

Considering that university students tend to exhibit unhealthy dietary and lifestyle behaviour it could be assumed that their nutritional status would be less than optimal. Several authors have undertaken to determine the nutritional status of university students in multiple countries. This section explores the literature related to nutritional assessment and status of university students.

2.7.1 Assessment of nutritional status

Several studies discussed in this literature review utilised BMI to assess nutritional status of university students and other population groups (Gresse *et al* 2015; Al-Nakeeb *et al* 2015; Peltzer, Pengpid, Samuels, Özcan, Mantilla, Rahamefy, Wong & Gasparishvili 2014; Ozdogan, Ozcelik & Surucuoglu 2010). Self-reported weight and height measurements were used to assess dietary and physical activity factors in students at NMMU (Gresse *et al* 2015). Peltzer *et al* (2014) measured weight and height to calculate BMI and assess the prevalence of overweight and obesity among university students from 22 different countries. In the Pakistani study, which investigated the breakfast habits of female university students, weight and height were measured and BMI determined (Ozdogan *et al* 2010). In a study assessing nutritional status among students at UFS, waist circumference in addition to BMI was measured (Van den Berg *et al* 2013). It is noteworthy that BMI alone has been reported to underestimate the prevalence of obesity. Dual-energy x-ray absorptiometry (DXA) which measures muscle mass,

bone mass and body fat simultaneously, was used to measure adiposity among adults in the USA. Body fat percentage measured using DXA was directly proportional to leptin levels and was reportedly a better indicator for obesity (Shah & Braverman 2012). However, measuring body fat percentage requires costly equipment or specialised scales. Nevertheless, the World Health Organization has endorsed the BMI as a simple to use reliable method to assess nutritional status in adults and to draw correlates with risk factors for disease (WHO 2015b). For the purposes of this study only anthropometry was used and particularly weight, height and BMI as it was considered to be least invasive and time consuming, considering the busy schedule of university students.

2.7.2 Nutritional status of university students

In a large prospective, nationally representative study conducted in the USA over a five-year interval, Niemeyer *et al* (2006) showed that there was an increase in the prevalence of overweight and obesity from adolescence to adulthood. Although several studies have been conducted on university students, some studies have either not specified the faculty or discipline of the students or grouped the different students together, whereas other studies have been more specific with classification of students. In an observational study done by Boo *et al* (2010) among Malaysian medical students, 16.1% were overweight or obese. Comparatively, at a Lebanese university, 37.5% and 12.5% of males and 13.6% and 3.2% of females were overweight or obese, respectively (Yahia *et al* 2008). At a Qatar university, 38.5% of females and 39.5% of males were either overweight or obese, respectively. This study also showed an increasing trend of overweight or obesity between the first and fourth year of study (Al-Nakeeb *et al* 2015). In a Canadian study, the prevalence of overweight and obesity was 17.5% and 5.3%, respectively (Pérusse-Lachance *et al* 2010).

Many studies have shown a higher prevalence of overweight and obesity in male students compared to females (Boo *et al* 2010; Kazi & Coopoo 2010; Pérusse-Lachance *et al* 2010; Yahia *et al* 2008; Satalić *et al* 2007). This differed in a Pakistani study, where 44.4% of males and 60.8% of females in a dental school were either overweight or obese (Hingorjo *et al* 2009). Further, Kazi & Coopoo (2010) found that females had a higher prevalence of obesity than males. Among South Africans in general, females have a higher prevalence of overweight and obesity compared to males (Shisana *et al* 2014). In two separate South African studies, more female university students were found to be overweight and obese, compared to males (Van den Berg *et al* 2013; Goon, Libalela, Amusa & Muluvhu 2013). Among South African students

at UKZN, 18.9% and 5.8% of students were found to be overweight and obese, respectively (Kazi & Coopoo 2010). At UFS, 19.8% of students were overweight or obese, similar to the results from UKZN (Van den Berg *et al* 2013).

2.8 Prevalence of breakfast skipping in various population groups

This section explores the various studies conducted on the prevalence of breakfast skipping or infrequent consumption of breakfast. As mentioned earlier, there is no universally accepted definition for breakfast and therefore various researchers have measured breakfast skipping differently. In addition to the lack of a tangible definition for breakfast or the skipping thereof, there is also a difference in opinion as to what classifies as a 'high' or 'low' prevalence of skipping breakfast. For the purpose of this study, the following classification was used: a low prevalence of breakfast skipping (less than 20%), substantial prevalence of breakfast skipping (between 20% to 40%) and high prevalence of breakfast skipping (above 40%).

2.8.1 Prevalence of regular breakfast consumption

In Lebanon, regular breakfast consumption was reported by 61.4% of the student population (Yahia *et al* 2008), while in a Saudi Arabian study the prevalence of daily breakfast consumption was only 49.9% (Al-Rethaiaa *et al* 2010). Similarly, at a Pakistani university, only 44.1% of female students consumed breakfast regularly (Ozdogan *et al* 2010), while at a Turkish university, only 35.6% of students consumed breakfast daily (Savlak *et al* 2016). At three different Indian universities, an average of 23.2% of students consumed breakfast daily (Khanna *et al* 2016). Among South African health science students at NMMU, 51% of students consumed breakfast less than five times per week (Gresse *et al* 2015). A small percentage of Croatian university students (29% of females and 19.1% of males) consumed breakfast regularly (Satalić *et al* 2007). In the study among students at UKZN, only 21% of students consumed breakfast regularly (Kazi & Coopoo 2010).

As can be seen from the literature reviewed, in several countries, including Lebanon, Saudi Arabia, Pakistan and in the South African study done at NMMU, a large proportion consumed breakfast regularly. On the contrary, studies done in Turkey, India, Croatia and the South African study done at UKZN, showed a low prevalence of regular breakfast consumption.

2.8.2 High prevalence of breakfast skipping

In a medical school in Ghana the prevalence of breakfast skipping was 71.92% (Ackuaku-Dogbe & Abaidoo 2014). Similar results were reported in a study conducted among students at a Malawian university, where 76.5% of students in the College of Agriculture skipped breakfast in the beginning of the academic year, while 64.3% skipped it at the end of the academic year (Takomana & Kalimbira 2012). Among students in the Iranian study, 52% of females at the University of Medical Sciences skipped breakfast (Azadbakht & Esmaillzadeh 2012). Another study conducted a year later among students at the same university showed the prevalence of breakfast skipping to be 53% (Azadbakht *et al* 2013). In Bangladesh, 46.7% of university students did not consume breakfast regularly (Shill *et al* 2014). Similarly, at a Malaysian medical school, 48.6% of overweight or obese students skipped breakfast (Boo *et al* 2010). Among three different universities in India the average prevalence of breakfast skipping was 42.23% (Khanna *et al* 2016). Among a sample of 870 nurses in England the prevalence of breakfast skipping was 42% (Chaplin & Smith 2011). This shows that in several countries including England, Iran, Malaysia, Bangladesh, Ghana and Malawi, the prevalence of breakfast skipping ranged from 42% to 76.5%.

2.8.3 Substantial to low prevalence of breakfast skipping

In a study by Pandey & Vora (2015), 27% of students skipped breakfast while 32.9% of students skipped breakfast at an Australian university (Lovell *et al* 2015). A large cross-sectional study conducted at a university in Kuala Lampur reported the prevalence of breakfast skipping at 29.2% (Moy *et al* 2009). In Saudi Arabia, the prevalence of skipping breakfast amongst students at the medical college was 30.5% (Mahfouz, Makeen, Akour, Madkhly, Hakami, Shaabi, Ageeli, Khawaj, Najmi, Hakami & Al-Ali 2016). In a Malaysian medical school, 34.1% of normal weight students skipped breakfast (Boo *et al* 2010), while 45% of students at a medical school in India skipped breakfast (Krishnan & Sharmila 2016). In another Turkish study conducted among public and private universities in Cyprus, the prevalence of breakfast skipping was 36.8% (Hadjimbei *et al* 2016). In a North Lebanese university, 38.5% of health science students skipped breakfast (El-Kassas & Ziade 2016). Among students at a Canadian University, a small percentage of students (14.3% of males and 9.6% of females) skipped breakfast (Pérusse-Lachance *et al* 2010). A low to substantial prevalence of breakfast skipping (9.6% to 38.5%) has been reported in Australia, Malaysia, Saudi Arabia, Turkey, Lebanon and Canada.

2.8.4 Breakfast consumption and breakfast skipping in adolescents

Among children and adolescents, the statistics of skipping breakfast are relatively low. Niemeyer *et al* (2006) showed that there was an increase in undesirable eating behaviours such as breakfast skipping and fast food consumption from adolescence to adulthood. It was proposed by the authors that this may be due to a change in lifestyle that accompanies the increased responsibility and independence of adulthood. In an American study on Hispanic youth, between 10-17 years of age, the prevalence of breakfast skipping was 21.5% while the prevalence of occasional breakfast consumption was 41.9%. The prevalence of regular breakfast consumption was 36.6% (Alexander *et al* 2009). In a study conducted among South African school going adolescents, 19% of students skipped breakfast (Tee *et al* 2015). Female Nigerian pupils were found to have a high rate of skipping meals, particularly breakfast (46.3%) (Onyiriuka *et al* 2013). In an Iranian study, 29% of students seldom ate breakfast (Shafiee *et al* 2013). Among Malaysian adolescents, 53.4% of the sample consumed breakfast regularly, while 43.6% of them consumed it irregularly (Nurul-Fadhilah *et al* 2013).

In a large study conducted among nationally representative samples of adolescents across 31 countries, the trends in daily breakfast consumption were analysed over an eight-year period. The findings showed that there was an increase in breakfast consumption in six countries: Canada, Netherlands, Macedonia, Scotland, Wales and England. On the other hand, the following eleven countries showed a decrease in daily breakfast consumption: Belgium, France, Germany, Croatia, Spain, Poland, Russian Federation, Ukraine, Latvia, Lithuania and Norway (Lazzeri, Ahluwalia, Niclasen, Pammolli, Vereecken, Rasmussen, Pedersen & Kelly 2016). It is interesting to note that females followed healthier eating practices compared to males, which includes a more regular intake of breakfast (Yahia, Achkar, Abdullah & Rizk 2008). This may be because females tend to be more concerned about their health and appearance compared to males. On the converse, according to a study conducted among Pakistani youth (Hisam *et al* 2015) as well as the study on Canadian students (Pérusse-Lachance *et al* 2010), males were more likely to consume breakfast regularly, compared to females. The relationship between breakfast consumption and BMI is reviewed in the next section.

2.9 Relationship between breakfast consumption and body mass index

Body Mass Index (BMI) gives an indication of the nutritional status of an individual by classifying them as either underweight, normal, overweight or obese. It is a measure of the

weight divided by the square of the height of an individual (WHO 2015a). Table 2.2 describes the ranges of BMI classification.

Table 2.2: BMI classification chart (WHO 2015b)

BMI classification	**kg/m^2**
Underweight	<18.5
Normal range	18.5-24.9
Overweight	≥ 25
Pre obese	25.0-29.9
Obese	≥ 30
Obese class I	30.0-34.9
Obese class II	35.0-39.9
Obese class III	≥ 40

Krishnan & Sharmila (2016) reported that breakfast consumption in conjunction with sufficient sleep and physically activity were linked to a lower BMI among medical students. In another study, those who seldom consumed breakfast had a higher BMI, compared to those who regularly consumed breakfast (Shafiee *et al* 2013). Frequent breakfast consumption was associated with a lower BMI as well as a lower percentage body fat (Marlatt *et al* 2016; Nurul-Fadhilah *et al* 2013). Studies by Azadbakht *et al* (2013) and Watanabe *et al* (2014) both showed that a direct relationship existed between breakfast skipping and an elevated BMI, as well as waist circumference. Nurul-Fadhilah *et al* (2013) showed the same results with those who consumed breakfast irregularly. Multiple studies have reported an inverse relationship between breakfast consumption and BMI (Marlatt *et al* 2016; Watanabe *et al* 2014; Azadbakht *et al* 2013; Nurul-Fadhilah *et al* 2013; Shafiee *et al* 2013). Furthermore, Niemeyer *et al* (2006) showed that over a five-year period an increase in the prevalence of breakfast skipping as well as fast food consumption from adolescence, was associated with an increase in the prevalence of weight gain in adulthood. The next section reviews the relationship between BMI and non-communicable diseases.

2.10 Relationship between body mass index and non-communicable diseases

Elevated BMI has been shown by various studies to be associated with an increased risk for chronic diseases (Hirko, Kantor, Cohen, Blot, Stampfer & Signorello 2015; De Mutsert, Sun,

Willett, Hu & van Dam 2014; Memish *et al* 2014; Saydah, Bullard, Cheng, Ali, Gregg, Geiss & Imperatore 2014). The prevalence of cardiovascular risk factors such as hypertension, dyslipidaemia and diabetes were found to be higher among overweight individuals (Saydah *et al* 2014; Feng, Zhao, Wang, Niu, Li, Guo, Li, Sun & Li 2012) and those who were obese (Memish *et al* 2014; Saydah *et al* 2014). In a large, prospective cohort study the risk for cardiovascular disease, diabetes and chronic obstructive pulmonary disease and mortality thereof was increased in those with an elevated BMI (Hirko *et al* 2015). In another large prospective cohort study by De Mutsert *et al* (2014), being overweight during young adulthood and/or gaining weight during adulthood, was positively correlated with the risk for chronic diseases. In a global population-based study, 12.8% of cases of cancer were positively linked to elevated BMI. Elevated BMI was most strongly linked with colon cancer in males and postmenopausal breast cancer in females (Arnold, Pandeya, Byrnes, Renehan, Stevens, Ezzati, Ferlay, Miranda, Romieu, Dikshit, Forman & Soerjomataram 2015).

