# BREAKFAST CONSUMPTION PATTERNS, KNOWLEDGE, ATTITUDE, AND PRACTICE AMONG DIETETICS AND NON-DIETETICS UTAR STUDENTS

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# BREAKFAST CONSUMPTION PATTERNS, KNOWLEDGE, ATTITUDE, AND PRACTICE AMONG DIETETICS AND NON-DIETETICS UTAR STUDENTS

By

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## ABSTRACT

### BREAKFAST CONSUMPTION PATTERNS, KNOWLEDGE, ATTITUDE, AND PRACTICE AMONG DIETETICS AND NON-DIETETICS UTAR STUDENTS

**Ho Xiao Qi**

Breakfast is widely acknowledged to be one of the most essential meals of the day. Although there are numerous advantages of breakfast consumption, breakfast is still reported as the most frequently skipped meal. This research aimed to determine the breakfast consumption patterns and knowledge, attitude, and practice (KAP) among dietetics and non-dietetics UTAR students. A cross-sectional study was conducted on 190 undergraduate students at UTAR Kampar campus by using a self-administered online questionnaire. The subjects in this study were chosen using a quota sampling method, in which there will be equal proportions of dietetics and non-dietetics students. The SPSS software was used for data analysis. The breakfast consumption between dietetics and non-dietetics students was compared using a chi-squared test. A chi-squared test was also used to analyze the KAP questionnaires and compare the KAP levels between dietetics and non-dietetics students. The means of KAP variables between dietetics and non-dietetics students were compared using an independent t-test and a Mann-Whitney test. Pearson's correlation test and Spearman's correlation test were performed to determine the relationship between KAP variables. A chi-

squared test was used to determine the association between breakfast consumption and BMI as well as academic performance. Among the 190 subjects, 66.3% of the subjects were classified as breakfast consumers whereas 33.7% of the subjects were classified as breakfast skippers. Dietetics students had a significantly higher number of breakfast consumers compared to non-dietetics students ($p=0.032$). The subjects had high knowledge levels but moderate attitude and practice levels. Between the 2 groups of dietetics and non-dietetics students, there was a significant difference in knowledge scores ($p<0.001$), attitude scores ($p=0.008$), and practice scores ($p<0.001$). There were statistically significant weak positive correlations between the KAP variables ($p<0.001$). There was no significant association between breakfast consumption with BMI ($p=0.810$). Also, there was no significant association between breakfast consumption with academic performance ($p=0.521$). The results of this study could be useful for developing interventions in the future to promote breakfast consumption among university students, thus improving their health and academic performance.

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## DECLARATION

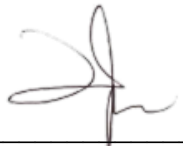
I hereby declare that this final year project report is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

HO XIAO QI

**APPROVAL SHEET**

This final year project report entitled "**BREAKFAST CONSUMPTION PATTERNS, KNOWLEDGE, ATTITUDE, AND PRACTICE AMONG DIETETICS AND NON-DIETETICS UTAR STUDENTS**" was prepared by HO XIAO QI and submitted as partial fulfillment of the requirements for the degree of Bachelor of Science (Honours) Dietetics at Universiti Tunku Abdul Rahman.

Approved by:



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**PERMISSION SHEET**

It is hereby certified that **HO XIAO QI** (ID No: **19ADB03822**) has completed this final year project report entitled "BREAKFAST CONSUMPTION PATTERNS, KNOWLEDGE, ATTITUDE, AND PRACTICE AMONG DIETETICS AND NON-DIETETICS UTAR STUDENTS" under the supervision of Dr. Farzana Athirah binti Abdul Latif from the Department of Allied Health Science, Faculty of Science.

I hereby give permission to the University to upload the softcopy of my final year project report in pdf format into the UTAR Institutional Repository, which may be made accessible to the UTAR community and public.

Yours truly,

(HO XIAO QI)

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| BMI | Body mass index |
| CGPA | Cumulative Grade Point Average |
| GPA | Grade Point Average |
| KAP | Knowledge, attitude, and practice |
| SPSS | Statistical Packages for Social Sciences |
| TEE | Total energy expenditure |
| WHO | World Health Organization |

# CHAPTER 1

# INTRODUCTION

## 1.1 Research background

Breakfast is widely acknowledged to be one of the most essential meals of the day. Breakfast is normally consumed within two hours after waking up, before or when daily activities began, and usually before 10.00 a.m. It is the first meal of the day which contains 20% to 35% of calories of the total daily energy requirements (Timlin and Pereira, 2007). Besides, different countries have different types of breakfast which largely depends on their cultures and living habits. Most Western countries consume cereal, toast, pastries, bacon, eggs, orange juice, and coffee for breakfast. However, grain and cereal products such as rice and noodles serve as the major staples for breakfast in Asian countries. For instance, Chinese prefer youtiao served with congee or warm soy milk for breakfast; Japanese prefer rice with grilled fish and miso soup; Korean prefer rice with tofu or cabbage soup and kimchi; and Malaysians prefer nasi lemak for breakfast (Howden, et al., 1993). This indicates the difference in the types of breakfast consumed by different countries in which Western countries prefer bread whereas Asian countries prefer rice for breakfast.

There are substantial studies that reported the potential benefits of breakfast consumption for individuals including children, adolescents, and adults. Regular consumption of breakfast contributes to the improvement of overall nutritional status, in which breakfast consumers will have a higher intake of micronutrients

such as dietary fiber, iron, folate, calcium, phosphorus, vitamin B2, C, and D (Pereira, et al., 2018; Uzhova, et al., 2018). Concurrently, skipping breakfast can cause poor academic performance as well as increase the risk of chronic degenerative diseases such as obesity, type 2 diabetes mellitus, hypertension, and metabolic syndrome (Odegaard, et al., 2013; Unal, et al., 2017; Chawla, et al., 2019). According to Karim, et al. (2021), breakfast consumption can positively affect academic performance among Malaysian university students. Furthermore, a study conducted by Tee, et al. (2018) reported that there is an association between breakfast consumption and body mass index (BMI).

Although there are numerous advantages of breakfast consumption, breakfast is still reported as the most frequently skipped meal (Pendergast, et al., 2016). In Malaysia, a moderately high prevalence (31.8%) of breakfast skipping among university students is reported in a study conducted by Jayaveloo, Daud and Rahman (2021). In addition, changes in the environment of university students, in which from staying with parents at home to living alone at the hostel, cause them to practice unhealthy dietary behaviours, including breakfast skipping. Several studies reported that university students tend to skip breakfast due to insufficient time for preparing or consuming breakfast (Chawla, et al., 2019; Mansouri, et al., 2020; Jayaveloo, Daud and Rahman, 2021).

## 1.2 Problem statement

In the modern sophisticated era, the rate of obesity has increased substantially, causing it to be one of the greatest worldwide health hazards. According to a recent estimate by the World Health Organization (WHO) (2022), there are over 1 billion obese people worldwide. A recent statistic shows that Malaysia has the highest prevalence of obesity, which is 15.6%, in the ASEAN region in 2019 (Ganbold, 2021). One of the main causes of this alarming trend is unhealthy dietary habits and lifestyles. Previous studies have established that skipping breakfast is associated with an increased risk of overweight and obesity (Mathiyalagen, et al., 2019; Mansouri, et al., 2020). However, skipping breakfast is a quite common habit among university students these days.

A recent study conducted by Jayaveloo, Daud and Rahman (2021) declared that general Malaysian university students have moderate levels of overall knowledge, attitude, and practice (KAP) scores on breakfast consumption. However, this study only assessed the KAP level among general university students in Malaysia instead of students studying specific courses such as dietetics students. There may be a significant difference in the result when assessing the KAP among dietetics students as they may have a better knowledge of nutrition and tend to practice a healthier dietary lifestyle. Although it ought to know that medical students have better knowledge and consciousness of healthy dietary behaviours compared to non-medical students, they still practice unhealthy dietary habits such as skipping breakfast (Alghamdi, et al., 2021). Hence, it is indeed important to determine the breakfast consumption patterns and KAP among university students. To the best of our

knowledge, although a considerable body of research has been carried out on this topic, there is a paucity of studies that examine the breakfast consumption patterns and KAP among dietetics and non-dietetics students specifically, and a complete absence of studies in Malaysia.

Furthermore, the extent to which breakfast consumption is associated with BMI and academic performance has remained controversial. Some studies have shown that breakfast consumption is associated with lower body weight, BMI, as well as the risk of being overweight and obese (Halib, Qian and Suan, 2018; Tee, et al., 2018) whereas others failed to find any significant association (Seedat and Pillay, 2020; Yamamoto, et al., 2021). In terms of academic performance, recent studies reported that the consumption of breakfast is positively associated with academic performance (Adolphus, Lawton and Dye, 2019; Gao, Zhao and Shu, 2021). However, a study conducted by Soheilipour, Salehiniya and Pishgahroudsari (2019) did not find an association between breakfast consumption and academic performance. Currently, more focus is being placed on health status, in particular, BMI, as well as the academic performance of university students. Since there is not yet enough agreement as the findings are conflicting, this study focuses on the breakfast consumption patterns and KAP among dietetics and non-dietetics UTAR students, as well as the association between breakfast consumption patterns with BMI and academic performance.

## 1.3 Objectives

The general objective of this research project is to determine the breakfast consumption patterns and knowledge, attitude, and practice (KAP) among dietetics and non-dietetics UTAR students. The specific objectives are as follows:

1. To investigate the breakfast consumption patterns among dietetics and non-dietetics UTAR students.
2. To determine the KAP of breakfast consumption among dietetics and non-dietetics UTAR students.
3. To examine the association between breakfast consumption with BMI among UTAR students.
4. To examine the association between breakfast consumption with academic performance among UTAR students.

## 1.4 Research hypothesis

1. $H0_A$: There is no significant difference in breakfast consumption patterns between dietetics students and non-dietetics students.

   $H1_A$: There is a significant difference in breakfast consumption patterns between dietetics students and non-dietetics students.
2. $H0_B$: There is no significant difference in breakfast consumption KAP levels between dietetics students and non-dietetics students.

   $H1_B$: There is a significant difference in breakfast consumption KAP levels between dietetics students and non-dietetics students.

3. $H0_C$: There is no significant association between breakfast consumption with BMI among UTAR students.

   $H1_C$: There is a significant association between breakfast consumption with BMI among UTAR students.

4. $H0_D$: There is no significant association between breakfast consumption with academic performance among UTAR students.

   $H1_D$: There is a significant association between breakfast consumption with academic performance among UTAR students.

## 1.5 Significance of the study

The practice of healthy dietary habits such as breakfast consumption is still low among university students (Tok, Ahmad and Koh, 2018). Alissa, et al. (2015) suggested that healthy dietary habits are more crucial among healthcare students as they are more likely to be involved in a health science career in the future. If they choose not to live a healthy lifestyle themselves, they have a greater likelihood to fail in convincing their patients to have a healthy lifestyle. Since there is no research carried out to determine the breakfast consumption patterns and knowledge, attitude, and practice (KAP) among dietetics and non-dietetics students specifically, this study may be useful for future interventions in increasing awareness and encouraging breakfast consumption to bridge the gap between the knowledge and effective practice of breakfast consumption among university students, especially dietetics students. This is likely because dietetics students may have better nutrition knowledge compared to other healthcare students such as medical students, and thus are more likely to practice healthy dietary habits.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Breakfast

### 2.1.1 Definition of breakfast

Different research studies provide different definitions of breakfast in different aspects, such as time of consumption, frequency of consumption per week, timing related to waking up and carrying out daily activities, amount of energy or calories provided by the breakfast, or types of food and beverage consumed during breakfast. According to Timlin and Pereira (2007), breakfast is referred to as the first meal of the day which is consumed within two hours after waking up and normally before 10.00 a.m. It is consumed before or when daily activities are carried out. Timlin and Pereira (2007) also stated that breakfast contributes 20% to 35% of calories of the total daily energy requirements. Besides, Adolphus, Lawton and Dye (2019) declared that breakfast contributes at least 5% of total energy expenditure (TEE) and is also consumed before 10.00 a.m. on school days. Dubois, et al. (2009) defined breakfast as the first meal which is consumed between 6.00 a.m. and 9.00 a.m. On the other hand, several studies reported that breakfast is consumed between 5.00 a.m. and 10.00 a.m. on weekdays whereas 5.00 a.m. and 11.00 a.m. on weekends (Barton, et al., 2005; Albertson, et al., 2009). In addition, O'Neil, et al. (2014) defined breakfast as the first meal of the day that stops starvation after the longest duration of sleep. It can be consumed anywhere within 2 to 3 hours after waking up and includes food or beverage from one food group or more (O'Neil, et al., 2014). In

conclusion, breakfast was defined as the first meal of the day which is consumed within two hours after waking up and normally before 10.00 a.m.

In the aspect of breakfast skipping, different definitions are provided by different research studies. Several studies defined breakfast skipping as not consuming breakfast at least once per week or consuming breakfast less than 7 days per week (Sjoberg, et al., 2003; Cheng, et al., 2008; Dubois, et al., 2009). Furthermore, Smith, et al. (2013) claimed that those who seldom or never eat breakfast and those who eat breakfast 2 days or less per week are classified as breakfast skippers. Timlin, et al. (2008) stated that breakfast skippers refer to those who skip breakfast 6 days or more per week. Besides, Berkey, et al. (2003), and Videon and Manning (2003) had a similar definition for breakfast skippers which is those who normally skip breakfast, nearly never, or never eat breakfast at all. On the other hand, several studies provide totally different definitions of breakfast skipping compared to previous studies, in which previous studies defined breakfast skipping in terms of frequency of consumption. Keski-Rahkonen, et al. (2003) stated that breakfast skipping is characterized as not consuming a meal at home in the morning. Moreover, Nicklas, et al. (2000) and Deshmukh-Taskar, et al. (2013) defined breakfast skipping as not consuming breakfast on the dietary survey day.

### 2.1.2 Prevalence of breakfast consumption

There are several cross-sectional studies conducted in other countries to study the prevalence of breakfast consumption and breakfast skipping among

university students. Several studies reported a high prevalence of breakfast skipping among university students in countries such as India, Iran, Saudi Arabia, Ghana, and South Africa, which varies from 42% to 95.1% (Ackuaku-Dogbe and Abaidoo, 2014; Gresse, Steenkamp and Pietersen, 2015; Mathiyalagen, et al., 2019; Mirghani, et al., 2019; Abdelhafez, et al., 2020; Mansouri, et al., 2020). However, several studies reported a low prevalence of breakfast skipping among universities students in South Africa, China, and Mexico, which varies from 6.8% to 31% (Sun, et al., 2013; Van den Berg, et al., 2013; Samano, et al., 2019; Seedat and Pillay, 2020). Furthermore, among school children and adolescents, breakfast skipping is common with a prevalence rate varying from 9.5% to 68% (Thompson-McCormick, et al., 2010; Adolphus, Lawton and Dye, 2019; Soheilipour, Salehiniya and Pishgahroudsari, 2019; Abebe, et al., 2022; Sincovich, et al., 2022).

On the other hand, studies over the past two decades have provided important information on the prevalence of breakfast consumption in Malaysia. In Malaysia, several cross-sectional studies have reported that breakfast is skipped most frequently among school children and adolescents aged 6 to 19 years old, with the prevalence of skipping breakfast varying from 10% to 78% (Moy, Gan and Mohd Kassim, 2006; Chin and Mohd, 2009; Law, Mohd Nasir and Hazizi, 2013; Nurul-Fadhilah, et al., 2013; Hui-Chin, Jalil, and Ruzita, 2015; Halib, Qian and Suan, 2018; Tee, et al., 2018; Mustafa, et al., 2019). Furthermore, three cross-sectional studies were conducted to study the prevalence of breakfast consumption among university students in Malaysia. Chawla, et al. (2019) reported that 61.8% of undergraduate dental students were breakfast consumers

with 38.2% being breakfast skippers. Jayaveloo, Daud and Rahman (2021) stated that 68.2% of students consumed breakfast in a week whereas 31.8% of students skipped breakfast in a week. Besides, Moy, et al. (2009) declared that 70.8% of undergraduates consumed breakfast whereas 29.2% of undergraduates skipped breakfast. Moreover, Isa and Masuri (2011) claimed that 76% of university students consumed breakfast on the data collection day whereas 24% of university students did not consume breakfast.

### 2.1.3 Factors affecting breakfast consumption

University students, especially those who just started to study at universities, will experience the significant transition from living at home with their parents to living independently on their own. In this case, there will be extreme alterations in their environment as well as resources (Wengreen and Moncur, 2009). They will not be under their parent's supervision, and they need to prepare their meal themselves. Thus, university students tend to practice unhealthy dietary behaviours such as skipping breakfast. Lupi, et al. (2015) have shown that students have healthier dietary habits when they live with their parents compared to living alone. Furthermore, there are several factors that affect the consumption of breakfast among university students. Several studies concluded that lack of time in terms of preparing or consuming breakfast is the major barrier to the consumption of breakfast among university students (Chawla, et al., 2019; Mansouri, et al., 2020; Jayaveloo, Daud and Rahman, 2021). Jayaveloo, Daud and Rahman (2021) also claimed that university students skip breakfast due to their classes starting very early in the morning as well as limited breakfast choices. Moreover, Hearst, et al. (2016) and Chawla,

et al. (2019) reported that lack of appetite or feeling of hunger is one of the reasons university students skip breakfast. In addition, a lack of knowledge regarding the advantages of breakfast consumption may result in breakfast skipping among university students (Mansouri, et al., 2020).

### 2.1.4 Advantages of breakfast consumption

There is a growing body of literature investigating the potential benefits of breakfast consumption. Regular consumption of breakfast has been reported in contributing to positive outcomes among children, adolescents, and adults. Breakfast consumption can improve overall nutritional status among university students and adults. Pereira, et al. (2018) and Uzhova, et al. (2018) observed that breakfast contributes to higher intakes of micronutrients such as dietary fiber, calcium, phosphorus, iron, folate, vitamin B2, C, and D as well as lower intakes of dietary fats and sodium. Breakfast consumers have a higher intake of proteins, vitamins, and minerals compared to breakfast skippers, resulting in a lower risk of nutritional deficiency or malnutrition (Mathiyalagen, et al., 2019; Sangwanna and Thongprasert, 2019).

Furthermore, frequent consumption of breakfast can reduce the risk of developing chronic degenerative diseases such as obesity, type 2 diabetes mellitus, hypertension, and metabolic syndrome (Odegaard, et al., 2013). Nicklas, et al. (2003) reported that breakfast skippers are likely to increase energy intake by consuming more food, especially foods that are high in fat and density for other meals of the day due to the increased feeling of hunger. Hence,

breakfast consumption helps to improve the control of appetite and blood glucose, thus reducing the risk of obesity and type 2 diabetes mellitus (Pereira, et al., 2011). A study conducted by Leidy and Racki (2010) concluded that consumption of dietary protein-rich breakfast can provide additional benefits by enhancing satiety as well as reducing appetite and intake of following meals. In addition, obesity may cause changes in the structure of the brain, thus decreasing memory and cognitive functions. Hence, So (2013) declared that there is a positive correlation between the consumption of breakfast and academic performance as breakfast skipping is associated with obesity. In addition, Unal, et al. (2017) and Chawla, et al. (2019) concluded that regular breakfast consumption has positive effects on academic performance, specifically resulting in better Grade Point Average (GPA) or Cumulative Grade Point Average (CGPA) scores. Also, several studies have reported that intake of breakfast is associated with high academic performance among students (Javaid and Munir, 2018; Rehman, et al., 2018; Pengpid and Peltzer, 2020).

## 2.2 Breakfast consumption patterns

### 2.2.1 Time of breakfast consumption by university students

The timing of breakfast consumption is more important than the type of food consumed during breakfast as foods that are normally consumed for breakfast differ extensively across cultures (Mustafa, et al., 2019). In the aspect of the timing of breakfast consumption, it is suggested to consume breakfast regularly earlier in the day, specifically in the morning. This suits the circadian rhythms in metabolism better, in which the food consumed can be processed more

effectively in the body. This is supported by two acute randomized crossover experiments which were carried out among adults. Bandin, et al. (2015) and Bo, et al., (2015) have shown that delayed breakfast consumption is negatively associated with appetite control, fasting lipid profiles, glucose tolerance, postprandial insulin sensitivity, and resting energy expenditure. Moreover, delayed breakfast consumption can cause delayed consumption of other meals in the day. This eating pattern is known as eating jet lag. A cross-sectional study conducted by Zeron-Rugerio, et al. (2019) has confirmed that eating jet lag is positively associated with BMI, in which the greater the eating jet lag, the higher the BMI.

In the aspect of the average time of breakfast consumption among university students in Malaysia, Jayaveloo, Daud and Rahman (2021) declared that most (64.4%) of Malaysian university students commonly consume their breakfast between 8 a.m. to 10 a.m. whereas least (10.4%) of them consume breakfast before 8 a.m. In addition, 25.3% of Malaysian university students consume breakfast after 10 a.m. Jayaveloo, Daud and Rahman (2021) commented that the time of breakfast consumption may depend on the time of university students' classes.