2.11 Methods or interventions to address poor breakfast consumption

Considering the importance of breakfast consumption, as previously discussed, it seems prudent that interventions be planned to address and prevent poor breakfast consumption. Campaigns to promote healthy eating and educating students on the consequences of unhealthy food choices has been suggestedby Gresse *et al* (2015). In addition to nutrition education, further intervention are required to promote a healthy lifestyle among health science students. This could include the incorporation of nutrition education into the university curriculum and creating an enabling environment that supports healthy and active living (Van den berg *et al* 2013). The role of familial influence has also been highlighted. Breakfast should be encouraged from a young age and throughout the schooling phase to create healthy eating habits that extends through to adulthood (Ozdogan *et al* 2010). Multimodal nutrition education intervention was shown to improve dietary intakes among university students in a randomised controlled trial in Malaysia. Nutrition education interventions included lectures, brochures and text messages using national dietary guidelines. This was reportedly successful in significantly decreasing processed food intake while increasing the intakes of the following: energy, carbohydrate, calcium, vitamin C and thiamin, fruit, 100% fruit juice, fish, egg, milk and dairy products (Shahril, Dali & Lua 2013).

2.12 Conclusion

Research on breakfast consumption has been found to vary considerably, as seen from this literature review. Breakfast is known to have various benefits, including a better nutrient intake and better cognitive, mental and psychosocial functioning. Neglecting this meal would therefore have a negative impact including a suboptimal nutritional intake and reduced satiety. Skipping breakfast has also been linked with an increased risk for chronic disease such as metabolic syndrome, diabetes and obesity. The dietary and lifestyle habits of university students in general were found to be suboptimal, with a high intake of fat, cholesterol, convenience and fast foods, a low intake of fibre, legumes, fruit and vegetables and physical inactivity. The prevalence of breakfast skipping varied from low to substantial in studies done throughout the globe. In some studies, skipping breakfast was positively correlated with an elevated BMI. This literature review has shown that the nutritional status of university students worldwide is less than optimal. In addition, students are known to make poor dietary and lifestyle decisions, which can negatively affect their health and wellbeing. Due to the lack of published literature on breakfast consumption of South African university health science students, this study aimed to investigate breakfast consumption and the relationship to socio-demographic and lifestyle factors of undergraduate students in the School of Health Sciences at UKZN.

CHAPTER 3: METHODOLOGY

This chapter describes how the study was conducted. It explains the study design, study population and sample selection, methods and materials utilised as well as the data collection process. Furthermore, this section explains how the pilot study was conducted, procedures followed for capturing and analysing data, data quality control and ethical considerations.

3.1 Study design

This was a cross-sectional descriptive study. Cross-sectional studies are descriptive and enable prevalence of conditions to be quantified. They also provide information on potential relationships between exposure to risk factors and disease (Woodward 2014, p19).

3.2 Study population and sample selection

3.2.1 Study population

This study was conducted on undergraduate students in the School of Health Sciences at UKZN. The following qualifications are offered within this School: audiology, biokinetics, dental therapy, occupational therapy, optometry, pharmacy, physiotherapy and speech therapy (UKZN 2016a). This population was selected as it is expected that students studying towards careers in the health field would be more concerned about their dietary intake and overall health, compared to students registered for other non-health related degrees. Future health professionals are more likely to follow healthy dietary and lifestyle habits. However, as described in the literature review in chapter two, the dietary and lifestyle habits of university students are less than ideal.

3.2.2 Sample selection

Simple random sampling was used in this study. Random sampling precludes bias, as every member of the study population would have an equal opportunity to be selected to participate (Woodward 2014, p19). Only undergraduate students who were registered for a health science qualification in the School of Health Sciences at UKZN, were eligible to participate in this study. Undergraduate students not registered for a qualification in the School of Health Sciences at UKZN were not eligible to participate in this study. Postgraduate students registered for a qualification in the School of Health Sciences at UKZN, were also excluded. The minimum sample size required to represent the population was determined by the statistician to be 320 participants. The total number of participants was 353, however, not all participants completed all sections and questions. Some participants did not answer some questions and this is indicated as missing data. To obtain data based on breakfast consumption or non-consumption, the

questionnaire was designed such that those who answered ‘yes’ to breakfast consumption answered a different set of questions, compared to those who answered ‘no’ to breakfast consumption. The number of participants who consumed breakfast was 284 while the number who did not consume breakfast was 62. The number of participants who consented to having their height and weight measurements taken was 350.

3.3 Study methods and materials

3.3.1 Self-administered questionnaire

A self-administered questionnaire, developed by the researcher was used to collect data (Appendix A). The questionnaire stated the objectives of the study and comprised of four sections. Section A contained questions pertaining to socio-demographic factors and included questions on age, race, gender, marital status, accommodation during the university term, degree registered for, year of study, method of financing studies and employment. Section B covered lifestyle factors such as: perceptions of state of health, smoking and alcohol consumption and questions on physical activity. Section C covered food purchasing and preparation factors such as person responsible for purchasing food and groceries, how much is spent per month on food and groceries, access to household appliances, time taken to travel to university in the mornings and how often students have lectures that start in the first period. Section D covered breakfast and dietary habits such as: meals and snacks consumed, a basic food frequency questionnaire, special diets, breakfast consumption, frequency and time of breakfast consumption. Time of breakfast consumption over the weekend or vacation, questions on fatigue and alertness, items regularly consumed for breakfast, reasons for breakfast consumption or non-consumption and questions on snacks and meals consumed when breakfast is skipped, were covered in section D. A section on anthropometry was included at the end of the questionnaire to record weight and height measurements.

3.4 Data collection

Prior to data collection and with the permission of the Dean and Head of School of Health Sciences, the researcher addressed the relevant students during lecture periods to inform them about the study. This helped to increase awareness about the study. The researcher recruited two research assistants and informed them of the purpose of the study. After obtaining their consent to assist in the study, the researcher trained the assistants on the procedures to be followed during data collection. The researcher conducted the training verbally and a training manual was not used. Data collection took place on the Westville campus of the University of

KwaZulu-Natal, as this is where the School of Health Sciences is based and lectures are held. Figure 3.1 shows an aerial view of the campus.

Figure 3.1 Aerial view of UKZN Westville campus (UKZN 2016b)

A research station was set up in the open space outside the cafeteria, where there is a high volume of students. Students were randomly approached and asked if they were registered for a degree in the School of Health Sciences. Students who met the inclusion criteria were given more information about the study and an informed consent form (Appendix B). The informed consent form also gave more information on the study. Only once the informed consent form was signed and consent obtained, were the participants given the questionnaire to complete. Students sat on benches or chairs as they completed the questionnaire. Data collection took place between August and October 2016. However, data collection was intermittent and stopped due to student protest action and an unplanned two-week recess period. When data collection resumed after the recess period, it was moved to the multi-purpose room of the occupational therapy department and the campus clinic, due to security concerns from the student protest action.

Weight and height measurements were taken in triplicate and were used to calculate mean values. The weight and height measurement procedure was explained to each participant prior to the actual process. Before taking the measurements participants were requested to remove additional clothing such as jackets as well as hats, jewellery, accessories, items from their pockets, bags and shoes. Weight measurements were taken using a calibrated, digital scale (SECA 874). Participants were asked to step onto the scale and stand still with hands to the side and feet correctly positioned. The weight measurements were taken three times and all three measurements were recorded at the end of the questionnaire. Height measurements were taken using a portable stadiometer (SECA 213). Participants were asked to stand on the stadiometer with their feet together, heels touching the base of the stadiometer and hands to

their side. Participants were asked to take a deep breath as the headpiece was lowered and a reading was obtained to the nearest centimetre. This process was also repeated three times and all three measurements were recorded at the end of the questionnaire. Anthropometric measurements were done away from the rest of the students and readings were not read out aloud, to ensure privacy. Anonymity was ensured as no names or personal details such as student numbers were recorded. For those who requested their BMI, it was calculated and interpreted by the researcher using the BMI classification table (WHO 2015b). Students did not receive payment for participating in the study.

3.5 Pilot study

Two pilot studies were conducted before the main study. The first pilot study was conducted on a convenience sample of ten first year students registered for the B.Sc Dietetics degree and five students registered for the Post Graduate Diploma in Community Nutrition. These students were used as they did not form part of the School of Health Sciences. The students were randomly selected and invited to participate. After students gave consent to participate in the study, the study protocol and objectives were explained to the students and the questionnaire was handed out. The purpose of the pilot study was to identify and correct potential errors in the questionnaire, and to allow research assistants to go through the process of taking weight and height measurements. Some of the first year students suggested that certain questions needed to be rephrased as they were not easily understood. The questionnaire was modified to aid clarity and improve understanding. The average time taken to complete the questionnaire was ten minutes. This was considered feasible, as students would not be willing to spend more time on a questionnaire.

3.6 Statistical analysis

A Microsoft excel spreadsheet was used to capture data and it was later transferred to IBM Statistical Package for Social Science (SPSS) version 24.0. Data was analysed using the following statistical tests: Chi-square goodness-of-fit-test, Wilcoxon Signed Ranks test, Chi-square test of independence, regression analysis, Kruskal Wallis Test, Mann Whitney U Test, binomial test, Pearson's/Spearman's correlation and t-tests. A p-value of less than 0.05 was considered statistically significant.

3.7 Reduction of bias

Several steps were taken to minimise bias and ensure validity and reliability during the data collection process. Research assistants were trained by the researcher on the procedure for

taking anthropometric measurements. Standardised procedures were used for taking all anthropometric measurements. All anthropometric measurements were taken in triplicate and recorded immediately. The digital scale was checked and calibrated before use. The digital scale was placed on a flat, hard level surface to ensure that the readings were accurate, while the stadiometer was placed against a wall to ensure that it was stable and steady. The researcher and research assistants ensured that there was no discussion between students while the questionnaires were being answered. Students were encouraged to be honest when completing the questionnaire and were assured that their questionnaires would remain anonymous and confidential. The researcher and the research assistants ensured that students only participated once.

3.8 Data quality control

Two individuals captured data at a time. A third person crosschecked the data for potential errors. Responses were coded and the codes were entered onto the excel spreadsheet. Questionnaires were numbered for cross reference purposes. All questionnaires and consent forms were stored with the research supervisor and will be shredded and disposed of, after five years.

3.9 Ethical considerations

Gatekeeper's permission was obtained from the Registrar of UKZN (Appendix C). Full ethics approval was obtained from the UKZN Biomedical Research Ethics Committee (BREC) (Ref: BE280/16) (Appendix D). Participants were required to sign a consent form (Appendix B), before participating in the study. The consent form introduced the researcher, described the study protocol and guaranteed the confidentiality of the participant. It also provided assurance that participation was voluntary and participants could withdraw from the study at any time.

CHAPTER 4: RESULTS

This chapter presents the results of the study. The socio-demographic characteristics and lifestyle profile of the sample are presented as well as the factors that influence breakfast consumption. Results on the correlation between breakfast consumption, socio-demographic profile, lifestyle indicators and BMI are also presented.

4.1 Sample characteristics

Sample characteristics (n=353) are presented in Table 4.1. Most participants were between 19 to 20 years of age (42.5%; n=150). The majority of the sample was made up of black African students (75.4%; n=266). Females made up 75% of the sample (n=267). The majority of the participants were single (98.9%; n=348) and were not employed (94%; n=329).

Table 4.1: Sample characteristics (n=353)

Variables	**n**	**%***
Age (n=353)		
17-18 years	71	20.1
19-20 years	150	42.5
21-22 years	106	30.0
>22 years	26	7.4
Race (n=353)		
Black	266	75.4
White	24	6.8
Indian	59	16.7
Coloured	3	0.8
Other	1	0.3
Gender (n=353)		
Male	86	24.4
Female	267	75.6
Marital status (n=352)**		
Single	348	98.9
Married	4	1.1
Employment (n=350)**		
Employed	21	6
Not employed	329	94

* Percentage of total sample

**Missing data (some students did not answer)

Background information on university studies, finances and accommodation is presented in Table 4.2. Students registered for the pharmacy degree made up the largest proportion of the sample (26.2%; n=92) followed by occupational therapy (21.9%; n=77). Students registered for speech language pathology (3.4%; n=12) and audiology (3.1%; n=11) made up the smallest proportion of the sample. Approximately 61.5% (n=216) of the sample lived at the university residence (61.5%; n=216). Most of the participants were in their first year of study (44.3%; n=154), while fourth year students made up the smallest proportion of the sample (8.9%; n=31).

Table 4.2: Background on university studies, finances and accommodation

Variables	**n**	**%***
Degree (n=351)**		
Audiology	11	3.1
Dental therapy	39	11.1
Occupational therapy	77	21.9
Optometry	42	12.0
Pharmacy	92	26.2
Physiotherapy	63	17.9
Speech language pathology	12	3.4
Sports science	15	4.3
Academic year of study(n=348)**		
First	154	44.3
Second	92	26.4
Third	71	20.4
Fourth	31	8.9
Finance of studies(n=351)**		
Self-funded	57	16.2
Parent/guardian	88	25.1
Bursary/scholarship	80	22.8
Loan	11	3.1
Financial aid	115	32.8
Accommodation(n=351)**		
Residence	216	61.5
Home	91	25.9
Commune	26	7.4
Flat	18	5.1

*Percentage of total sample

**Missing data (some students did not answer)

4.2 Lifestyle profile of participants

State of health as reported by participants is represented in Figure 4.1. A Chi-square goodness-of-fit-test was used to analyse the state of health reported. A significant number of participants described their health as fair (28%; n=97) or good (48%; n=167) [$\chi^2(4)=254.252$, $p<0.05$].

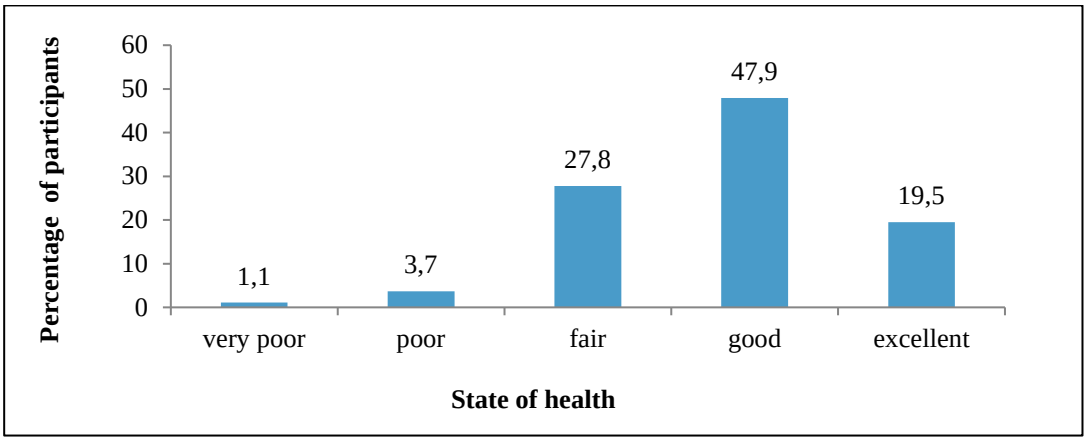

Figure 4.1: State of health (n=349)*

*Missing data (some students did not answer)

A binomial test was used to analyse smoking and alcohol consumption (Figure 4.2). The majority did not smoke (95%; n=334, $p<0.05$) and a significant number did not consume alcohol (75%; n=265, $p<0.05$).

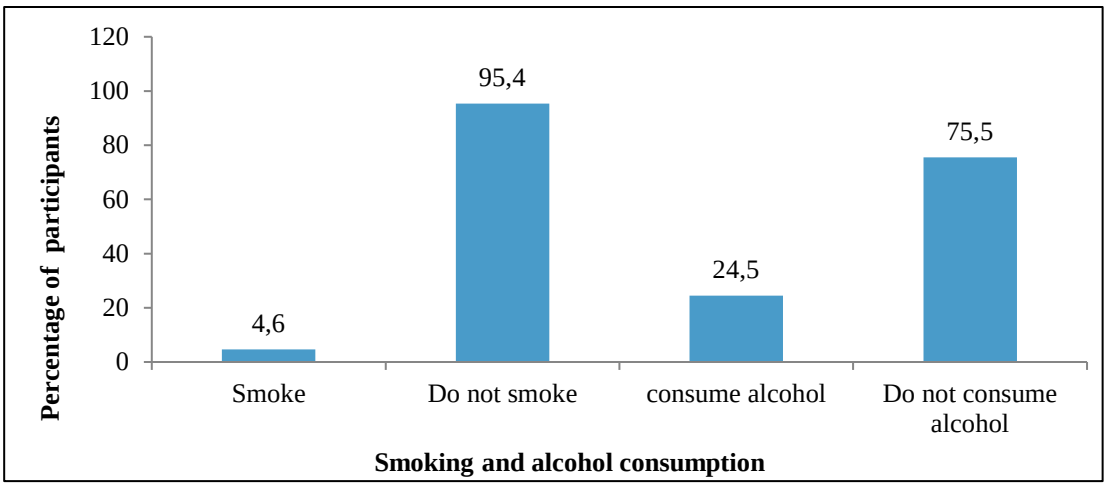

Figure 4.2: Smoking (n=350) and alcohol consumption (n=351)

Just more than half of the sample indicated that they were physically active (59%; n=206, p<0.05) (Figure 4.3).

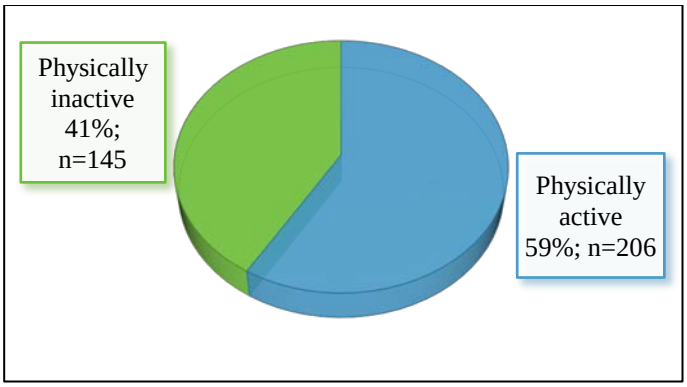

Figure 4.3: Physical activity and inactivity (n=351)*

*Missing data (some students did not answer)

Behaviour related to physical activity is reported in Table 4.3. Less than half of the sample of those who were physically active were involved in physical activity 2-3 times a week (43.7%; n=90, p<0.05). Approximately 48.3% (n=98) were engaged in strenuous physical activity (p<0.05), while 31.5% (n=64) were engaged in mild physical activity (p<0.05). This represented a significant proportion of the sample (p< 0.05).

Table 4.3: Behaviour related to physical activity

Questions on physical activity	**n**	**%***
What type of activity are you generally involved in? (n=203)**		
Strenuous	98	48.3
Moderate	39	19.2
Mild	64	31.5
Other	2	1.0
How long does the activity referred to last, on average? (n=203)**		
Up to 30 minutes	72	35.5
30-59 minutes	70	34.5
1-2 hours	53	26.1
>2 hours	8	3.9
If you do physical activity in the morning, when do you consume breakfast? (n=185)**		
Before physical activity	54	29.2
After physical activity	106	57.3
Not at all	25	13.5
Indicate how often you skip breakfast altogether because of your physical activity (n=196)**		
Never	59	30.1
Rarely	49	25.0
Sometimes	54	27.6
Often	26	13.3
Always	8	4.1

*Percentage of sample

**Missing data (some students did not answer)

4.3 Food purchasing behaviour

Most participants reported that they were responsible for going to the supermarket to purchase food and groceries (72.8%; n=252) (Table 4.4). For those who were responsible for buying

their own food, 50.8% (n=127) spent between R500-R1000/month, while 39.2% (n=98) spent between R200-R499/month ($p<0.05$).

Table 4.4: Food purchasing behaviour

	n	**%**	P value*
Who is mainly responsible for going to the supermarket to buy food/groceries?(n=346)**			
Myself	252	72.8	0.000
Parents or family	91	26.3	
Housemates	3	0.9	
If you are responsible for buying your own food, how much money do you spend on your food per month? (n=250)**			
<R200	4	1.6	
R200-R499	98	39.2	0.000
R500-R1000	127	50.8	0.000
>R1000	11	4.4	
Don't know	10	4.0	

*Chi-square goodness-of-fit-test. Only significant p values are presented.

**Missing data (some students did not answer)

Figure 4.4 shows access to household appliances. Most participants had access to all appliances including a refrigerator (95.8%; n=338), stove (96%; n=339), kettle (88.1%; n=311), microwave (87.8%; n=310) and an oven (64.3%; n=227).

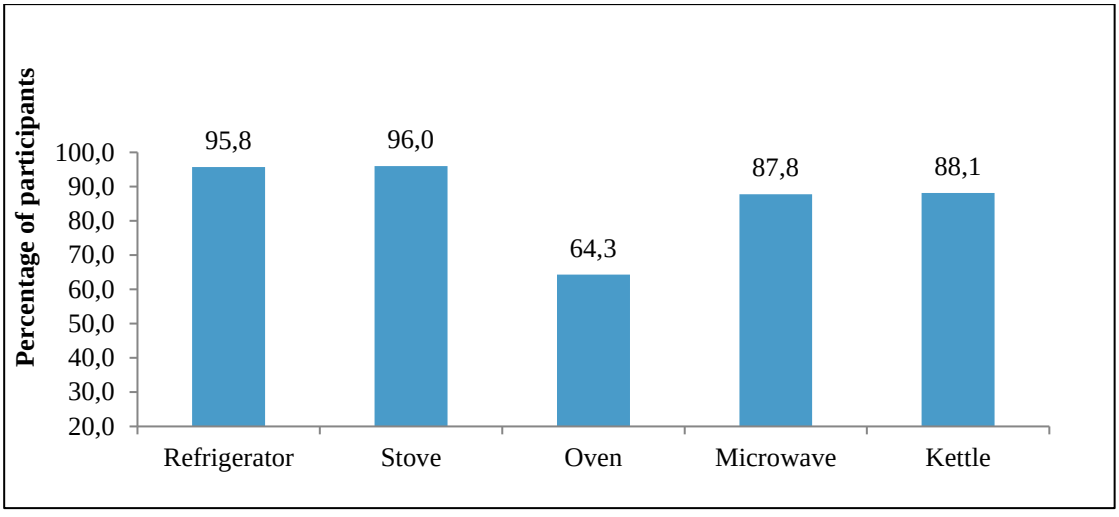

Figure 4.4: Access to household appliances (n=353)

4.4 Meal and snack consumption

Most participants consumed breakfast (71.4%; n=252), lunch (74.2%; n=262) and supper (83.3%; n=294), however, only a few consumed a morning snack (24.9%; n=88), afternoon snack (41.4%; n=146) and evening snack (30.6%; n=108) (Figure 4.5).

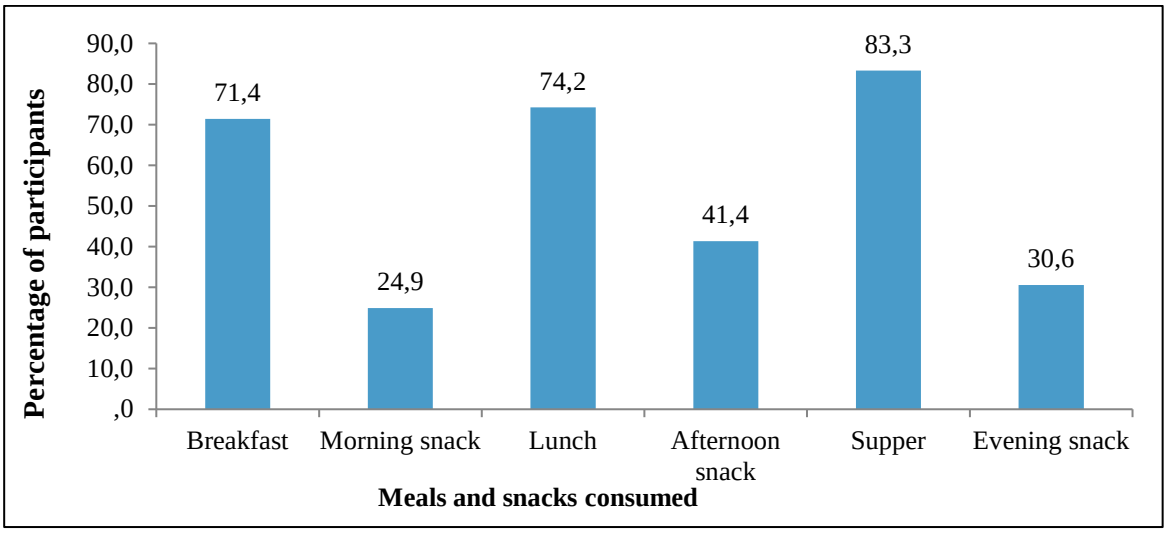

Figure 4.5: Meals and snacks consumed by participants (n=353)

4.5 Breakfast consumption

Breakfast consumption is shown in Figure 4.6. The majority of participants (82.1%; n=284) answered that they consumed breakfast, while 18% (n=62) did not consume breakfast ($p<0.05$).

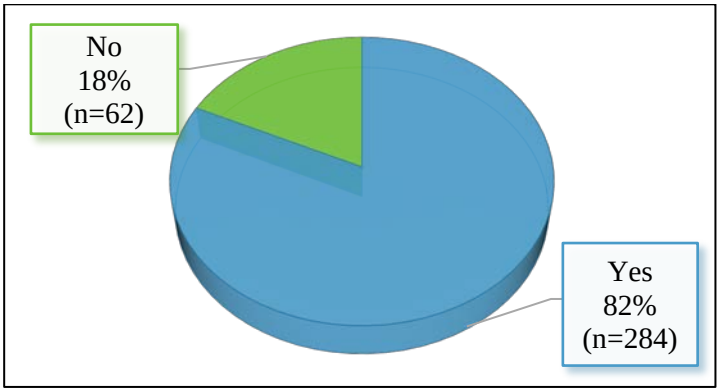

Figure 4.6: Breakfast consumption reported by participants (n=346)*

*Missing data (some students did not answer)

Those who responded 'yes' (n=284) were required to answer a different set of questions in the questionnaire.

About half of the sample (50.5%; n=143) consumed breakfast daily (p<0.05) (Figure 4.7).