### 2.2.2 Amount of money spent on breakfast by university students

A study conducted by Jayaveloo, Daud and Rahman (2021) showed that most (55.6%) of Malaysian university students usually spent RM2 to RM5 on breakfast, followed by RM2 and below (33.1%). Malaysian university students

seldom spent RM5 and above on breakfast. The amount of money spent on breakfast by university students may greatly depend on their daily budget for food and their monthly allowance. Jayaveloo, Daud and Rahman (2021) reported that almost half of Malaysian university students have a monthly allowance of RM500 and below whereas a small number of Malaysian university students have more than RM1000 monthly allowance. Hence, their daily budget for food will be adjusted based on their monthly allowance, in which most of Malaysian university students set their daily budget for food in a range of RM5 to RM15 (Jayaveloo, Daud and Rahman, 2021). However, frankly speaking, the amount of money spent on breakfast by Malaysian university students is considered quite low as the normal price for breakfast provided outside the university will be commonly more than RM5.

### 2.2.3 Place or setting of breakfast consumption by university students

According to Jayaveloo, Daud and Rahman (2021), a large portion of Malaysian university students commonly have their breakfast at the cafeteria in college or faculty. Most of them also consume breakfast at their home or hostel. However, a minority of Malaysian university students consume their breakfast at restaurants, food stalls, or fast food restaurants. The place or setting of breakfast consumption by university students may depend on the availability of time and convenience. Since students may be in a rush to attend classes, they may prefer to have their breakfast at a place which they feel the most convenient such as cafeteria or hostel. In addition, Awang Damit, Rahman and Ahmad (2019) also reported that half of the Universiti Brunei Darussalam students consume their breakfast at home.

### 2.2.4 Types of breakfast consumed by university students

Regarding the types of food that university students had for breakfast, it largely depends on their cultures and living habits. Different types of breakfast were consumed by university students from different countries. Cereals, milk, and fruits were the most common foods consumed for breakfast in most Western countries. Diaz-Torrente and Quintiliano-Scarpelli (2020) indicated that Chilean university students consume dairy (66.5%), cereals (76%), and fruits (31.5%) for breakfast. Besides, dairy products (92.6%), cereals (58.8%), and sweet food (57.9%) are reported as common breakfast foods consumed by Spanish university students (Trave, 2013).

However, most Asian countries consume grain and cereal products such as rice and noodles for breakfast. Awang Damit, Rahman and Ahmad (2019) reported that 66% of Universiti Brunei Darussalam students usually consume bread for breakfast, followed by rice-based food (38.1%), cereal (36.7%), noodles-based food (34.9%), and fruits or vegetables (14.1%). Apart from that, a study conducted by Sundaram, Ghazi and Elnajeh (2018) has noted that the common foods consumed by Malaysian university students are cereal, bread, biscuit, noodles, and rice. In this study, bread and biscuits were the most prevalent choice of food for breakfast, with 46.6% of Malaysian university students consuming bread or biscuits for breakfast. Cereal and noodles or rice were preferred by 25.2% and 21.1% of university students in Malaysia, respectively.

The choices of food for breakfast may largely depend on its cost as well as the ease of obtaining and consuming it.

## 2.3 Breakfast consumption knowledge, attitude, and practice (KAP)

This section reviews the literature related to breakfast consumption knowledge, attitude, and practice (KAP). A recent study conducted by Jayaveloo, Daud and Rahman (2021) reported that the overall KAP scores on breakfast consumption were still at moderate levels among university students in Malaysia. The knowledge score on breakfast consumption was 64.2% ± 21.1, the attitude score was 68.8% ± 10.5, and the practice score was 51.1% ± 23.1.

In this context, a series of studies have examined the KAP on dietary habits among medical students. Alghamdi, et al. (2021) claimed that medical students had better knowledge and idea of healthy dietary behaviours compared to non-medical students. Although it is expected that medical students have better knowledge and awareness of healthy dietary habits and lifestyles compared to non-medical students, the application of this knowledge to their daily life is still lacking. Several studies have proved that medical students practice unhealthy dietary habits such as skipping meals namely breakfast, despite their high knowledge and awareness of healthy dietary habits (Sajwani, et al., 2009; Alissa, et al., 2015; Alghamdi, et al., 2021; Jayaveloo, Daud and Rahman, 2021). Al-Qahtani (2016) stated that there is a high percentage of medical students consuming a lot of unhealthy foods such as fast food and soft drinks. This indicates that good nutrition knowledge may not be reflected in daily practices.

However, previous studies have almost exclusively focused on the KAP on dietary habits among medical students. There is no study to date that has examined the KAP on breakfast consumption among dietetics students specifically.

## 2.4 Association between breakfast consumption with BMI

Body mass index (BMI) is a screening tool to evaluate the body fat of females and males at any age based on their height and weight (Centers for Disease Control and Prevention, 2022). BMI can be calculated by dividing the body weight (in kilograms) by height (in meters) squared. The formula can be written as follows:

$$BMI\ (kg/m^2) = \frac{weight}{height^2}$$

According to the WHO, BMI can be classified into several categories including underweight, normal weight, overweight, and obesity. The cut-off points for BMI categories in general populations can cause an underestimation of obesity risk in Asian populations as there are differences in their respective dietary and lifestyle habits that may cause obesity. Hence, slight changes have been done to the BMI classification for Asian populations. BMI is categorized according to WHO and Asian-Pacific BMI classification (Lim, et al., 2017).

**Table 2.1:** Classification of BMI.

| **Classification** | **BMI for general populations based on WHO ($kg/m^2$)** | **BMI for Asian populations based on Asia-Pacific ($kg/m^2$)** |
|---|---|---|
| Underweight | < 18.5 | < 18.5 |
| Normal weight | 18.5 - 24.9 | 18.5 - 22.9 |
| Overweight | 25 - 29.9 | 23 - 24.9 |
| Obese | ≥ 30 | ≥ 25 |

BMI is inexpensive and relatively easy to perform as the calculation only requires the height and weight of the subject. However, BMI does not measure body fat directly. It only can estimate body fat in males and females of any age (Centers for Disease Control and Prevention, 2022). Also, BMI does not provide direct and exact information on health status. For instance, certain populations such as athletes or bodybuilders may have an increased BMI due to their increased muscle mass, causing their body weight to wrongly increase their BMI (Weir and Jan, 2019). It does not indicate that they are overweight or obese although they are having a high BMI. Despite the limitations of BMI, it is still widely used to evaluate overweight and obesity, especially among normal individual populations.

There have been reports of plausible findings establishing that breakfast consumption is associated with a reduced risk of overweight and obesity as well

as lower BMI among university students (Mathiyalagen, et al., 2019; Mansouri, et al., 2020). Moreover, several studies further highlighted that skipping breakfast is correlated to an increased risk of overweight and obesity, higher BMI, and higher waist circumference among children and adolescents (Ayranci, Erenoglu and Son, 2010; Deshmukh-Taskar, et al., 2010; Szajewska and Ruszczynski, 2010; Thompson-McCormick, et al., 2010). In Malaysia, several cross-sectional studies have reported that regular breakfast consumption is associated with a decreased risk of overweight and obesity among children and adolescents (Nurul-Fadhilah, et al., 2013; Halib, Qian and Suan, 2018; Tee, et al., 2018).

A recent study conducted by AlFaris, et al. (2022) reported that skipping breakfast is associated with appetite changes, increased hunger, and decreased satiety. This can lead to subsequent overeating throughout the day and impaired insulin sensitivity. In contrast, breakfast consumption helps in controlling and regulating appetite, as well as improving insulin sensitivity and blood glucose response in the subsequent meal. In addition, a randomized controlled trial that was conducted by Chowdhury, et al. (2016) has declared that in comparison to skipping breakfast that leads to increased calorie intake later in the day, daily breakfast consumption increases considerable physical activity in obese individuals during the morning.

However, there appear to be discrepancies between some of the reported observations on the association between breakfast consumption and BMI. Two

recent studies claimed that breakfast consumption is not associated with BMI or risk of overweight and obesity among university students (Seedat and Pillay, 2020; Yamamoto, et al., 2021). In Malaysia, a cross-sectional study conducted by Karim, et al. (2021) reported that there is no association between breakfast consumption and BMI among university students.

## 2.5 Association between breakfast consumption with academic performance

Academic performance is measured by Cumulative Grade Point Average (CGPA) points, which is commonly used in Malaysian universities. Academic performance indicates how well students have met their short-term or long-term educational goals (Tadese, Yeshaneh and Mulu, 2022). Good academic performance is associated with higher pay, a higher chance of being promoted, and greater employment advantages. Additionally, students who are successful in their academics are more likely to be socially inclined as well as having greater levels of self-confidence and self-esteem, and lower levels of anxiety and despair (Tadese, Yeshaneh and Mulu, 2022). There are several factors affecting academic performance among students, for instance, an uncomfortable learning environment, learning infrastructure and resources, family background, performance pressure, information overload, difficulty in understanding, loss of interest, and unhealthy lifestyle (Rachh, 2022). An unhealthy lifestyle such as skipping breakfast can negatively affect academic performance.

There have been numerous studies investigated the association between breakfast consumption and academic performance among university students. Several studies reported that breakfast skipping is correlated to fatigue, poor attention, and significantly lower GPA (Ackuaku-Dogbe and Abaidoo, 2014; Reuter, Forster and Brister, 2021). Furthermore, a recent study conducted by Karim, et al. (2021) declared that breakfast consumption has positive effects on academic performance and cognitive skills among Malaysian university students. In addition, previous studies showed that the consumption of breakfast is positively associated with academic performance among adolescents in which breakfast consumers can have higher academic performance (So, 2013; Adolphus, Lawton and Dye, 2019; Gao, Zhao and Shu, 2021). Regular breakfast consumption is also associated with reduced mental distress as well as improved attention and memory, thus leading to high academic performance among children and adolescents (Lien, 2007; Wesnes, Pincock and Scholey, 2012).

A recent study conducted by Gao, Zhao and Shu (2021) has reported an association between breakfast consumption and academic performance. Gao, Zhao and Shu (2021) stated that students who skipped breakfast can easily lose their focus and concentration as well as reduce their motivation in class due to hunger as a result of skipping breakfast. Hence, this will significantly decrease the effective learning time in class, leading to an expected drop in their academic achievement if the situation continues for long periods of time. Besides, prolonged breakfast skipping can lead to malnutrition, causing the learning ability and performance of students to be decreased. Therefore, breakfast consumption can relieve hunger, improve students' focus and concentration in

class, as well as increase the learning motivation of students, thus improving their academic performance (Gao, Zhao and Shu, 2021).