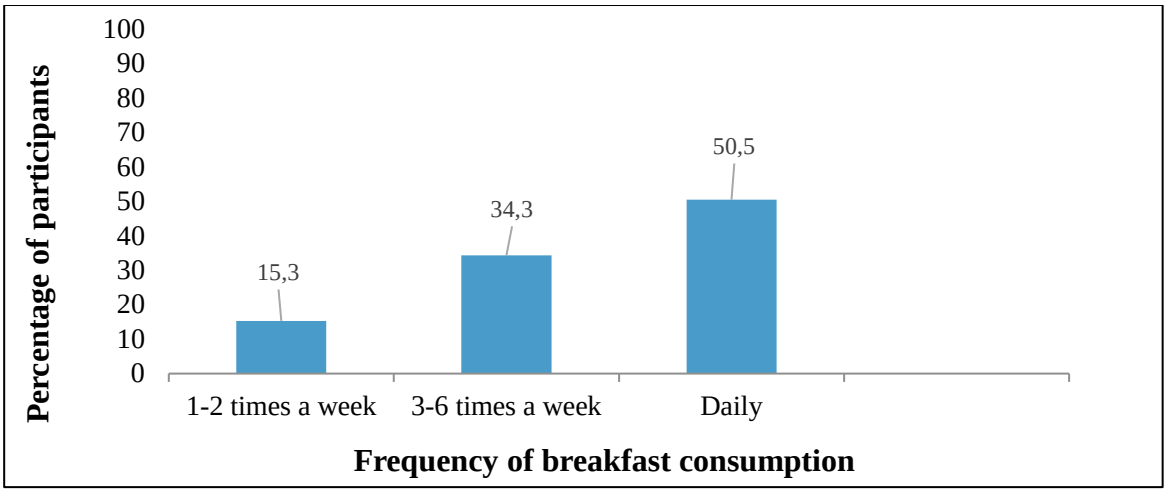

Figure 4.7: Frequency of breakfast consumption (n=276)*

*Missing data (some students did not answer)

Times of breakfast consumption is shown in Figure 4.8. Breakfast was mostly commonly consumed between 7:00 to 8:00 (43.6%; n=120) (p<0.05) and between 6:00 to 7:00 (28.7%; n=79) (p<0.05).

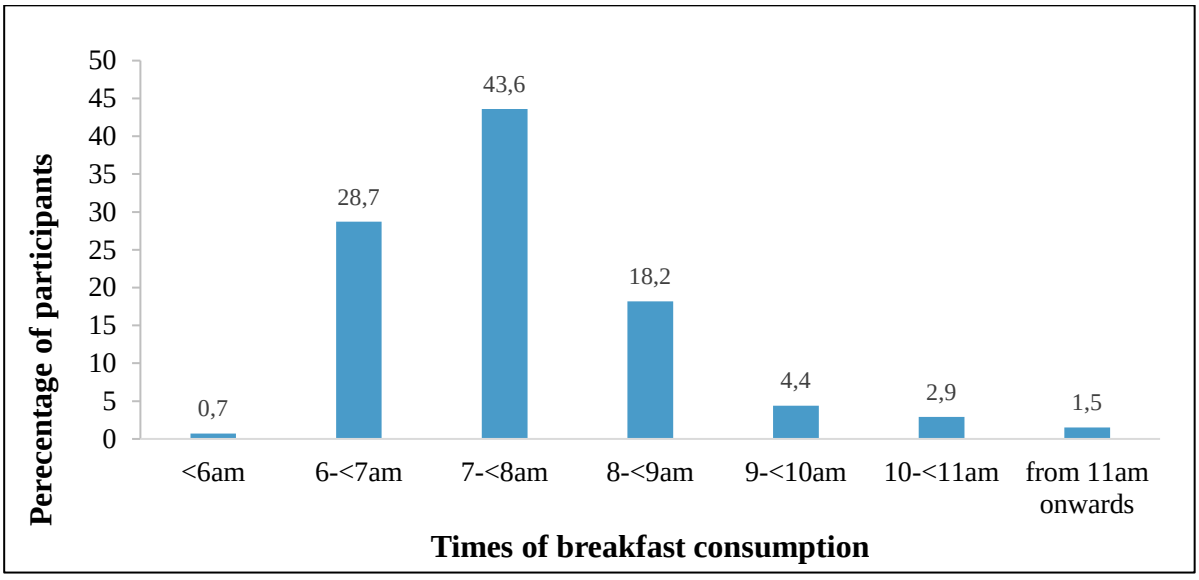

Figure 4.8: Times of breakfast consumption during the week (n=275)*

*Missing data (some students did not answer)

The majority of participants reported that this time changed over the weekends (92.5%; n=259) ($p<0.05$) and during the vacation (81.8%; n=225), ($p<0.05$) in that they ate later (Figure 4.9).

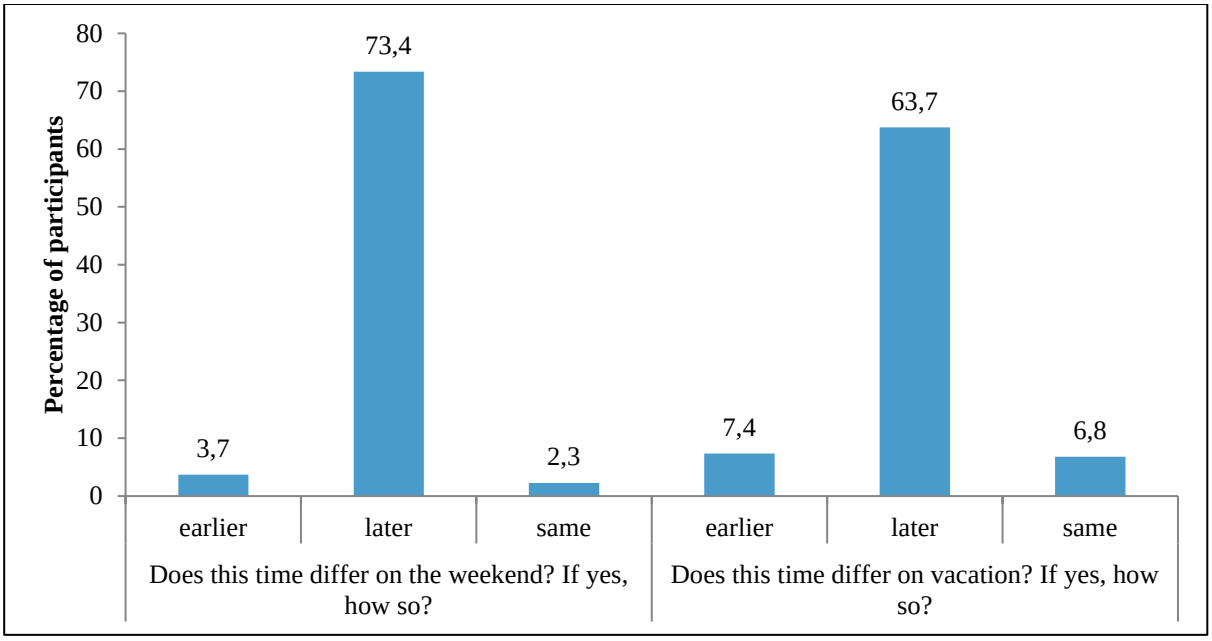

Figure 4.9: Times of breakfast consumption over the weekend (n=280) and vacation (n=275)

4.6 Frequency of consumption of food items

The frequency of consumption of various food items by participants is shown in Table 4.5. A significant proportion of participants consumed dairy products such as milk, *maas* and yoghurt daily (n=122; 35.1%) and up to 1 to 3 times per week (n=101; 29.0%). Fruit and vegetables were consumed between 1 to 3 times per week by 31.2% of participants (n=109) and daily by 26.6% (n=93). Chicken, fish and meat products were consumed between 1 to 3 times and 4 to 6 times per week by 32.4% (n=112) of participants and daily by 25.1% (n=87) of participants. Lentils, beans, peas and soya were consumed less than once per week by 41.9% (n=144) and 1 to 3 times per week by 28.5% (98) of participants. Starches such as rice, bread, pasta and potatoes were consumed at least daily by 42.6% (n=149) and 4 to 6 times per week by 26.5% (n=91). Biscuits, cakes, sweets, crisps and chocolates were consumed 1 to 3 times per week by 31.8% (n=110), less than once per week by 26.0% (n=90) and 4 to 6 times by 24.3% (n=84) of participants. Cold drinks or fizzy drinks were consumed less than once per week by 39.5% (n=136) and 1 to 3 times per week by 24.4% (n=84). Butter, margarine, oil and peanut butter

were consumed 1 to 3 times per week by 26.8% (n=92) and at least daily by 24.8% (n=85) of participants. Avocado pear, nuts and seeds were consumed less than once per week by 45.0% (n=154) and never consumed at all by 26.6% (n=91) of participants. Fast food and take aways were consumed less than once per week by 45.3% (n=155) and 1 to 3 times per week by 26.9% (n=92). Sugar was consumed at least daily by 48.1% (n=167). All of these findings were statistically significant ($p<0.05$).

Table 4.5: Frequency of consumption of various food items by participants

Food items	**n**	**%**	**P value***
Dairy products such as milk/*maas*/yoghurt (n=348) **			
Never	12	3.4	
<once a week	64	18.4	
1-3 times a week	101	29.0	0.000
4-6 times a week	49	14.1	
At least daily	122	35.1	0.000
Fruit and vegetables (n=349) **			
Never	9	2.6	
<once a week	65	18.6	
1-3 times a week	109	31.2	0.000
4-6 times a week	73	20.9	
At least daily	93	26.6	0.000
Chicken/fish/meat products (n=346) **			
Never	3	0.9	
<once a week	32	9.2	
1-3 times a week	112	32.4	0.000
4-6 times a week	112	32.4	0.000
At least daily	87	25.1	0.000
Lentils/beans/peas/soya (n=344) **			
Never	55	16.0	
<once a week	144	41.9	0.000
1-3 times a week	98	28.5	0.000
4-6 times a week	30	8.7	
At least daily	17	4.9	
Starches such as rice/bread/pasta/potatoes (n=343) **			
Never	4	1.2	
<once a week	26	7.6	
1-3 times a week	76	22.2	
4-6 times a week	91	26.5	0.000
At least daily	146	42.6	0.000
Biscuits/cakes/sweets/crisps/chocolates (n=346) **			
Never	9	2.6	
<once a week	90	26.0	0.000
1-3 times a week	110	31.8	0.000
4-6 times a week	84	24.3	0.000
At least daily	53	15.3	

Table 4.5 continued: Frequency of consumption of various food items by participants

Food items	n	%	P value*
Cold drinks/fizzy drinks (n=344) **			
Never	44	12.8	
<once a week	136	39.5	0.000
1-3 times a week	84	24.4	0.000
4-6 times a week	48	14.0	
At least daily	32	9.3	
Butter/margarine/oil/peanut butter (n=343) **			
Never	20	5.8	
<once a week	72	21.0	
1-3 times a week	92	26.8	0.000
4-6 times a week	74	21.6	
At least daily	85	24.8	0.000
Avocado pear/nuts/seeds (n=342) **			
Never	91	26.6	0.000
<once a week	154	45.0	0.000
1-3 times a week	55	16.1	
4-6 times a week	29	8.5	
At least daily	13	3.8	
Fast food/take aways (n=342) **			
Never	24	7.0	
<once a week	155	45.3	0.000
1-3 times a week	92	26.9	0.000
4-6 times a week	49	14.3	
At least daily	22	6.4	
Sugar (n=347) **			
Never	7	2.0	
<once a week	46	13.3	
1-3 times a week	57	16.4	
4-6 times a week	70	20.2	
At least daily	167	48.1	0.000

*Chi-square goodness-of-fit-test. Only significant p values are presented

**Missing data (some students did not answer)

4.7 Types of diet followed

The various types of diets followed by participants is shown in Table 4.6. Sixteen percent of the sample (n=56) did follow a diet and the most popular diets were energy-controlled or weight reducing diets (n=19; 35.8%), as well as low fat diets (n=19; 35.8%).

Table 4.6: Types of diets followed by participants (n=53)*

Type of diet	n	%
Vegetarian	4	7.5
Vegan	2	3.8
Lacto ovo-vegetarian	3	5.7
Diabetic	2	3.8
Energy controlled or weight reducing	19	35.8
Low fat	19	35.8
Other	4	7.5

Statistical tests: Chi-square goodness-of-fit-test

*Missing data

4.8 Fatigue and alertness

A one-sample t-test was used to analyse the effect of breakfast on fatigue and alertness. This analysis showed that eating breakfast resulted in significantly lower levels of fatigue (M=2.3, SD = 1.187), t (277) = -9.854, $p<0.05$) and significantly higher levels of alertness (M = 3.73, SD = 1.225), t (274) = -6.550, $p<0.05$).

4.9 Breakfast food items

Food items regularly consumed for breakfast by participants is shown in Figure 4.10. The most commonly consumed breakfast items were ready to eat cereals or instant cereals (60.1%; n=212), tea or coffee (50.4%; n= 178), eggs (46.2%; n=163) and leftovers (32.0%; n=113).

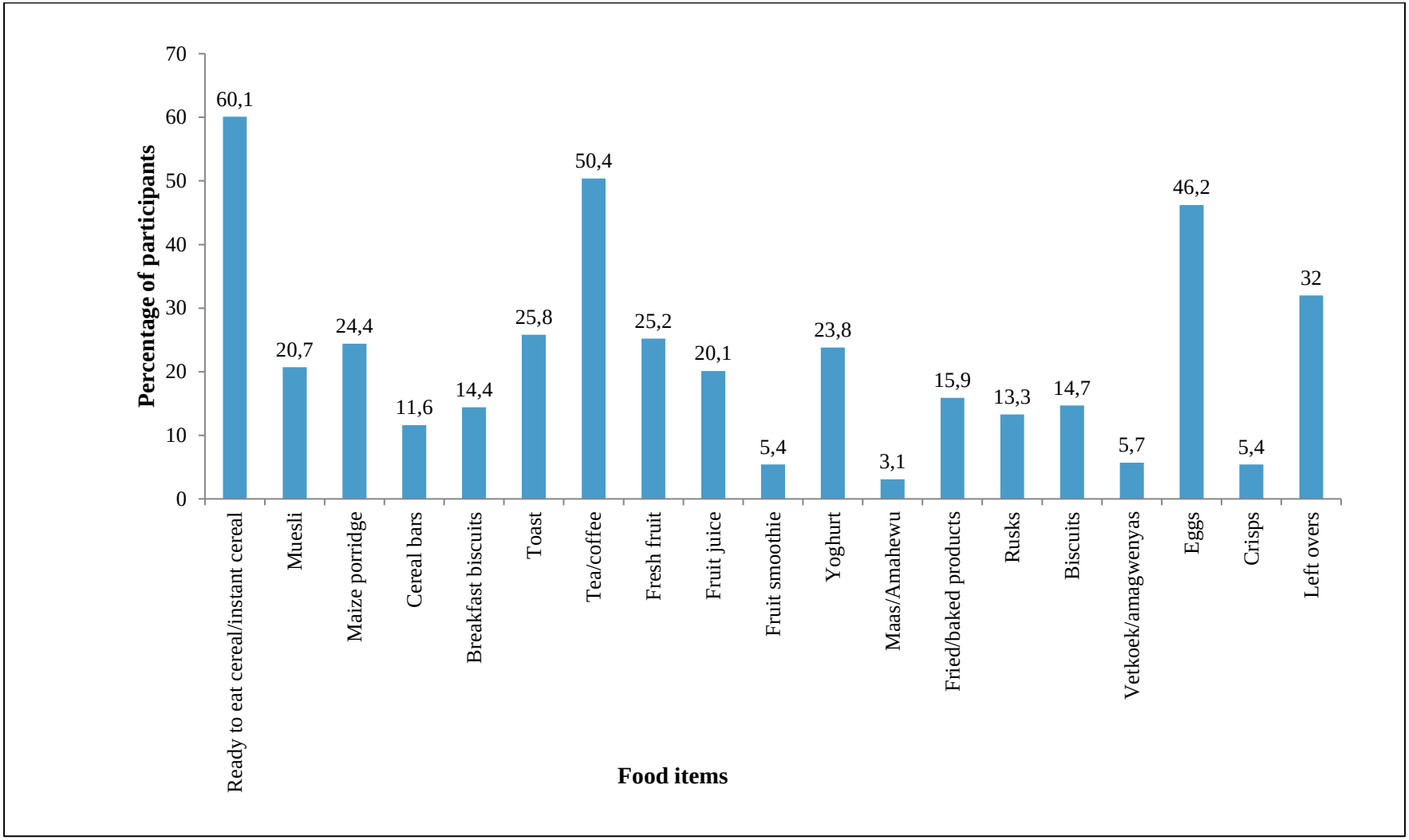

Figure 4.10: Food items consumed for breakfast (n=353)

4.10 Reasons for consuming or not consuming breakfast

A Likert scale was used to analyse the reasons for consuming or not consuming breakfast, and a one-sample t-test was used to determine significance of agreement or disagreement to the reasons offered (Figure 4.11). There was a significant agreement that breakfast was consumed for the following reasons: to satisfy hunger, for energy, to be alert and prevent fatigue and for health reasons ($p<0.05$). There was also a significant disagreement that breakfast was consumed because it was eaten together as a family ($p<0.05$).

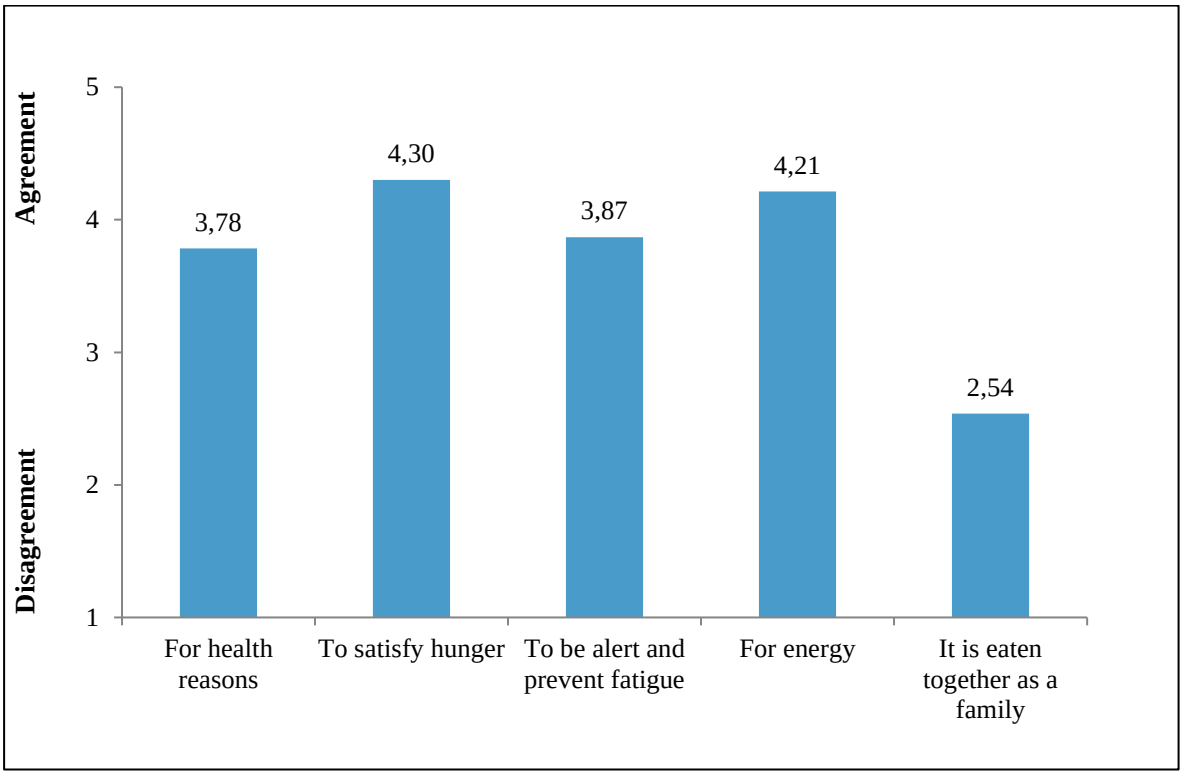

Figure 4.11: Reasons for breakfast consumption (n=284)

Reasons for not consuming breakfast are shown in Figure 4.12. Statistically significant reasons for not consuming breakfast included: lack of time and lack of appetite ($p<0.05$). There was a general disagreement that breakfast was skipped for the following reasons: expensive cost of foods, unable to prepare due to lack of facilities and the perception that breakfast was not important ($p<0.05$).

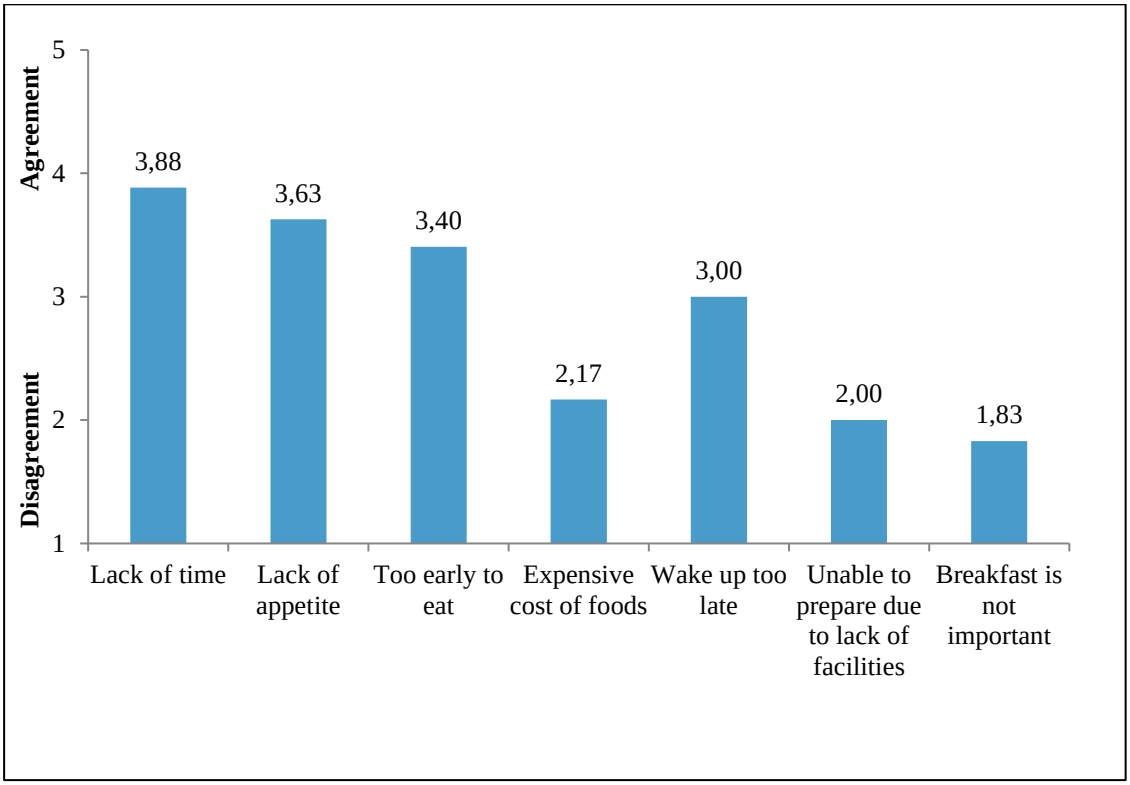

Figure 4.12: Reasons for not consuming breakfast (n=62)

4.11 Meal times and snacking behaviour

Approximately 71% of participants who skipped breakfast (n=62) ate lunch between 12:00 to 14:00 (n=27). A substantial proportion ate supper between 17:00 to 19:00 (50%; n=19) and after 19:00 (42.1%; n=16) ($p<0.05$). Those who skipped breakfast, consumed snacks between 10:00 and 11:00 (26%; n=13), 12:00 and 13:00 (26%; n=13) and from 13:00 onwards (26%; n=13) ($p<0.05$).

4. 12 Factors influencing breakfast consumption

4.12.1 Frequency of breakfast consumption

There was a significant relationship between the frequency of breakfast consumption and the following: race [χ^2 (3) = 22.654, p<0.05], where students lived during the academic term [χ^2 (3) = 20.516, p<0.05], year of study [χ^2 (3) = 19.022, p<0.05] and who was responsible for buying the groceries [χ^2 (3) = 16.600, p<0.05]. Indian and white participants, those that lived at home during the academic term and those whose parents or family were responsible for buying the groceries, consumed breakfast daily. Less frequent breakfast consumption was associated with a significant number of black students, those that lived at the university residence or in a commune, those that were in first year and those who purchased their own groceries (p<0.05).

4.12.2 Breakfast consumption and year of study

Table 4.7 shows the relationship between breakfast consumption and year of study. A significant relationship was found between breakfast consumption and year of study [χ^2 (3) = 10.079, p=0.018]. A significant number of those who did not eat breakfast were in third year. A significant relationship was found between breakfast consumption and the following: smoking (p<0.05) and consuming fast foods or take away foods [χ^2 (3) = 13.477, p<0.05]. A significant number of those who did not eat breakfast were smokers and consumed fast foods or take away foods frequently (between 4 to 6 times a week).

Table 4.7: Relationship between breakfast consumption and year of study

Breakfast consumption	**Year of study**			
	First	**Second**	**Third**	**Fourth**
Percentage of participants who ate breakfast (n=284)	47.9%	26.4%	17.1%	8.6%
Percentage of participants who did not eat breakfast (n=62)	44.4%	26.9%	19.9%*	8.8%

* p= 0.018

Fisher's exact test, Pearson Chi Square

4.12.3 Times of breakfast consumption

The relationship between where students lived during the academic term and times of breakfast consumption are shown in Table 4.8. A significant relationship was found between time of breakfast consumption and where students lived during the academic term [χ^2 (3) = 32.104, p<0.05]. Those who lived at home were more likely to eat earlier, compared to those who lived in a flat or at the university residence.

Table 4.8: Relationship between where students lived during the academic term and times of breakfast consumption (n=284)

Where students lived during the academic term	Times of breakfast consumption	P value
Home or commune	6:00 to <7:00	0.021
University residence	7:00 to <8:00	0.021
Flat	8:00 to <9:00	0.021
Commune	11:00 onwards	0.021

Pearson Chi Square

Time taken to get to the university in the mornings and times of breakfast consumption is shown in Table 4.9. A significant relationship was found between time of breakfast consumption and time taken to get to university in the mornings [χ^2 (3) = 45.256, p<0.05]. Those who took more time to get to university in the mornings had breakfast earlier.

Table 4.9: Relationship between time taken to get to university in the mornings and times of breakfast consumption (n=284)

Time taken to get to university in the morning	Time of breakfast consumption	P value
> 60 minutes	<6:00	0.000
31 to 60 minutes	6:00 to <7:00	0.000
> 60 minutes	9:00 to <10:00	0.000
10 to 30 minutes	10:00 to <11:00	0.000
<10 minutes and 31 to 60 min	11:00 onwards	0.000

Pearson Chi Square

Differences in times of breakfast consumption were noted over the weekend and during the vacation period. A significant relationship was found between time of breakfast consumption over the weekend, and the intake of dairy products such as milk, *maas* or yoghurt [χ^2 (3) = 19.842, p<0.05]. Those who ate breakfast earlier in the weekend never had any dairy, while those who ate breakfast at the same time, had dairy daily. Eating breakfast at the same time during the week and over the weekend was associated with regular dairy intake. A significant relationship was also found between time of breakfast consumption over the weekend and the intake of avocado pear, nuts or seeds [χ^2 (3) = 23.982, p<0.05]. Those who had breakfast earlier in the weekend, had these food items 1 to 3 times per week, while those who ate breakfast at the same time, ate these food items daily. Eating breakfast at the same time during the week and over the weekend was associated with a regular intake of avocado pear, nuts or seeds.