However, a limited number of studies have reported contradictory results on the association between breakfast consumption and academic performance. According to Soheilipour, Salehiniya and Pishgahroudsari (2019), there was no significant association between breakfast consumption and academic status among elementary school students. In contrast, students who have incomplete breakfast consumption have a higher percentage of scoring an excellent score compared to students who consumed a full breakfast.

# CHAPTER 3

# METHODOLOGY

## 3.1 Introduction

This is a cross-sectional study carried out between 1st December 2022 to 31st January 2023 at UTAR, Kampar campus after the protocol was received and approved by the UTAR Scientific and Ethical Review Committee.

## 3.2 Study design

A cross-sectional study was used to determine the breakfast consumption patterns and knowledge, attitude, and practice (KAP) among dietetics and non-dietetics Universiti Tunku Abdul Rahman (UTAR) Kampar students. A cross-sectional study analyses the information about a population at a single and specific point in time. Hence, it only shows associations instead of causal relationships (Wang and Cheng, 2020). In this case, this cross-sectional study assessed the prevalence of breakfast consumption, students' breakfast consumption patterns, and the association between breakfast consumption and BMI as well as academic performance. Cross-sectional studies are commonly rapid and cheap to perform (Wang and Cheng, 2020).

## 3.3 Study location

This study was conducted on the Universiti Tunku Abdul Rahman (UTAR) Kampar campus.

## 3.4 Ethical consideration and approval

The study obtained ethical approval from the UTAR Scientific and Ethical Review Committee (Appendix A). The cover page of the questionnaire contained information about the study, including an explanation of voluntary participation. Subjects who agreed and volunteered to participate were required to sign consent forms, while subjects who did not wish to participate could withdraw from the study by informing the researcher. All sampling procedures adhered to the Personal Data Protection Act 2010 (PDPA). To maintain anonymity and confidentiality, the subjects' responses were kept confidential. The personal information of the subjects would not be disclosed.

## 3.5 Sampling

### 3.5.1 Type of sampling

A quota sampling method was applied in this research study to recruit subjects from the UTAR Kampar campus. The quota sampling method is a non-probability sampling method that involves the selection of a predetermined proportion of sample units, which is called a quota. The population was divided into dietetics and non-dietetics students in equal proportions. The recruitment of samples was continued until the 50% quota for each subgroup was reached.

### 3.5.2 Subject recruitment

Subjects were recruited via direct approaches and voluntary participation through social media platforms such as WhatsApp, Microsoft Team, Instagram, Facebook, and others. Subjects who fulfilled the inclusion criteria and were not in the exclusion criteria were included in the survey. After obtaining consent from subjects, they responded to self-administered online questionnaires for the data collection on social demographic, breakfast consumption patterns, and breakfast consumption KAP.

### 3.5.3 Inclusion and exclusion criteria

Subjects were included students from Universiti Tunku Abdul Rahman (UTAR) Kampar campus, Malaysian citizen, pursuing undergraduate degree program, healthy with no history of chronic disease, and willing to participate. Students who are currently fasting due to religious festivals, and with a medical diagnosis of chronic diseases such as diabetes, cardiovascular disease, and hypertension were all excluded.

**Table 3.1:** Inclusion and exclusion criteria.

| Inclusion Criteria | Exclusion Criteria |
|---|---|
| 1. From Universiti Tunku Abdul Rahman (UTAR) Kampar<br>2. Malaysian citizen<br>3. Pursuing undergraduate degree program<br>4. Healthy with no history of chronic disease<br>5. Willing to participate | 1. Currently fasting due to religious festivals<br>2. With a medical diagnosis of chronic diseases |

### 3.5.4 Sample size

The current study targeted undergraduate students on UTAR (Kampar) campus. Cochran's (1977) formula was used to calculate the sample size of this study. Cochran's formula is shown below:

$$n_0 = \frac{z^2 \times p\,(1 - p)}{e^2}$$

Where $n_0$ refers to sample size; $z^2$ refers to the chosen critical value of the desired level of confidence; $p$ refers to the maximum variability of the population, and $e$ refers to the margin of error.

In the present study, a 95% confidence level was used, which corresponds to a z-score of 1.96. Although there is a large population of undergraduate students

at UTAR Kampar campus, the variability of the population is unclear. To account for this uncertainty, a maximum population variability was assumed to be 50%, which was 0.5. Due to limitations in resources and time when conducting this research, the margin of error in this study was set to ±8. Hence, the calculation was as follows:

$$n_0 = \frac{(1.96)^2 \times 0.5\,(1 - 0.5)}{0.08^2} = 150.06 \approx 150$$

The calculated sample size was further increased 10% for non-response rate and to minimize any error during data collection:

$$n_0 = 150 \times \frac{110}{100} = 165 \approx 170$$

Since a quota sampling method was applied, the samples were in equal proportions which is 50% was dietetics students while the other 50% was non-dietetics students. Hence, the minimum total sample size required for this study was 170, in which 85 of the samples were dietetics students and the other 85 samples were non-dietetics students. In the current study, 190 responses were collected, in which 95 of them were dietetics students whereas the remaining 95 of them were non-dietetics students.

## 3.6 Data collection

### 3.6.1 Questionnaire

Data was collected through a self-administered online questionnaire (Appendix C). The questionnaire compromised 3 sections, which are Section A: Social

demographic data, Section B: Breakfast consumption patterns, and Section C: Breakfast consumption knowledge, attitude, and practice (KAP). The questionnaire was adopted and adapted from a local study by Jayaveloo, Daud and Rahman (2021). This questionnaire was already being validated by the researcher. The Cronbach alphas for KAP in this questionnaire were 0.722, 0.705, and 0.784 respectively, which were all in the acceptable range (Jayaveloo, Daud and Rahman, 2021).

### 3.6.2 Social demographic data

This section obtained the personal details of the subjects such as gender, age, race, academic year of study, course programme, daily budget for food, monthly allowance, financial status, and living arrangement. Besides, the self-reported body weight and height of the subjects were collected to obtain the body mass index (BMI) of the subjects. The BMI of the subjects were calculated by using the following formula:

$$BMI\ (kg/m^2) = \frac{weight}{height^2}$$

BMI was categorized according to the Asian-Pacific BMI classification (Lim, et al., 2017).

**Table 3.2:** Classification of BMI based on Asia-Pacific.

| **Classification** | **BMI (kg/m$^2$)** |
|---|---|
| Underweight | < 18.5 |
| Normal weight | 18.5 - 22.9 |
| Overweight | 23 - 24.9 |
| Obese | ≥ 25 |

Furthermore, the academic performance of the subjects was determined by Cumulative Grade Point Average (CGPA) points, which is commonly used in Malaysian universities. The self-reported CGPA were collected from the subjects. The CGPA used was based on the current CGPA of the subjects. In the current study, the subjects were graded using a 4.00-point scale. Subjects were categorized as "good academic performance" with a grade point being 3.00 and above, whereas "poor academic performance" with a grade point being below 3.00 (Mat Ludin, 2016).

### 3.6.3 Breakfast consumption patterns

In this section, the breakfast consumption patterns of the subjects were collected in terms of their frequency of breakfast consumption in a week, time of breakfast consumption, amount of money spent on breakfast, location to consume breakfast, and having breakfast with whom. In this study, breakfast was defined as the first meal of the day which is consumed within two hours after waking up and normally before 10.00 a.m., which was similar to the definition of breakfast used in the study conducted by Timlin and Pereira (2007). In this study, the

classification of breakfast consumers and breakfast skippers were classified based on the subjects' frequency of breakfast consumption, which was similar to a study conducted by Smith, et al. (2013). Subjects who consume breakfast for 3 days or more were classified as "breakfast consumers" whereas subjects who consume breakfast for 2 days or less were classified as "breakfast skippers".

The questions in this section, which were adopted from Jayaveloo, Daud and Rahman (2021) were adjusted to be more matchable for the objective of this study. In the questionnaire by Jayaveloo, Daud and Rahman (2021), a question "Are you a breakfast consumer?" was asked. This question was removed from this study as it might be confusing for the subjects to classify themselves whether they are breakfast consumers. Hence, this study classified subjects into two groups which are "breakfast consumers" and "breakfast skippers" based on the classified frequency of breakfast consumption of the subjects. Subjects only need to provide their frequency of breakfast consumption, and they did not need to classify themselves. In this case, for the question "frequency of breakfast consumption in a week", this study adjusted the category for the multiple-choice questions from "0-1, 2-3, 4-5, 6-7 times" to "0-2, 3-5, 6-7 times". This adjustment was made for the ease of data analysis as the classification of "breakfast consumers" and "breakfast skippers" groups was based on the frequency of breakfast consumption, which was set by Smith, et al. (2013). Besides, for the time of breakfast consumption, the choice of "after 10.00 a.m." was removed. This is because there will be a contradiction as the definition of breakfast in this study is a meal consumed normally before 10.00 a.m.

### 3.6.4 Breakfast consumption knowledge, attitude, and practice

This section was further divided into three parts. Part A assessed the breakfast consumption knowledge of the subjects; Part B assessed the breakfast consumption attitude of the subjects; Part C assessed the breakfast consumption practice of the subjects. There were 13 questions for Part A, 11 questions for Part B, and 10 questions for Part C. Part A used multiple choice questions with options of "True", "Not sure", and "False". For Part A, 2, 1, and 0 marks were given for the correct, not sure, and wrong answers, respectively. Therefore, the maximum score for Part A was 26 marks. On the other hand, both Part B and C used Likert scales that range from "Strongly agree", "Agree", "Not sure", "Disagree", and "Strongly disagree". For both Part B and C, 4 marks were given for the most ideal answers, 2 marks for the not sure answers, and 0 marks for the non-ideal answers. Hence, the maximum score for Part B was 44 marks whereas Part C was 40 marks. The total score in each part was scored and categorized based on Jayaveloo, Daud and Rahman (2021), in which less than 40% indicated a low score, 40 to 80% indicated a moderate score, and more than 80% indicated a high score.

## 3.7 Statistical analysis

The data collected were analysed using the Statistical Packages for Social Sciences (SPSS) Version 26.0 computer program (IBM Corporation, New York, USA). Data was double checked during data entry to prevent inaccuracies. Before data analysis, the normality or distribution of the data was checked using the Kolmogorov-Smirnov test (sample size $\geq$ 100). In the current research, the

attitude and practice scores were normally distributed whereas age, BMI, CGPA, and knowledge scores were not normally distributed (Appendix B). Categorical variables were computed as frequencies and percentages whereas continuous variables were computed as mean and standard deviation or median and interquartile range. The significant level was considered at $p<0.05$ and $p<0.001$ for all statistical tests.

### 3.7.1 Descriptive analysis

The sociodemographic data was reported using descriptive frequency analysis. Categorical variables were presented in frequencies and percentages. Since the age, BMI, and CGPA were not normally distributed, the Mann-Whitney test was used to test the differences of age, BMI, and CGPA between dietetics and non-dietetics students. The data for the Mann-Whitney test was presented as median, interquartile range, Mann-Whitney U, z score, 2-tailed significance score (p-value), and the effect size. The effect size can be calculated by dividing the z score by the square root of the sample size. An effect size of $r < 0.3$ was classified as a small effect size, $0.3 < r < 0.5$ was classified as a medium effect size, and $r > 0.5$ was classified as a large effect size.

### 3.7.2 Chi-squared test

To answer objective 1, a chi-squared test was used to compare the breakfast consumption between dietetics and non-dietetics students. A chi-squared test was used to analyse the KAP questionnaires and compare the KAP levels between dietetics and non-dietetics students to answer objective 2. To answer

objectives 3 and 4, a chi-squared test was used to determine the association between breakfast consumption and BMI as well as academic performance. The data for chi-squared test were presented in frequencies and percentages.

### 3.7.3 Independent t-test and Mann-Whitney test

To answer objective 2, independent t-test and Mann-Whitney test were used to compare the means of KAP variables between dietetics and non-dietetics students. Since the data for knowledge scores were not normally distributed, Mann-Whitney test was used, and the data was presented in median and interquartile range. On the other hand, the data for attitude and practice scores were normally distributed. Hence, independent t-test was used, and the data was presented in mean and standard deviation.

### 3.7.4 Pearson's correlation test and Spearman's correlation test

Pearson's correlation test and Spearman's correlation test were performed to determine the relationship between KAP variables to answer objective 2. Since the data for knowledge scores were not normally distributed, Spearman's correlation test was used to test the correlation between knowledge and attitude levels as well as knowledge and practice levels. On the other hand, the data for attitude and practice scores were normally distributed. Therefore, Pearson's correlation test was used to test the correlation between attitude and practice levels.

**Table 3.3:** Pearson and Spearman correlation coefficient interpretation.

| **Scale of Pearson and Spearman correlation coefficient** | **Interpretation** |
|---|---|
| $0 < r \leq 0.19$ | Very weak correlation |
| $0.2 \leq r \leq 0.39$ | Weak correlation |
| $0.4 \leq r \leq 0.59$ | Moderate correlation |
| $0.6 \leq r \leq 0.79$ | Strong correlation |
| $0.8 \leq r \leq 1.0$ | Very strong correlation |

# CHAPTER 4

# RESULTS

## 4.1 Sociodemographic characteristics of the subjects

The sociodemographic characteristics of the subjects are shown in Table 4.1. There was a total of 190 subjects involved in this study with an equal proportion of the subjects, in which half (n = 95) of them were dietetics students and the other half (n = 95) of them were non-dietetics students. Among the 190 subjects, a majority of them were females (72.1%) and aged between 21 to 23 years old (70.5%). The median age of the subjects was 21.00 (1.00) years old and there was a significant difference between dietetics and non-dietetics students, U=2731.500, z= –4.938, p<0.001, with a medium effect size r= –0.358. Moreover, 95.8% of the subjects were Chinese while 3.2% and 1.1% of the subjects were Indian and Malay respectively. Most of the subjects were studying for their degree in year 3 (48.4%), subsequently followed by year 2 (21.6%), year 1 (19.5%), and year 4 (10.5%).

Furthermore, 45.8% of the subjects set RM10 to RM15 for their daily budgets on foods whereas 41.6% of the subjects set more than RM15. A majority of the subjects (49.5%) have a monthly allowance of RM500 to RM1000. Most of the subjects apply study loans (61.1%), subsequently followed by self or family funds (27.9%) and received scholarships (11.1%). In terms of living arrangement, 67.9% of the subjects live at a hostel while 21.6% and 10.5% of the subjects live at a rented home and parents' home respectively.

Almost half of the subjects (51.6%) were normal weight, subsequently followed by underweight (26.8%), overweight (11.1%), and obese (10.5%). The median body mass index (BMI) of the subjects was 20.2 (4.05) kg/m$^2$. The test revealed that the BMI was significantly lower in dietetics students (Md=19.6, IQR=4.20) compared to non-dietetics students (Md=20.7, IQR=3.7), U=3441.000, z= –2.827, p=0.005, with a small effect size r= –0.205. Besides, a majority of the subjects (73.7%) had good academic performance while 26.3% of the subjects had a poor academic performance. The median Cumulative Grade Point Average (CGPA) points of the subjects was 3.18 (0.43). The median CGPA for dietetics students was 3.20 (0.33) whereas the median CGPA for non-dietetics students was 3.10 (0.70). A Mann-Whitney test showed that this difference was not statistically significant, U=4313.500, z= –0.526, p=0.599, with a small effect size r= –0.043.

**Table 4.1**: Sociodemographic characteristics of the subjects.

| **Characteristics** | **Overall (n=190)** | **Dietetics students (n=95)** | **Non-dietetics students (n=95)** | **p-value** |
|---|---|---|---|---|
| Gender | | | | |
| Male | 53 (27.9) | 14 (14.7) | 39 (41.1) | - |
| Female | 137 (72.1) | 81 (85.3) | 56 (58.9) | |
| Age group | | | | |
| 18 – 20 years | 45 (23.7) | 9 (9.5) | 36 (37.9) | |
| 21 – 23 years | 134 (70.5) | 78 (82.1) | 56 (58.9) | |
| 24 – 26 years | 11 (5.8) | 8 (8.4) | 3 (3.2) | |
| Median age (years) [a] | 21.00 (1.00) | 21.00 (1.00) | 21.00 (1.00) | <0.001** |
| Race | | | | |
| Malay | 2 (1.1) | 0 (0) | 2 (2.1) | - |
| Chinese | 182 (95.8) | 92 (96.8) | 90 (94.7) | |
| Indian | 6 (3.2) | 3 (3.2) | 3 (3.2) | |

**Table 4.1** continued

| Characteristics | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | p-value |
|---|---|---|---|---|
| Academic year of study | | | | |
| Year 1 | 37 (19.5) | 8 (8.4) | 29 (30.5) | - |
| Year 2 | 41 (21.6) | 18 (18.9) | 23 (24.2) | |
| Year 3 | 92 (48.4) | 51 (53.7) | 41 (43.2) | |
| Year 4 | 20 (10.5) | 18 (18.9) | 2 (2.1) | |
| Daily budget on foods (Ringgit Malaysia) | | | | |
| < RM10 | 24 (12.6) | 12 (12.6) | 12 (12.6) | - |
| RM10 – RM15 | 87 (45.8) | 44 (46.3) | 43 (45.3) | |
| > RM15 | 79 (41.6) | 39 (41.1) | 40 (42.1) | |
| Monthly allowance (Ringgit Malaysia) | | | | |
| < RM500 | 48 (25.3) | 23 (24.2) | 25 (26.3) | - |
| RM500 – RM1000 | 94 (49.5) | 50 (52.6) | 44 (46.3) | |
| > RM1000 | 48 (25.3) | 22 (23.2) | 26 (27.4) | |
| Financial status | | | | |
| Received scholarship (e.g. JPA, UTAR scholarship) | 21 (11.1) | 12 (12.6) | 9 (9.5) | - |
| Study loan (e.g. PTPTN) | 116 (61.1) | 66 (69.5) | 50 (52.6) | |
| Self / family fund | 53 (27.9) | 17 (17.9) | 36 (37.9) | |
| Living arrangement | | | | |
| Hostel | 129 (67.9) | 60 (63.2) | 69 (72.6) | - |
| Rented home | 41 (21.6) | 20 (21.1) | 21 (22.1) | |
| Parents' home | 20 (10.5) | 15 (15.8) | 5 (5.3) | |
| Body mass index classification | | | | |
| Underweight | 51 (26.8) | 35 (36.8) | 16 (16.8) | |
| Normal weight | 98 (51.6) | 44 (46.3) | 54 (56.8) | |
| Overweight | 21 (11.1) | 8 (8.4) | 13 (13.7) | |
| Obese | 20 (10.5) | 8 (8.4) | 12 (12.6) | |
| Median body mass index ($kg/m^2$) [a] | 20.2 (4.05) | 19.6 (4.20) | 20.7 (3.7) | 0.005* |
| Academic performance | | | | |
| Good academic performance | 140 (73.7) | 74 (77.9) | 66 (69.5) | |
| Poor academic performance | 50 (26.3) | 21 (22.1) | 29 (30.5) | |
| Median Cumulative Grade Point Average (CGPA) [a] | 3.18 (0.43) | 3.20 (0.33) | 3.10 (0.70) | 0.599 |

Data are expressed as number (percentage), n (%), and [a] median (interquartile range).

Significant difference between dietetics and non-dietetics students at *p<0.05 and **p<0.001, tested using Mann-Whitney test.

## 4.2 Breakfast consumption patterns of the subjects

The breakfast consumption patterns of the subjects are presented in Table 4.2. The frequency of breakfast consumption in a week was approximately equally distributed among the subjects, in which 33.7% of the subjects consume breakfast 6 to 7 times per week, 33.7% of the subjects consume breakfast 2 times or less per week, and 32.6% of the subjects consume breakfast 3 to 5 times per week. There was no significant difference in the frequency of breakfast consumption in a week between dietetics and non-dietetics students ($\chi^2=4.643$, $p=0.098$). Hence, by classifying breakfast consumers and breakfast skippers based on the frequency of breakfast consumption in a week, 66.3% of the subjects were classified as breakfast consumers whereas 33.7% of the subjects were classified as breakfast skippers. There was a significant difference in breakfast consumption between dietetics and non-dietetics students ($\chi^2=4.618$, $p=0.032$). Dietetics students (73.7%) have a significantly higher number of breakfast consumers compared to non-dietetics students (58.9%) ($p>0.05$). Dietetics students (26.3%) also have a significantly smaller number of breakfast skippers compared to non-dietetics students (41.1%) ($p>0.05$).

Subjects generally consume their breakfast between 8.00 a.m. and 10.00 a.m. (90.5%) whilst the very least of them (9.5%) consume their breakfast before 8.00 a.m. Besides, most of the subjects (42.6%) spent RM2 to RM5 on their breakfast, subsequently followed by RM5 to RM8 (33.2%), more than RM8 (13.2%), and less than RM2 (11.1%). In terms of the location to consume breakfast, 67.9% of the subjects consume their breakfast at their home or hostel, subsequently followed by restaurant or food stall (16.3%), cafeteria in university (13.2%), and

fast food restaurant (2.6%). A majority of the subjects (71.1%) consume their breakfast alone whereas 28.9% of the subjects consume their breakfast with their friends.