The relationship between time of breakfast consumption during the vacation period and frequency of intake of certain food items is shown in Table 4.10. A significant relationship was found between time of breakfast consumption during the vacation period and intake of certain food items such as chicken, fish or meat products [χ^2 (3) = 20.790, p<0.05], cold drinks or fizzy drinks [χ^2 (3) = 24.141, p<0.05] and avocado pear, nuts or seeds [χ^2 (3) = 25.735, p<0.05].

Table 4.10: Relationship between time of breakfast consumption during the vacation period and frequency of intake of certain food items (n=284)

	Time of breakfast consumption during the vacation period and frequency of intake of food items			
Food items	**Same time**	**Earlier**	**Later**	**P value**
Chicken, fish or meat products	Never	Less than once per week		0.008
Cold drinks or fizzy drinks	Never	1-3 times a week and 4-6 times a week	Less than once per week	0.002
Avocado pear, nuts or seeds	At least daily			0.001

Pearson Chi Square

A significant relationship was also found between time of breakfast consumption during the vacation period and gender [χ^2 (3) = 6.763, p=0.034] and physical activity [χ^2 (3) = 8.999, p=0.011]. A significant number of those who had breakfast at the same time during the vacation period were males. Those who ate breakfast earlier during the vacation period were not physically active, while those who had breakfast at the same time were physically active.

4.13 Relationship between breakfast consumption and body mass index

Significant relationships were found between BMI and the following factors: age, gender, state of health, being on a diet and the consumption of lentils, beans, peas or soya. A significant positive correlation was found between age and BMI ($r = .139$, $p<0.05$). There was a significant difference in BMI across gender [Welch (1, 178.687) = 10.961, $p<0.05$]. Females (M = 23.8569, SD = 4.767) had a higher BMI than males (M = 22.1992, SD = 3.7443). A significant negative correlation was found between BMI and the state of health ($r = -.207$, $p<0.05$). A higher BMI was associated with a worse state of health. The only food items found to have a significant relationship with BMI were lentils, beans, peas or soya. A low consumption of lentils, beans, peas or soya was associated with a high BMI ($r = -.133$, $p<0.05$). Those who followed a diet had a higher mean BMI, compared to those who were not on any diet ($p<0.05$). No significant relationships were found between BMI and breakfast consumption or non-consumption, nor with the frequency of consumption.

4.14 Weight, height and body mass index

Anthropometric data collected included weight and height measurements. Body mass index was calculated using the mean weight and height measurements (Table 4.11).

Table 4.11: Weight, height and body mass index values (n=350)*

	Mean ± SD
Overall (n=350)	
Weight (kg)	61.67 ± 12.57
Height (m)	1.62 ± 0.08
BMI (kg/m^2)	23.45 ± 4.59
Males (n=85)	
Weight (kg)	65.24 ± 11.89
Height (m)	1.71 ± 7.17
BMI (kg/m^2)	22.19 ± 3.74
Females (n=265)	
Weight (kg)	60.53 ± 12.58
Height (m)	1.59 ± 6.31
BMI (kg/m^2)	23.86 ± 4.76

SD= standard deviation

*Missing data (some students did not want to have their anthropometric measurements taken)

Most participants had a normal BMI (64%, n=224) while a small percentage of participants (8.3%, n=29) were underweight. The prevalence of overweight and obesity was 19.7% (n=69) and 8% (n=28), respectively (Table 4.12).

Table 4.12: Body mass index classification of participants (n=350)*

BMI classification	n	%
Underweight	29	8.3
Normal range	224	64.0
Overweight	69	19.7
Obese	28	8.0

*Missing data (some students did not want to have their anthropometric measurements taken)

4.15 Summary

Most study participants were between 19 to 20 years of age, were females, lived at the university residence and were in their first year of study. A significant number perceived their health status to be good or fair. Most reported that they did not smoke or consume alcohol and were physically active. The majority reported that they were responsible for purchasing their own food, groceries, and most spent between R500 to R1000 per month on food and groceries. Household appliances such as a refrigerator, stove, kettle, microwave and an oven were available to most participants. The majority of participants (82.1%) consumed breakfast and 50.5% had breakfast daily. Breakfast consumption was associated with significantly lower levels of fatigue and higher levels of alertness. The most commonly consumed breakfast items were ready to eat or instant cereals, tea or coffee, eggs and leftovers. Reasons for consuming breakfast were to satisfy hunger, for energy, to be alert and prevent fatigue and for health reasons. Reasons for not consuming breakfast were a lack of time and a lack of appetite. A significant number of those who did not eat breakfast were in their third year of study, were smokers and consumed fast foods or take away foods frequently. Daily breakfast intake was found among a significant proportion of Indian and white participants, those that lived at home and those whose parents or family were responsible for purchasing groceries. A higher BMI was associated with being older and female. A higher BMI was also associated with a worse perceived state of health, a low consumption of lentils, beans, peas or soya and being on a diet. There was no relationship between breakfast consumption and BMI.

CHAPTER 5: DISCUSSION

The objectives of this study were as follows:

- To investigate breakfast consumption and the factors that influence breakfast consumption in undergraduate students in the School of Health Sciences at UKZN.
- To determine the socio-demographic and lifestyle profile of undergraduate students in the School of Health Sciences at UKZN.
- To determine if there was a correlation between breakfast consumption, socio-demographic profile, lifestyle indicators and BMI among undergraduate students in the School of Health Sciences at UKZN.

This chapter discusses the results presented in chapter 4.

5.1 Sample characteristics

Most of the sample were black (75.4%), followed by Indian (16.7%), white (6.8%) and coloured (0.8%). This is in line with the Census 2011 data, which showed the racial profile of KwaZulu-Natal to be 86.8% black African, 7.4% Indian, 4.2% white and 1.4% coloured (Statistics South Africa 2012). The majority of the sample comprised of females (75.6%), which is in line with a similar study done at NMMU (75.4% female) (Gresse *et al* 2015) and the UFS (75.8% females) (Van den Berg *et al* 2013). A large proportion of the sample were registered for degrees in pharmacy (26.2%) and occupational therapy (21.9%). This could be attributed to the fact that data collection was conducted in areas frequented by these students. Most students were between 19 to 20 years old (42.5%) and were in their first year of study (44.3%). The lower participation of the senior students was due to their busier schedules, which included participation in clinic and hospital sessions, off campus.

5.2 Lifestyle profile of participants

A large proportion of the sample perceived their health status to be good (47.9%), did not smoke (95.4%) or consume alcohol (75.5%) and were physically active (59%). Those who were willing to participate seemed to be more interested in their health. Many students declined the invitation to participate due to being uncomfortable about disclosing their dietary and lifestyle habits. This is somewhat different to findings from other studies. Gresse *et al* (2015) reported a high rate of alcohol consumption (83%), as well as a high rate of physical inactivity (78%) among health science students. Similar to a previous study, Van den Berg *et al* (2013) reported that 65.2% of health science students at UFS consumed alcohol on a weekly basis. However, Van den Berg *et al* (2013) also reported that 59% of their participants were very physically active, 39% were just active and only 10.6% smoked, which is in line with the current study. In the current study, 48.3% engaged in strenuous physical

activity, while 31.5% engaged in mild physical activity. In terms of frequency of physical activity, a significant proportion were involved in physical activity 2-3 times a week (43.7%). In the study by Kazi & Coopoo (2010), 63% of students at UKZN were involved in regular physical activity. A lack of time has been cited before as a reason for being unable to participate in regular physical activity (Al-Nakeeb *et al* 2015).

5.3 Food purchasing behaviour

A lower monthly household income and food insecurity has been linked to breakfast skipping (Smith *et al* 2013). A considerable level of food insecurity was previously reported among UKZN students (Munro *et al* 2013). Although this study did not directly investigate food insecurity, food-purchasing factors were investigated. Most participants reported that they were responsible for going to the supermarket to purchase food and groceries (72.8%) and 50.8% spent between R500 to R1000 on food and groceries per month. This is expected, as 61.5% of students in this study lived at a university residence. A similar finding was reported by an earlier study done at UKZN, where 63.5% of students lived at a university residence (Munro *et al* 2013). At UFS, 55.4% reported that their parents, family or guardian were their source of food or money for food, however, the amount spent on food was not reported (Van den Berg & Raubenheimer 2015).

5.4 Meal and snack consumption

Participants were asked to indicate which meals and snacks they consumed. The most commonly consumed meals were breakfast (71.4%), lunch (74.2%) and supper (83.3%). This is consistent with the findings from Van den Berg *et al* (2013), where the majority of students consumed all main meals including breakfast (93.2%), lunch (99.4%) and supper (96.3%) (Van den Berg *et al* 2013). In terms of snacks, 24.9% had a morning snack, 41.4% had an afternoon snack and 30.6% had an evening snack. This is consistent with previously reported snacking behaviour. Approximately 26.5% of health science students in Bahrain had a snack between breakfast and lunch, while 33.2% had a snack between lunch and supper (Musaiger, Awadhalla, Al-Mannai, Alsawad & Asokan 2015). In the current study, it is noteworthy that less snacks were consumed compared to main meals. This could be due to busy schedules, poor accessibility and the high cost of food.

5.5 Breakfast consumption

A large proportion of the participants (82.1%) consumed breakfast, while a small proportion (18%) did not consume breakfast. About half of the participants (50.5%) consumed breakfast daily. Similar results were reported among health science students at UFS, where 93.2% consumed breakfast regularly (Van den Berg *et al* 2013). A study by Tee *et al* (2015) reported that 81% of South African

school going adolescents in the North West province consumed breakfast. International studies conducted in Lebanon and Saudi Arabia reported a high prevalence of breakfast consumption (Al-Rethaiaa *et al* 2010; Yahia *et al* 2008). In Lebanon, regular breakfast consumption was reported by 61.4% of the student population (Yahia *et al* 2008); while in a Saudi Arabian study, the prevalence of daily breakfast consumption was 49.9% (Al-Rethaiaa *et al* 2010).

On the contrary, some researchers have also reported a lower prevalence of breakfast consumption. Only 21% of UKZN students consumed breakfast regularly (Kazi & Coopoo 2010), while only 51% of health science students at NMMU had regular breakfast (Gresse *et al* 2015). In a study done at a Pakistani University, 44.1% of female students consumed breakfast regularly (Ozdogan *et al* 2010). Similarly, only 44% of health science students in Bahrain consumed breakfast daily (Musaiger *et al* 2015). Ackuaku-Dogbe & Abaidoo (2014) reported that 71.92% of students at a medical school in Ghana skipped breakfast, while an average of 23.2% of students were found to consume breakfast daily, at three different Indian universities (Khanna *et al* 2016). An Iranian study found that 52% of females at the University of Medical Sciences skipped breakfast (Azadbakht & Esmaillzadeh 2012), while another study conducted a year later among students at the same university showed the prevalence of breakfast skipping to be 53% (Azadbakht *et al* 2013). In Bangladesh, 46.7% of university students did not consume breakfast regularly (Shill *et al* 2014).

As previously mentioned, there is no universally accepted definition for breakfast; therefore quantifying the skipping of breakfast has yielded conflicting results, in the literature reviewed. The prevalence of breakfast consumption in this study was higher than that previously reported among South African students, with the exception of the study conducted at the UFS by Van den Berg *et al* (2013). The reason for the high consumption of breakfast may be attributed to an increased knowledge and awareness about health amongst students studying towards health science-related degrees. It could also be due to dishonest reporting by the participants, who felt the need to respond ideally. It could also be because the sample was mainly female (75.6%) and females are generally more concerned about their health. Satalić *et al* (2007) reported that females consumed breakfast more frequently, and had a more optimal macronutrient intake compared to males. Furthermore, male students were more likely to indulge in unhealthier lifestyle behaviours such as smoking (Ramírez-Vélez *et al* 2015), soft drink consumption (Musaiger *et al* 2015; Pérusse-Lachance *et al* 2010) and consumption of fast foods (Mahfouz *et al* 2016). Another reason for the high prevalence of breakfast consumption could be due to the observation that those who were willing to participate in the study, showed a greater interest in their health and wellbeing. When approached, many of those who refused to participate in the study claimed to follow ‘unhealthy dietary habits’ that they did not wish to share

or make known.

5.6 Reasons for breakfast consumption or breakfast skipping

Reasons given for breakfast consumption included to satisfy hunger, for energy, to be alert, prevent fatigue and for health reasons. Skipping breakfast has been found to have an effect on hunger and satiety (Levitsky & Pacanowski 2013; Leidy & Racki 2010; Ozdogan *et al* 2010; Pereira *et al* 2010). The consumption of breakfast has been significantly associated with improved cognitive ability (Pandey & Vora 2015; Arshad & Ahmed 2014; Pivik *et al* 2012) and ability to concentrate (Ackuaku-Dogbe & Abaidoo 2014; Ozdogan *et al* 2010).