**Table 4.2**: Breakfast consumption patterns of the subjects.

| Variables | Total, n (%) | | | $\chi^2$ (p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| Frequency of breakfast consumption in a week [a] | | | | |
| 0 – 2 times | 64 (33.7) | 25 (26.3) | 39 (41.1) | 4.643 |
| 3 – 5 times | 62 (32.6) | 34 (35.8) | 28 (29.5) | (0.098) |
| 6 – 7 times | 64 (33.7) | 36 (37.9) | 28 (29.5) | |
| Breakfast consumption [a] | | | | |
| Breakfast consumers | 126 (66.3) | 70 (73.7) | 56 (58.9) | 4.618 |
| Breakfast skippers | 64 (33.7) | 25 (26.3) | 39 (41.1) | (0.032)* |
| Time of breakfast consumption [a] | | | | |
| Before 8.00 a.m. | 18 (9.5) | 8 (8.4) | 10 (10.5) | 0.245 |
| 8.00 a.m. to 10.00 a.m. | 172 (90.5) | 87 (91.6) | 85 (89.5) | (0.620) |
| Amount of money spent on breakfast (Ringgit Malaysia) [a] | | | | |
| Less than RM2 | 21 (11.1) | 12 (12.6) | 9 (9.5) | 2.516 |
| RM2 – RM5 | 81 (42.6) | 42 (44.2) | 39 (41.1) | (0.472) |
| RM5 – RM8 | 63 (33.2) | 32 (33.7) | 31 (32.6) | |
| RM8 and more | 25 (13.2) | 9 (9.5) | 16 (16.8) | |
| The location to consume breakfast [b] | | | | |
| Cafeteria in university | 25 (13.2) | 6 (6.3) | 19 (20.0) | 13.275 |
| Restaurant / food stall | 31 (16.3) | 13 (13.7) | 18 (18.9) | (0.004)* |
| Fast food restaurant | 5 (2.6) | 1 (1.1) | 4 (4.2) | |
| Home / hostel | 129 (67.9) | 75 (78.9) | 54 (56.8) | |
| With whom having breakfast [a] | | | | |
| With friends | 55 (28.9) | 20 (21.1) | 35 (36.8) | 5.758 |
| Alone | 135 (71.1) | 75 (78.9) | 60 (63.2) | (0.016)* |

Significant difference between dietetics and non-dietetics students at *p<0.05, tested using Chi-square test.

[a] refer Pearson Chi-Square for p-value.

[b] refer Likelihood Ratio for p-value.

## 4.3 Analysis of knowledge, attitude, and practice questionnaires of breakfast consumption among subjects

### 4.3.1 Knowledge of breakfast consumption

Table 4.3 shows the analysis of knowledge questionnaires on breakfast consumption among subjects. More than half of the subjects (52.1%) disagreed that breakfast consumption will increase calorie intake in the next meal. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=24.873$, $p<0.001$). Besides, 92.1% of the subjects answered correctly that breakfast provides numerous vitamins and minerals for our body. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=0.346$, $p=0.841$). There were 84.2% of the subjects agreed that high fiber breakfast help them to feel full for longer. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=36.625$, $p<0.001$).

Most of the subjects (88.4%) answered correctly that eating breakfast helps students to concentrate and retain new information in class. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=3.314$, $p=0.191$). Moreover, 76.8% of the subjects disagreed with the false statement, which is eating breakfast will lead to a consumption of unhealthy snacks. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=10.647$, $p=0.005$). There were 48.9% of the subjects disagreed that breakfast that high in fiber and protein, but low in fats and sugars can reduce concentration levels during the learning process.

There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=13.701$, $p=0.001$).

A majority of the subjects (71.1%) answered correctly that regular consumption of a healthy breakfast will help to reduce body weight. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=1.258$, $p=0.533$). More than half of the subjects (59.5%) agreed that risks of heart diseases can be reduced by eating high energy and fibrous breakfast. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=8.925$, $p=0.012$). In addition, there were 82.6% of the subjects chose correctly regarding the best timing to have breakfast, which is between 6.00 to 10.00 in the morning. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=1.091$, $p=0.580$).

Most of the subjects (73.2%) disagreed with the false statement, which is breakfast will increase the consumption of food high in fat such as fried foods. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=16.810$, $p<0.001$). A majority of the subjects (83.2%) answered correctly that breakfast provides glucose as a fuel to our brain to function properly after a long overnight fasting. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=32.544$, $p<0.001$). There were 87.9% of the subjects agreed on the correct statement, which is eating breakfast helps to have a good mood and improve students' academic performance. There was no significant difference for this

statement between dietetics and non-dietetics students ($\chi^2=2.461$, $p=0.292$). A large number of subjects (89.5%) answered correctly that breakfast that is high in fiber will help in digestion. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=21.800$, $p<0.001$).

**Table 4.3**: Analysis of knowledge questionnaires of breakfast consumption among subjects.

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | **Overall (n=190)** | **Dietetics students (n=95)** | **Non-dietetics students (n=95)** | |
| **Knowledge** | | | | |
| Breakfast consumption will increase calorie intake in the next meal.[a] | | | | |
| True | 31 (16.3) | 13 (13.7) | 18 (18.9) | 24.873 |
| Not sure | 60 (31.6) | 16 (16.8) | 44 (46.3) | (<0.001)** |
| False | 99 (52.1) | 66 (69.5) | 33 (34.7) | |
| Breakfast provides numerous vitamins and minerals for our body.[b] | | | | |
| True | 175 (92.1) | 87 (91.6) | 88 (92.6) | 0.346 |
| Not sure | 12 (6.3) | 6 (6.3) | 6 (6.3) | (0.841) |
| False | 3 (1.6) | 2 (2.1) | 1 (1.1) | |
| High-fiber breakfasts help me to feel full for longer.[a] | | | | |
| True | 160 (84.2) | 95 (100) | 65 (68.4) | 36.625 |
| Not sure | 20 (10.5) | 0 (0) | 20 (21.1) | (<0.001)** |
| False | 10 (5.3) | 0 (0) | 10 (10.5) | |
| Eating breakfast helps students to concentrate and retain new information in class.[a] | | | | |
| True | 168 (88.4) | 88 (92.6) | 80 (84.2) | 3.314 |
| Not sure | 12 (6.3) | 4 (4.2) | 8 (8.4) | (0.191) |
| False | 10 (5.3) | 3 (3.2) | 7 (7.4) | |
| Eating breakfast will lead to a consumption of unhealthy snacks.[a] | | | | |
| True | 18 (9.5) | 7 (7.4) | 11 (11.6) | 10.647 |
| Not sure | 26 (13.7) | 6 (6.3) | 20 (21.1) | (0.005)* |
| False | 146 (76.8) | 82 (86.3) | 64 (67.4) | |
| Breakfast that high in fiber and protein, but low in fats and sugars can reduce concentration levels during the learning process.[a] | | | | |
| True | 41 (21.6) | 17 (17.9) | 24 (25.3) | 13.701 |
| Not sure | 56 (29.5) | 19 (20.0) | 37 (38.9) | (0.001)* |
| False | 93 (48.9) | 59 (62.1) | 34 (35.8) | |
| Regular consumption of a healthy breakfast will help to reduce body weight.[b] | | | | |
| True | 135 (71.1) | 71 (74.7) | 64 (67.4) | 1.258 |
| Not sure | 48 (25.3) | 21 (22.1) | 27 (28.4) | (0.533) |
| False | 7 (3.7) | 3 (3.2) | 4 (4.2) | |

**Table 4.3** continued

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| Risks of heart diseases can be reduced by eating high energy and fibrous breakfast.[a] | | | | |
| True | 113 (59.5) | 66 (69.5) | 47 (49.5) | 8.925 |
| Not sure | 63 (33.2) | 22 (23.2) | 41 (43.2) | (0.012)* |
| False | 14 (7.4) | 7 (7.4) | 7 (7.4) | |
| The best time to have breakfast is between 6.00 to 10.00 in the morning.[b] | | | | |
| True | 157 (82.6) | 76 (80.0) | 81 (85.3) | 1.091 |
| Not sure | 27 (14.2) | 16 (16.8) | 11 (11.6) | (0.580) |
| False | 6 (3.2) | 3 (3.2) | 3 (3.2) | |
| Breakfast will increase the consumption of food high in fat such as fried foods.[a] | | | | |
| True | 18 (9.5) | 5 (5.3) | 13 (13.7) | 16.810 |
| Not sure | 33 (17.4) | 8 (8.4) | 25 (26.3) | (<0.001)** |
| False | 139 (73.2) | 82 (86.3) | 57 (60.0) | |
| Breakfast provides glucose as a fuel to our brain to function properly after a long overnight fasting.[b] | | | | |
| True | 158 (83.2) | 92 (96.8) | 66 (69.5) | 32.544 |
| Not sure | 26 (13.7) | 1 (1.1) | 25 (26.3) | (<0.001)** |
| False | 6 (3.2) | 2 (2.1) | 4 (4.2) | |
| Eating breakfast helps to have a good mood and improve students' academic performance.[b] | | | | |
| True | 167 (87.9) | 87 (91.6) | 80 (84.2) | 2.461 |
| Not sure | 20 (10.5) | 7 (7.4) | 13 (13.7) | (0.292) |
| False | 3 (1.6) | 1 (1.1) | 2 (2.1) | |
| Breakfast that is high in fiber will help in digestion.[b] | | | | |
| True | 170 (89.5) | 94 (98.9) | 76 (80.0) | 21.800 |
| Not sure | 19 (10.0) | 1 (1.1) | 18 (18.9) | (<0.001)** |
| False | 1 (0.5) | - | 1 (1.1) | |

Significant difference between dietetics and non-dietetics students at *p<0.05 and **p<0.001, tested using Chi-square test.

[a] refer Pearson Chi-Square for p-value.

[b] refer Likelihood Ratio for p-value.

### 4.3.2 Attitude of breakfast consumption

Table 4.4 shows the analysis of attitude questionnaires on breakfast consumption among subjects. 65.3% of subjects strongly believed that breakfast intake helps to maintain a healthy body. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=3.079$, $p=0.545$). More than

half of the subjects (52.6%) strongly agreed that breakfast intake will increase the absorption of vitamins and minerals. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=3.546$, $p=0.471$). There were 47.9% of the subjects strongly thought that breakfast intake will help me to meet my daily total dietary fiber intake. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=9.978$, $p=0.041$).

Besides, 43.2% of the subjects strongly believed that breakfast intake helps to reduce the risk of heart disease, diabetes, and high blood pressure. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=2.272$, $p=0.686$). More than half of the subjects (52.1%) strongly believed that they will be more focused during studying if they consume breakfast. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=1.862$, $p=0.761$). However, only 8.9% of the subjects strongly disagreed and 19.5 % of the subjects disagreed that they prioritized their morning classes over consuming breakfast. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=8.517$, $p=0.074$).

Also, only 3.7% of the subjects strongly disagreed and 16.35% of the subjects disagreed that it is difficult to get well-balanced nutritious food for breakfast in the university. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=6.221$, $p=0.183$). There were 45.3% of

the subjects strongly disagreed that they would not eat breakfast if they were alone. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=15.825$, $p=0.003$). Furthermore, 40% of the subjects strongly disagreed that they skip breakfast to save money. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=5.424$, $p=0.246$).

23.7% of the subjects strongly agreed and 34.7% of the subjects agreed that the university cafeteria sells similar and common Malaysian foods for breakfast. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=13.503$, $p=0.009$). Remarkably, there were only 5.8% of the subjects strongly disagreed and 11.6% of the subjects disagreed that early morning classes lead students to skip breakfast. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=4.280$, $p=0.369$).

**Table 4.4**: Analysis of attitude questionnaires of breakfast consumption among subjects.

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| **Attitude** | | | | |
| I believe breakfast intake helps to maintain a healthy body [b] | | | | |
| Strongly agree | 124 (65.3) | 64 (67.4) | 60 (63.2) | 3.079 |
| Agree | 42 (22.1) | 20 (21.1) | 22 (23.2) | (0.545) |
| Neutral | 13 (6.8) | 4 (4.2) | 9 (9.5) | |
| Disagree | 6 (3.2) | 4 (4.2) | 2 (2.1) | |
| Strongly disagree | 5 (2.6) | 3 (3.2) | 2 (2.1) | |

**Table 4.4** continued

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| I believe breakfast intake will increase the absorption of vitamins and minerals.[b] | | | | |
| Strongly agree | 100 (52.6) | 52 (54.7) | 48 (50.5) | 3.546 |
| Agree | 50 (26.3) | 22 (23.2) | 28 (29.5) | (0.471) |
| Neutral | 30 (15.8) | 17 (17.9) | 13 (13.7) | |
| Disagree | 5 (2.6) | 1 (1.1) | 4 (4.2) | |
| Strongly disagree | 5 (2.6) | 3 (3.2) | 2 (2.1) | |
| I think breakfast intake will help me to meet my daily total dietary fiber intake.[a] | | | | |
| Strongly agree | 91 (47.9) | 51 (53.7) | 40 (42.1) | 9.978 |
| Agree | 46 (24.2) | 24 (25.3) | 22 (23.2) | (0.041)* |
| Neutral | 39 (20.5) | 11 (11.6) | 28 (29.5) | |
| Disagree | 11 (5.8) | 7 (7.4) | 4 (4.2) | |
| Strongly disagree | 3 (1.6) | 2 (2.1) | 1 (1.1) | |
| I believe that breakfast intake helps to reduce the risk of heart disease, diabetes, and high blood pressure.[b] | | | | |
| Strongly agree | 82 (43.2) | 42 (44.2) | 40 (42.1) | 2.272 |
| Agree | 52 (27.4) | 23 (24.2) | 29 (30.5) | (0.686) |
| Neutral | 44 (23.2) | 22 (23.2) | 22 (23.2) | |
| Disagree | 5 (2.6) | 3 (3.2) | 2 (2.1) | |
| Strongly disagree | 7 (3.7) | 5 (5.3) | 2 (2.1) | |
| I believe that I will be more focused during studying if I consume breakfast.[a] | | | | |
| Strongly agree | 99 (52.1) | 53 (55.8) | 46 (48.4) | 1.862 |
| Agree | 40 (21.1) | 19 (20.0) | 21 (22.1) | (0.761) |
| Neutral | 30 (15.8) | 13 (13.7) | 17 (17.9) | |
| Disagree | 15 (7.9) | 8 (8.4) | 7 (7.4) | |
| Strongly disagree | 6 (3.2) | 2 (2.1) | 4 (4.2) | |
| I prioritize my morning classes over consuming breakfast.[a] | | | | |
| Strongly agree | 46 (24.2) | 21 (22.1) | 25 (26.3) | 8.517 |
| Agree | 41 (21.6) | 20 (21.1) | 21 (22.1) | (0.074) |
| Neutral | 49 (25.8) | 21 (22.1) | 28 (29.5) | |
| Disagree | 37 (19.5) | 19 (20.0) | 18 (18.9) | |
| Strongly disagree | 17 (8.9) | 14 (14.7) | 3 (3.2) | |
| I think it is difficult to get well-balanced nutritious food for breakfast in the university.[a] | | | | |
| Strongly agree | 57 (30.0) | 26 (27.4) | 31 (32.6) | 6.221 |
| Agree | 54 (28.4) | 31 (32.6) | 23 (24.2) | (0.183) |
| Neutral | 41 (21.6) | 19 (20.0) | 22 (23.2) | |
| Disagree | 31 (16.3) | 13 (13.7) | 18 (18.9) | |
| Strongly disagree | 7 (3.7) | 6 (6.3) | 1 (1.1) | |
| I think that I would not eat breakfast if I am alone.[a] | | | | |
| Strongly agree | 18 (9.5) | 4 (4.2) | 14 (14.7) | 15.825 |
| Agree | 22 (11.6) | 7 (7.4) | 15 (15.8) | (0.003)* |
| Neutral | 23 (12.1) | 8 (8.4) | 15 (15.8) | |
| Disagree | 41 (21.6) | 26 (27.4) | 15 (15.8) | |
| Strongly disagree | 86 (45.3) | 50 (52.6) | 36 (37.9) | |

**Table 4.4** continued

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| I skip breakfast to save money.[a] | | | | |
| Strongly agree | 17 (8.9) | 6 (6.3) | 11 (11.6) | 5.424 |
| Agree | 23 (12.1) | 10 (10.5) | 13 (13.7) | (0.246) |
| Neutral | 31 (16.3) | 12 (12.6) | 19 (20.0) | |
| Disagree | 43 (22.6) | 25 (26.3) | 18 (18.9) | |
| Strongly disagree | 76 (40.0) | 42 (44.2) | 34 (35.8) | |
| I think the university cafeteria sells similar and common Malaysian foods for breakfast.[a] | | | | |
| Strongly agree | 45 (23.7) | 27 (28.4) | 18 (18.9) | 13.503 |
| Agree | 66 (34.7) | 40 (42.1) | 26 (27.4) | (0.009)* |
| Neutral | 57 (30.0) | 21 (22.1) | 36 (37.9) | |
| Disagree | 14 (7.4) | 6 (6.3) | 8 (8.4) | |
| Strongly disagree | 8 (4.2) | 1 (1.1) | 7 (7.4) | |
| I think early morning classes lead students to skip breakfast.[a] | | | | |
| Strongly agree | 88 (46.3) | 45 (47.4) | 43 (45.3) | 4.280 |
| Agree | 45 (23.7) | 22 (23.2) | 23 (24.2) | (0.369) |
| Neutral | 24 (12.6) | 8 (8.4) | 16 (16.8) | |
| Disagree | 22 (11.6) | 13 (13.7) | 9 (9.5) | |
| Strongly disagree | 11 (5.8) | 7 (7.4) | 4 (4.2) | |

Significant difference between dietetics and non-dietetics students at *p<0.05 and **p<0.001, tested using Chi-square test.

[a] refer Pearson Chi-Square for p-value.

[b] refer Likelihood Ratio for p-value.

### 4.3.3 Practice of breakfast consumption

Table 4.5 shows the analysis of practice questionnaires on breakfast consumption among subjects. There were 31.6% of the subjects strongly disagreed that they substituted breakfast with snacking. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=12.061$, $p=0.017$). Notably, only 9.5% of the subjects strongly disagreed and 8.9% of the subjects disagreed that they would have brunch if they did not have breakfast before 10.00 a.m. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=1.109$, $p=0.893$).

Besides, there were 25.3 % of the subjects strongly disagreed that they only take dairy products as breakfast. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=22.455$, $p<0.001$). Also, 25.3% of the subjects strongly disagreed that they only take protein-based food for breakfast. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=30.743$, $p<0.001$). Moreover, less than 40% of the subjects always take cereals for breakfast compared to local foods such as Nasi lemak. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=14.912$, $p=0.005$).

There were 31.1% of the subjects strongly disagreed that they only eat breakfast if they are at their parents' home compared to on the campus. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=3.786$, $p=0.436$). About 50% of the subjects disagreed that they only take breakfast if they are hungry. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=19.217$, $p=0.001$). Notably, only 18.9% of the subjects strongly disagreed that they skip breakfast if their class starts at 8.00 a.m. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=3.867$, $p=0.424$).

In addition, there were 41.6% of the subjects strongly disagreed that they skip breakfast because they are lacking money. There was a significant difference for this statement between dietetics and non-dietetics students ($\chi^2=12.735$, $p=0.013$). Furthermore, 27.4% of the subjects strongly disagreed that they do

not have enough time to buy breakfast. There was no significant difference for this statement between dietetics and non-dietetics students ($\chi^2=7.244$, $p=0.124$).