Reasons for not consuming breakfast included a lack of time and a lack of appetite. It is noteworthy that a significant number of participants took between 10 to 30 minutes or less than 10 minutes to get to university in the mornings and a significant proportion reported that they had no lectures in the first period. This suggests that a lack of time in the mornings should not be a reason for skipping breakfast. Nevertheless, a lack of appetite in the morning and a lack of time has been widely reported in previous studies (Khanna *et al* 2016; Hisam *et al* 2015; Onyiriuka *et al* 2013; Ozdogan *et al* 2010; Moy *et al* 2009). In the study done among Ghanaian medical students, a busy schedule and lack of time was the main reason for skipping breakfast, followed by financial constraints (Ackuaku-Dogbe & Abaidoo 2014). In the present study, the expensive cost of foods, lack of facilities and the perception that breakfast is not important, were not reasons for skipping breakfast. Furthermore, most students had access to common household appliances such as a refrigerator, stove, kettle, microwave and an oven. The availability of basic household equipment should facilitate food preparation and regular meal consumption, whereas a lack of any of these essential items would make it difficult to prepare and consume daily meals.

5.7 Fatigue and alertness

In the current study, breakfast consumption resulted in significantly lower levels of fatigue and higher levels of alertness. This is consistent with other studies. In a medical school in Ghana, those who consumed breakfast were less fatigued and more alert compared to those who skipped breakfast (Ackuaku-Dogbe & Abaidoo 2014). Additionally, breakfast skipping was associated with the following symptoms among university students in Pakistan: fatigue, impaired concentration, headache, dizziness and feeling cold (Ozdogan *et al* 2010). Consumption of breakfast has been significantly associated with improved cognitive ability (Pandey & Vora 2015; Arshad & Ahmed 2014; Pivik *et al* 2012). Breakfast consumption is also linked to improved problem solving ability (Arshad & Ahmed 2014), reduced stress, anxiety and depression (Richards & Smith 2015). Breakfast

skipping has been associated with poor concentration and lethargy during lectures amongst university students (Arshad & Ahmed 2014), as well as mental illness (Lovell *et al* 2015).

5.8 Breakfast food items

The most commonly consumed breakfast items were ready to eat cereals or instant cereals (60.1%), tea or coffee (50.4%), eggs (46.2%) and leftovers (32.0%). Ready to eat or instant cereals were also commonly consumed breakfast items among adolescents (Tee *et al* 2015) and university students (Savlak *et al* 2016). These are popular breakfast items due to convenience, desirable taste, perceived nutritional value, fibre content (Savlak *et al* 2016) and high micronutrient content (Barr *et al* 2012). Tea was also a common beverage choice for university students in Turkey (Ozdogan *et al* 2010), as was the case in the current study.

5. 9 Factors influencing breakfast consumption

5.9.1 Frequency of breakfast consumption

Indian and white participants, those that lived at home during the academic term and those whose parents or family were responsible for buying the groceries, consumed breakfast daily. A lower frequency of breakfast consumption was associated with a significant number of black students, those who lived at the university residence or in a commune, those who were in their first year of study and those who purchased their own groceries. Previous researchers reported that food insecurity was a serious threat among university students (Van den Berg & Raubenheimer 2015; Munro *et al* 2013). Furthermore, Tanton *et al* (2015) reported that students who lived away from home and on campus, exhibited poor dietary practices, such as a lower consumption of fruit and vegetables.

5.9.2 Breakfast consumption and year of study

A significant relationship was found between breakfast consumption and year of study. A significant number of those who did not eat breakfast were in third year. This could be attributed to busy schedules and increased travelling to hospitals and clinics, as part of the academic requirements. This finding is similar to reports from a Lebanese study where students in the fifth semester of study, consumed breakfast less regularly compared to those in their first semester of study (El-Kassas & Ziade 2016). On the contrary, the prevalence of breakfast skipping was inversely proportional to the participant's age among Malaysian university students (Moy *et al* 2009).

5.9.3 Breakfast consumption and lifestyle factors

A significant number of those who did not eat breakfast were smokers and consumed fast foods or take away foods frequently (between 4 to 6 times a week). This is consistent with previous studies, which reported that those who skipped breakfast were more likely to indulge in undesirable lifestyle behaviour such as smoking (Asao *et al* 2016; Yokohama *et al* 2016; Uemura *et al* 2015; Cahill *et al* 2013; Smith *et al* 2013; Barr *et al* 2012; Nishiyama *et al* 2009) and alcohol consumption (Asao *et al* 2016; Yokohama *et al* 2016; Uemura *et al* 2015; Cahill *et al* 2013). Those who skipped breakfast were also more likely to eat take-away foods or at restaurants (Nishiyama *et al* 2009) and consume fast food at least once a week (Moy *et al* 2009).

5.9.4 Times of breakfast consumption

In the current study, differences in times of breakfast consumption were noted over the weekend and during the vacation period. A significant relationship was found between time of breakfast consumption over the weekend and the intake of dairy products such as milk, *maas* or yoghurt. Those who had breakfast earlier in the weekend never had any dairy products, while those who ate breakfast at the same time daily, consumed more dairy products. Eating breakfast at the same time during the week and over the weekend was associated with a regular intake of dairy products. A significant relationship was also found between time of breakfast consumption over the weekend and the intake of avocado pear, nuts or seeds. Those who had breakfast earlier in the weekend consumed these food items between 1 to 3 times per week, while those who ate breakfast at the same time daily, ate these food items daily. Eating breakfast at the same time during the week and over the weekend was associated with a regular intake of avocado pear, nuts or seeds. This may suggest that those who habitually wake up early follow a routine of consuming these foods and perhaps consume these foods for their perceived nutritional value. There was a significant relationship between time of breakfast consumption during the vacation period and gender, as well as physical activity. A significant number of those who had breakfast at the same time during the vacation period were males. Those who ate breakfast earlier during the vacation period were not physically active, while those who had breakfast at the same time were physically active. These findings suggest that healthy eating and lifestyle habits are sustainable if they become part of an established routine.

5.10 Weight and height

In this study, the prevalence of underweight was 8.3%, normal weight 64%; overweight 19.7% and obesity 8%. This is line with other studies among university students in South Africa. In the study done at the University of Venda, the prevalence of underweight was 7.5%, overweight 21.4% and obesity 11.1% (Goon *et al* 2013). At the UFS, the prevalence of underweight was 8%, normal weight

72.1% with overweight and obesity combined at 19.8% (Van den Berg *et al* 2013). At UKZN, Kazi & Coopoo (2010) reported a prevalence of 18.9% and 5.8% for overweight and obesity, respectively. A comparison of studies by Kazi & Coopoo (2010), Goon *et al* (2013) and Van den Berg *et al* (2013) with the current study, showed that the prevalence of overweight and obesity among South African university students has not changed greatly over the years. In the current study, the mean BMI for males and females were 22.19 kg/m^2 and 23.86 kg/m^2, respectively. This is similar to findings from the SANHANES-1 (2014), which reported the mean BMI for males and females in South Africa as 23.6 kg/m^{2}and 28.9 kg/m^2, respectively (Shisana *et al* 2014).

5.11 Relationship between breakfast consumption and body mass index

Significant relationships were found between BMI and the following factors: age, gender, state of health, being on a diet and the consumption of lentils, beans, peas or soya. There was a significant positive correlation between age and BMI, whereby a higher age was associated with a higher BMI. There was a significant difference in BMI across gender. Females had a higher BMI than males, which is in line with previous findings. South African female university students had a higher prevalence of overweight and obesity compared to males in two different studies (Goon *et al* 2013; Van den Berg *et al* 2013). A significant negative correlation was found between BMI and the state of health. A higher BMI was associated with a worse state of health. This is consistent with findings among Korean university students, where participants with a normal BMI were more likely to consider themselves healthy (Kim, Lim & Kwak 2008).

The only food items found to have a significant relationship with BMI were lentils, beans, peas and soya. A low consumption of lentils, beans, peas or soya was associated with a high BMI. Those who consumed a low amount of the above foods had a higher BMI. This could be due to their high fibre content and ability to promote satiety. The intake of pulses has been linked to desirable health benefits such as improved glucose metabolism, lower BMI and lower waist circumference (Wennberg, Söderberg, Uusitalo, Tuomilehto, Shaw, Zimmet, Kowlessur, Pauvaday & Magliano 2015). A low intake of pulses may be accompanied by a high intake of processed and high fat foods. However, further research on dietary intake is required to confirm this.

Those who followed a type of diet had a higher mean BMI compared to those who were not on any diet. This is in line with previous research, which showed that overweight, and obesity is prevalent amongst those who were currently on or had previously been on a diet (Pérusse-Lachance *et al* 2015). This may also be due to the idea that those on diets are more likely to be dissatisfied with their body

weights. No significant relationships were found between BMI and breakfast consumption or non-consumption, nor with the frequency of consumption. This is contrary to reports from previous studies. An inverse relationship between breakfast consumption and BMI has been previously reported (Marlatt *et al* 2016; Watanabe *et al* 2014; Azadbakht *et al* 2013; Nurul-Fadhilah *et al* 2013; Shafiee *et al* 2013). Similar to the current study, a study on Serbian university students reported no links between breakfast skipping or frequency of breakfast consumption with BMI (Gazibara, Tepavcevic, Popovic & Pekmezovic 2013). As discussed earlier, there is no universally accepted definition for breakfast, which could explain the reason for variations in both the prevalence of breakfast skipping and the relationship between breakfast consumption and BMI. Dialektakou & Vranas (2008) showed that prevalence of breakfast skipping differed with variations in the definitions of breakfast skipping.

5.12 Summary

It is evident that breakfast is an extremely important meal that has multiple health benefits. Given the lack of a universal definition for breakfast, studies show varied results in terms of prevalence of breakfast consumption and skipping. In the current study, the majority consumed breakfast and a significant proportion consumed it daily. This is in line with findings from Van den Berg *et al* (2013) and Tee *et al* (2015). Students in the School of Health Sciences consumed breakfast because of perceived health benefits. Barriers to breakfast consumption such as a lack of time and a lack of appetite reported in the current study, are consistent with previous research (Khanna *et al* 2016; Hisam *et al* 2015; Onyiriuka *et al* 2013; Ozdogan *et al* 2010; Moy *et al* 2009). Breakfast skipping was also associated with unhealthy diet and lifestyle practices, which is also in line with the literature (Asao *et al* 2016; Yokohama *et al* 2016; Uemura *et al* 2015; Cahill *et al* 2013; Smith *et al* 2013; Barr *et al* 2012; Moy *et al* 2009; Nishiyama *et al* 2009). Although the study sample followed some good dietary practices such as regular breakfast consumption, the study did identify barriers to a healthy diet and lifestyle. This needs to be overcome to incorporate healthy lifestyle practices into a sustainable routine for university students.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

This chapter presents the conclusions, study limitations and recommendations.

The objectives of this study were:

- To investigate breakfast consumption and the factors that influence breakfast consumption in undergraduate students in the School of Health Sciences at UKZN.
- To determine the socio-demographic and lifestyle profile of undergraduate students in the School of Health Sciences at UKZN.
- To determine if there was a correlation between breakfast consumption, socio-demographic profile, lifestyle indicators and BMI among undergraduate students in the School of Health Sciences at UKZN.

6.1 Conclusions

Students in the School of Health Sciences at UKZN exhibited some desirable dietary and lifestyle habits. A significant proportion considered their health status to be good or fair, did not smoke or consume alcohol and were physically active. Most had access to household appliances such as a refrigerator, stove, kettle, microwave and an oven. The majority of participants consumed breakfast; however, a smaller proportion consumed it daily. Desirable lifestyle practices, including a high prevalence of breakfast consumption, could be attributed to the fact that the sample comprised of future health professionals who are concerned about their health.

Breakfast consumption had a beneficial effect in decreasing fatigue and improving alertness. Participants reported consuming breakfast to achieve satiety, provide energy, be alert, prevent fatigue and for health reasons. Nevertheless, barriers to a healthy lifestyle and regular breakfast consumption were identified in this study. Time constraints and a lack of appetite were reasons given for skipping breakfast. Breakfast skipping was associated with students in the third year of study, smoking and intake of fast foods and take away foods. Those who skipped breakfast also followed other unhealthy lifestyle practices. In this study, a higher BMI was associated with being older and being female. Additionally, those with a worse perceived state of health had a higher BMI. A low consumption of lentils, beans, peas or soya and being on a diet, were also linked with a higher BMI. There was no relationship between breakfast consumption and BMI.

6.2 Study limitations

6.2.1 Some students were unwilling to participate in this study, as they did not want to be weighed. Some of the reasons for this included the misconception that they would be overweight or obese, were uncomfortable with removing their shoes and unwilling for others to know their weight and BMI. This is an interesting observation given the fact that the information document handed out to the students who met the inclusion criteria for the study, mentioned that confidentiality would be maintained throughout. Participants were not required to identify themselves or share their weight and height measurements with others.

6.2.2 Only those participants, who were keen to be weighed and to disclose their lifestyle habits, participated in the study. This limits the findings of this study to those students who were comfortable with being weighed and disclosing their lifestyle habits.

6.2.3 Some participants may have been dishonest in their reporting in order to give ideal responses.

6.2.4 The majority of the study sample were females and females are generally more concerned about their health, compared to males. Again, this may limit the findings of the study to those who were concerned about their health.

6.2.5 The 'Fees must Fall' protests, which affected the UKZN Westville campus, took place in the midst of data collection, thereby disrupting the data collection process.

6.3 Recommendations

6.3.1 Recommendations to the university

6.3.3.1 The university should consider providing nutritious meals free of charge or at low cost to students, particularly those on financial aid and those that reside on campus. These groups have been identified as being at risk for unhealthy dietary practices.