**Table 4.5**: Analysis of practice questionnaires of breakfast consumption among subjects.

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| **Practice** | | | | |
| I substitute breakfast with snacking. | | | | |
| Strongly agree | 12 (6.3) | 3 (3.2) | 9 (9.5) | 12.061 |
| Agree | 22 (11.6) | 13 (13.7) | 9 (9.5) | (0.017)* |
| Neutral | 36 (18.9) | 12 (12.6) | 24 (25.3) | |
| Disagree | 60 (31.6) | 29 (30.5) | 31 (32.6) | |
| Strongly disagree | 60 (31.6) | 38 (40.0) | 22 (23.2) | |
| I will have brunch if I did not have breakfast before 10.00 a.m. | | | | |
| Strongly agree | 93 (48.9) | 48 (50.5) | 45 (47.4) | 1.109 |
| Agree | 49 (25.8) | 23 (24.2) | 26 (27.4) | (0.893) |
| Neutral | 13 (6.8) | 6 (6.3) | 7 (7.4) | |
| Disagree | 17 (8.9) | 10 (10.5) | 7 (7.4) | |
| Strongly disagree | 18 (9.5) | 8 (8.4) | 10 (10.5) | |
| I only take dairy products as breakfast. | | | | |
| Strongly agree | 7 (3.7) | 2 (2.1) | 5 (5.3) | 22.455 |
| Agree | 34 (17.9) | 14 (14.7) | 20 (21.1) | (<0.001)** |
| Neutral | 52 (27.4) | 15 (15.8) | 37 (38.9) | |
| Disagree | 49 (25.8) | 30 (31.6) | 19 (20.0) | |
| Strongly disagree | 48 (25.3) | 34 (35.8) | 14 (14.7) | |
| I only take protein-based food for breakfast. | | | | |
| Strongly agree | 10 (5.3) | 3 (3.2) | 7 (7.4) | 30.743 |
| Agree | 28 (14.7) | 13 (13.7) | 15 (15.8) | (<0.001)** |
| Neutral | 52 (27.4) | 12 (12.6) | 40 (42.1) | |
| Disagree | 52 (27.4) | 31 (32.6) | 21 (22.1) | |
| Strongly disagree | 48 (25.3) | 36 (37.9) | 12 (12.6) | |
| I always take cereals for breakfast compared to local foods (e.g., Nasi lemak). | | | | |
| Strongly agree | 19 (10.0) | 11 (11.6) | 8 (8.4) | 14.912 |
| Agree | 50 (26.3) | 30 (31.6) | 20 (21.1) | (0.005)* |
| Neutral | 55 (28.9) | 16 (16.8) | 39 (41.1) | |
| Disagree | 37 (19.5) | 19 (20.0) | 18 (18.9) | |
| Strongly disagree | 29 (15.3) | 19 (20.0) | 10 (10.5) | |
| I only eat breakfast if I am at my parents' home compared to on the campus. | | | | |
| Strongly agree | 26 (13.7) | 11 (11.6) | 15 (15.8) | 3.786 |
| Agree | 32 (16.8) | 13 (13.7) | 19 (20.0) | (0.436) |
| Neutral | 33 (17.4) | 15 (15.8) | 18 (18.9) | |
| Disagree | 40 (21.1) | 22 (23.2) | 18 (18.9) | |
| Strongly disagree | 59 (31.1) | 34 (35.8) | 25 (26.3) | |

**Table 4.5** continued

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | |
| I only take breakfast if I am hungry. | | | | |
| Strongly agree | 35 (18.4) | 14 (14.7) | 21 (22.1) | 19.217 |
| Agree | 34 (17.9) | 13 (13.7) | 21 (22.1) | (0.001)* |
| Neutral | 27 (14.2) | 7 (7.4) | 20 (21.1) | |
| Disagree | 49 (25.8) | 29 (30.5) | 20 (21.1) | |
| Strongly disagree | 45 (23.7) | 32 (33.7) | 13 (13.7) | |
| I skip breakfast if my class starts at 8.00 a.m. | | | | |
| Strongly agree | 55 (28.9) | 26 (27.4) | 29 (30.5) | 3.867 |
| Agree | 36 (18.9) | 14 (14.7) | 22 (23.2) | (0.424) |
| Neutral | 27 (14.2) | 14 (14.7) | 13 (13.7) | |
| Disagree | 36 (18.9) | 19 (20.0) | 17 (17.9) | |
| Strongly disagree | 36 (18.9) | 22 (23.2) | 14 (14.7) | |
| I skip breakfast because I am lacking money. | | | | |
| Strongly agree | 18 (9.5) | 5 (5.3) | 13 (13.7) | 12.735 |
| Agree | 17 (8.9) | 7 (7.4) | 10 (10.5) | (0.013)* |
| Neutral | 27 (14.2) | 8 (8.4) | 19 (20.0) | |
| Disagree | 49 (25.8) | 27 (28.4) | 22 (23.2) | |
| Strongly disagree | 79 (41.6) | 48 (50.5) | 31 (32.6) | |
| I do not have enough time to buy breakfast. | | | | |
| Strongly agree | 30 (15.8) | 16 (16.8) | 14 (14.7) | 7.244 |
| Agree | 35 (18.4) | 15 (15.8) | 20 (21.1) | (0.124) |
| Neutral | 35 (18.4) | 12 (12.6) | 23 (24.2) | |
| Disagree | 38 (20.0) | 24 (25.3) | 14 (14.7) | |
| Strongly disagree | 52 (27.4) | 28 (29.5) | 24 (25.3) | |

Significant difference between dietetics and non-dietetics students at *p<0.05 and **p<0.001, tested using Chi-square test.

## 4.4 Knowledge, attitude, and practice scores of breakfast consumption

Table 4.6 demonstrates the knowledge, attitude, and practice scores of breakfast consumption among subjects. Overall, the knowledge score (Md=88.462, IQR=16.35) was the highest compared to attitude (64.175 ± 13.9478) and practice (55.447 ± 17.7112) scores. This indicates that their knowledge score was high while the attitude and practice scores were moderate. To evaluate the difference between dietetics and non-dietetics students for knowledge scores was tested using Mann-Whitney U test. The test revealed that the knowledge scores were significantly higher in dietetics students (Md=92.308, IQR=11.5)

compared to non-dietetics students (Md=80.769, IQR=19.2), U=2096.500, z= –6.412, p<0.001, with a medium effect size r= –0.465. An independent t-test was conducted to compare the means of attitude and practice variables for dietetics and non-dietetics students. The attitude score of dietetics students (66.866 ± 15.2516) were significantly higher than non-dietetics students (61.483 ± 11.9958) (t(178.112)=2.704, p=0.008) with a difference of 5.3828 (95% CI, 1.4542 to 9.3114). The practice score of dietetics students (60.395 ± 16.8903) were significantly higher than non-dietetics students (50.500 ± 17.2034) (t(188)=4.000, p<0.001) with a difference of 9.8947 (95% CI, 5.0153 to 14.7742). In summary, the comparison between groups showed that the dietetics students had significantly higher knowledge, attitude, and practice (KAP) scores compared to the non-dietetics students.

**Table 4.6**: Knowledge, attitude, and practice scores of breakfast consumption among subjects.

| Variables | Overall (n=190) | Dietetics students (n=95) | Non-dietetics students (n=95) | p-value |
|---|---|---|---|---|
| Knowledge [b] | 88.462 (16.35) | 92.308 (11.5) | 80.769 (19.2) | <0.001** |
| Attitude [a] | 64.175 ± 13.9478 | 66.866 ± 15.2516 | 61.483 ± 11.9958 | 0.008* |
| Practice [a] | 55.447 ± 17.7112 | 60.395 ± 16.8903 | 50.500 ± 17.2034 | <0.001** |

Data are expressed as [a] mean ± standard deviation and [b] median (interquartile range).

Significant difference between dietetics and non-dietetics students at *p<0.05 and **p<0.001, tested using [a] independent t-test and [b] Mann-Whitney test.

## 4.5 Level of knowledge, attitude, and practice of breakfast consumption

Table 4.7 shows the level of knowledge, attitude, and practice of the breakfast consumption among subjects. Overall, 70% of the subjects had a high knowledge score and 30% of the subjects had a moderate knowledge score on breakfast consumption. A majority of the subjects (84.2%) had a moderate attitude score on breakfast consumption, while 11.6% and 4.2% of the subjects had high and low attitude scores on breakfast consumption, respectively. The same goes for the practice score, in which most of the subjects (75.8%) had a moderate practice score on breakfast consumption, whereas 18.4% and 5.8% of the subjects had low and high practice scores on breakfast consumption, respectively.

A chi-square test was conducted to compare the levels of knowledge, attitude, and practice of breakfast consumption between dietetics and non-dietetics students. The test revealed that there was a significant difference in knowledge scores between dietetics and non-dietetics students ($\chi^2=21.078, p<0.001$). There was a significantly higher number of dietetics students (85.3%) having a high knowledge score compared to non-dietetics students (54.7%). Notably, dietetics students (14.7%) had a significantly smaller number of students having a moderate knowledge score compared to non-dietetics students (45.3%). Besides, the test revealed that there was a significant difference in attitude scores between dietetics and non-dietetics students ($\chi^2=10.863$, $p=0.004$). There was a significantly higher number of dietetics students (18.9%) having a high attitude score compared to non-dietetics students (4.2%). However, dietetics students (76.8%) had a significantly smaller number of students having a moderate

attitude score compared to non-dietetics students (91.6%). Moreover, the test revealed that there was a significant difference in practice scores between dietetics and non-dietetics students ($\chi^2=8.023$, $p=0.018$). There was a significantly higher number of dietetics students (9.5%) having a high practice score compared to non-dietetics students (2.1%). Remarkably, dietetics students (12.6%) had a significantly smaller number of students having a low practice score compared to non-dietetics students (24.2%).

**Table 4.7**: Level of knowledge, attitude, and practice of breakfast consumption among subjects.

| Variables | Total, n (%) | | | $\chi^2$(p-value) |
|---|---|---|---|---|
| | **Overall (n=190)** | **Dietetics students (n=95)** | **Non-dietetics students (n=95)** | |
| **Knowledge**[a] | | | | |
| Low score | 0 (0) | 0 (0) | 0 (0) | 21.078 |
| Moderate score | 57 (30.0) | 14 (14.7) | 43 (45.3) | (<0.001)** |
| High score | 133 (70.0) | 81 (85.3) | 52 (54.7) | |
| **Attitude**[b] | | | | |
| Low score | 8 (4.2) | 4 (4.2) | 4 (4.2) | 10.863 |
| Moderate score | 160 (84.2) | 73 (76.8) | 87 (91.6) | (0.004)* |
| High score | 22 (11.6) | 18 (18.9) | 4 (4.2) | |
| **Practice**[a] | | | | |
| Low score | 35 (18.4) | 12 (12.6) | 23 (24.2) | 8.023 |
| Moderate score | 144 (75.8) | 74 (77.9) | 70 (73.7) | (0.018)* |
| High score | 11 (5.8) | 9 (9.5) | 2 (2.1) | |

Significant difference between dietetics and non-dietetics students at *p<0.05 and **p<0.001, tested using Chi-square test.

[a] refer Pearson Chi-Square for p-value.

[b] refer Likelihood Ratio for p-value.

## 4.6 Correlation between knowledge, attitude, and practice of breakfast consumption

Table 4.8 demonstrates the correlation between knowledge, attitude, and practice of breakfast consumption among subjects. Spearman's correlation test was run to examine the correlation between knowledge and attitude, as well as knowledge and practice levels of breakfast consumption. There were statistically significant weak positive correlations between knowledge and attitude (*r=0.344, p<0.001*), and knowledge and practice (*r=0.307, p<0.001*) variables. In addition, Pearson's correlation test was run to examine the correlation between attitude and practice levels of breakfast consumption. There was a statistically significant weak positive correlation between attitude and practice variables (*r=0.277, p<0.001*).

**Table 4.8