6.3.3.2 Facilitating a food garden for students where they can be involved in small-scale subsistence farming, is also a sustainable method of providing fresh produce to students to prepare nutritious meals.

6.3.3.3 The university should ensure that the university residences are well equipped with functioning kitchen appliances needed to effectively prepare and store food.

6.3.2 Recommendations to address breakfast consumption among students

6.3.2.1 Barriers to a healthy lifestyle including regular breakfast should be identified and addressed. The main reasons given by students in this study for skipping breakfast were a lack of time and lack of appetite. The university environment should be supportive and facilitative in promoting good diet and lifestyle practices. This could include the structuring of lecture times

such that students have a morning or mid-morning break to eat and having healthy food options available at lower cost as alternatives to unhealthy snacks, take aways and vending machines.

6.3.2.2 Furthermore, health promotion campaigns should be initiated to create awareness and prevent poor decisions, which could have negative health implications for young adults.

6.3.3 Recommendations for future research

6.3.3.1 Future research should include health science students from other South African universities to determine if the breakfast consumption is similar for all health science students.

6.3.3.2 Studies should be conducted to draw comparisons between students registered for health science qualifications compared to other disciplines. This would provide valuable insight as to the reasons for the positive health behaviour shown by participants in this study. It would also help to address the question of whether positive health behaviour is due to their interest in health and their subsequent career choice. It would also provide data on the diet and lifestyle habits of the larger university student population.

6.3.3.3 Further efforts are required to emphasise the important role of research in order to improve student participation.

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APPENDIX A: QUESTIONNAIRE

Breakfast consumption patterns of undergraduate students in the School of Health Sciences at the University of KwaZulu-Natal

This is a research project for a Master of Science in Dietetics. The breakfast consumption patterns of health science students at UKZN are being investigated.

Objectives of the study

1. To determine the breakfast consumption patterns of undergraduate health sciences students at UKZN.

2. To determine the factors that influence breakfast consumption patterns and if there is any correlation between BMI and breakfast consumption patterns.

Please answer all questions honestly and tick the appropriate column/s or fill in where necessary. Please complete ALL sections A, B and C.

SECTION A: SOCIO-DEMOGRAPHIC FACTORS

1. What is your age? Please tick the appropriate box.

17-18 years	
19-20 years	
21-22 years	
>22 years	

2. What is your race?

Black	
White	
Indian	
Colored	
Other(please specify) _____	

3. What is your gender?

Male	
Female	

4. What is your marital status?

Single	
Married	
Divorced	
Widowed	

5. Where do you live during the university term?

University residence	
Home	
Commune	
Flat/apartment away from home	
Other (please specify) _____	

6. What degree are you registered for?

7. What is your current year of study?

8. How are your studies financed? (Select ONE option only)

Self-funded	
Parent/guardian	
Bursary/scholarship	
Loan	
Financial aid	
Other (please specify) _____	

9. Are you currently employed?

Yes	
No	

10. If you are currently employed, please choose your employment type.

Part time/temporary	
Full time/permanent	

SECTION B: LIFESTYLE FACTORS

11. How would you describe your state of health?

Very poor	
Poor	
Fair	
Good	
Excellent	

12. Do you smoke?

Yes	
No	

13. Do you consume alcohol?

Yes	
No	

14. Do you do any physical activity? If yes continue below: if no, proceed to question 20.

Yes	
No	

15. How often, on average, are you involved in physical activity?

Daily	
4-6 times a week	
2-3 times a week	
Once a week	
Less than once a week	

16. What type of activity are you generally involved in? (Select ONE option only)

Strenuous (circuit weights/swimming/running/soccer/rugby)	
Moderate (gymnastics/tennis/cricket/easy cycling/rowing)	
Mild (walking)	
Other (please specify)_____	

17. How long does the activity referred to in question 16 last, on average?

Up to 30 minutes	
30-59 minutes	
1-2 hours	
>2 hours	

18. If you do physical activity in the morning, when do you consume breakfast?

Before physical activity	
After physical activity	
I do not eat breakfast at all	

19. Indicate how often you skip breakfast altogether because of your physical activity.

Never	
Rarely	
Sometimes	
Often	
Always	

SECTION C: FOOD PURCHASING AND PREPARATION FACTORS

20. Who is mainly responsible for going to the supermarket to buy your food/groceries?

Myself	
Parents/family members	
House/flat-mates	
Other (please specify)_____	

21. If you are responsible for buying your own food, how much money do you spend on your food per month?

<R200	
R200-R499	
R500-R1000	
>R1000	
I do not know	

22. Indicate which of the following appliances you have access to. Tick all that apply.

22.1 Refrigerator	
22.2 Stove	
22.3 Oven	
22.4 Microwave	
22.5 Kettle	

23. How long does it take you to get to university in the mornings?

<10 minutes	
10-30 minutes	
31-60 minutes	
>60 minutes	

24. How often in a week do you have lectures that start in the first period?

Never	
Less than 3 times per week	
Up to 3 times per week	
More than 3 times per week	

SECTION D: BREAKFAST AND DIETARY HABITS

25. Indicate which of the following meals or snacks you consume.

25.1 Breakfast	
25.2 Morning snack	
25.3 Lunch	
25.4 Afternoon snack	
25.5 Supper	
25.6 Evening snack	

26. Indicate how often you consume the following items

Food items	Never	Less often than once a week	1-3 times a week	4-6 times a week	At least daily
26.1 Dairy products such as milk/maas/yoghurt					
26.2 Fruit and vegetables					
26.3 Chicken/fish/meat products					
26.4 Lentils/beans/peas/soya					
26.5 Starches such as rice/bread/pasta/potatoes					
26.6 Biscuits/cakes/sweets/crisps/chocolates					
26.7 Coldrinks/fizzy drinks					
26.8 Butter/margarine/oil/peanut butter					
26.9 Avocado pear/nuts/seeds					
26.10 Fast food/take aways					
26.11 Sugar					

27. Do you follow any particular diet?

Yes	
No	

28. If yes, indicate what type of diet. (Select ONE option only)

Vegetarian	
Vegan	
Lacto Ovo-vegetarian	
Lacto Vegetarian	
Ovo Vegetarian	
Diabetic diet	
Energy controlled/weight reducing diet	
Low fat diet	
Other(please specify) _____	

29. Do you eat breakfast? If yes, continue below, if no, proceed to question 38

Yes	
No	

30. How often do you eat breakfast per week?

1-2 times per week	
3-6 times per week	
Daily	

31. At what time do you eat breakfast?

32. Does this time differ on the weekend? If yes, how so?

I eat earlier	
I eat later	
I eat at the same time	

33. Does this time differ on vacation? If yes, how so?

I eat earlier	
I eat later	
I eat at the same time	

34. Rate your level of fatigue (tiredness) when you have eaten and when you have not eaten breakfast. **1=Not fatigued at all, 5= Very fatigued.**

	1	2	3	4	5
34.1 When you have eaten breakfast					
34.2 When you have not eaten breakfast					

35. Rate your level of alertness when you have eaten and when you have not eaten breakfast. **1=Not at all alert, 5= Very alert**

	1	2	3	4	5
35.1 When you have eaten breakfast					
35.2 When you have not eaten breakfast					

36. What do you regularly eat for breakfast? Tick all that apply.

36.1 Ready to eat cereal/instant cereal	
36.2 Muesli	
36.3 Maize porridge	
36.4 Cereal bars	
36.5 Breakfast biscuits	
36.6 Toast	
36.7 Tea/coffee	
36.8 Fresh fruit	
36.9 Fruit juice	
36.10 Fruit smoothie	
36.11 yoghurt	
36.12 Maas/ Amahewu	
36.13 Fried/baked products such as doughnuts/ croissants/ pancakes/scones/muffins/cakes /pastries	
36.14 Rusks	
36.15 Biscuits	
36.16 Vetkoek/amagwenyas	
36.17 Eggs	
36.18 Crisps (E.g. Simba chips)	
36.19 Left overs	
36.20 Other(please specify) _____	

37. Indicate your agreement that you eat breakfast for the following reasons.

Reason	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
37.1 For health reasons					
37.2 To satisfy hunger					
37.3 To be alert and prevent fatigue					
37.4 For energy					
37.5 It is eaten together as a family					
37.6 Other (please specify) _____					

Thank you for your participation

Anthropometric data to be filled in by researcher.

	Value 1	Value 2	Value 3
Weight			
Height			

If you answered NO to question 38 proceed below.

38. Indicate your agreement that the following are reasons why you skip breakfast at times.

Reason	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
38.1 Lack of time					
38.2 Lack of appetite					
38.3 Too early to eat					
38.4 Expensive cost of foods					
38.5 Wake up too late					
38.6 Unable to prepare due to lack of facilities					
38.7 Breakfast is not important					
38.8 Other (please specify)_____					

39. If you skip breakfast, at what time is your next snack?

40. Select the types of snacks you have during the day from the list below. Tick all that apply.

40.1 Items from the vending machine/cafeteria/street vendors such as crisps/sweets/chocolates	
40.2 Fast foods/take aways	
40.3 Home made items such as a sandwich	
40.4 Biscuits/cakes/pastries/vetkoek/amagwenyas	
40.5 Fruit/vegetables	
40.6 Yoghurt	
40.7 Nuts/seeds	
40.8 Other (please specify) _____	

41. At what times do you consume the following meals?

41.1 Lunch	
41.2 Supper	

Thank you for your participation

Anthropometric data to be filled in by researcher.

	Value 1	Value 2	Value 3
Weight			
Height			

APPENDIX B: INFORMED CONSENT FORM

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Information Sheet and Consent to Participate in Research

Dear students

My name is Raeesa Seedat from the University of KwaZulu-Natal, Department of Dietetics and Human Nutrition, email address: raeesa.see@gmail.com. You are being invited to consider participating in a study that involves research on breakfast consumption patterns in undergraduate students in the School of Health Sciences at the University of KwaZulu-Natal.

Aim: To investigate the breakfast consumption patterns in undergraduate health science students at UKZN.
Objectives: To determine the breakfast consumption patterns and the factors that influence breakfast consumption patterns of undergraduate students in the School of Health Sciences at UKZN.

The study is expected to enroll approximately 340 students from UKZN, Westville. It will involve the following procedures:

- Taking your body weight, height measure and Body Mass Index (BMI)
- Filling out a questionnaire

The duration of your participation if you choose to enroll should be 15 minutes only. No follow up is required.

The study does not involve any risks or direct benefits to participants.

This study has been ethically reviewed and approved by the UKZN Biomedical research Ethics Committee (approval number_____).

In the event of any problems or concerns/questions you may contact the researcher at (provide contact details) or the UKZN Biomedical Research Ethics Committee, contact details as follows:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

Participation in this research is voluntary; you may withdraw participation at any point. In the event of refusal/withdrawal of participation no penalty will be incurred. Your confidentiality is guaranteed as your inputs will not be attributed to you in person, but reported only as a population member opinion. Any information given by you cannot be used against you, and the collected data will be used for purposes of this research only. Data will be stored in secure storage and destroyed after five years.

DECLARATION

I _____ have been informed about the study entitled Breakfast consumption patterns in undergraduate students in the School of Health Sciences by Raeesa Seedat.

I understand the purpose and procedures of the study. I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any treatment or care that I would usually be entitled to.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at raeesa.see@gmail.com.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 2604609
Email: BREC@ukzn.ac.za

_____ _____

Signature of Participant **Date**

APPENDIX C: GATEKEEPERS APPROVAL LETTER

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

9 March 2016

Ms Raeesa Seedat (SN 211506704)
School of Agricultural, Earth & Environmental Sciences
College of Agriculture, Engineering and Science
Pietermaritzburg
UKZN
Email: pillayk@ukzn.ac.za

Dear Ms Seedat

RE: PERMISSION TO CONDUCT RESEARCH

Gatekeeper's permission is hereby granted for you to conduct research at the University of KwaZulu-Natal (UKZN), towards your postgraduate studies, provided Ethical clearance has been obtained. We note the title of your research project is:

"Breakfast consumption patterns of undergraduate students in the School of Health Sciences at the University of KwaZulu-Natal".

It is noted that you will be constituting your sample by handing out questionnaires to students from the School of Health Sciences on the Westville Campus.

Please ensure that the following appears on your questionnaire/attached to your notice:

- Ethical clearance number;
- Research title and details of the research, the researcher and the supervisor;
- Consent form is attached to the notice/questionnaire and to be signed by user before he/she fills in questionnaire;
- gatekeepers approval by the Registrar.

Data collected must be treated with due confidentiality and anonymity.

Yours sincerely

MR SS MOKOENA
REGISTRAR

APPENDIX D: ETHICS APPROVAL LETTER

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

08 June 2016

Ms R Seedat (211506704)
Discipline of Dietetics and Human Nutrition
School Agriculture, Engineering Sciences
Raeesa.see@gmail.com

Protocol: Breakfast consumption patterns of undergraduate students in the School of Health Sciences at the University of KwaZulu-Natal.
Degree: MSc
***BREC reference* number:** BE280/16

The Biomedical Research Ethics Committee has considered and noted your application received on 25 April 2016.

The study was provisionally approved pending appropriate responses to queries raised. Your response received on 03 June 2016 to queries raised on 31 May 2016 have been noted and approved by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given **full ethics approval.**

This approval is valid for one year from **08 June 2016.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2015), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its meeting taking place on **12 July 2016.**

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor J Tsoka-Gwegweni
Chair: Biomedical Research Ethics Committee

cc supervisor: pillayk@ukzn.ac.za
cc postgraduate officer: higherdegrees2@ukzn.ac.za

Biomedical Research Ethics Committee
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Website: http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx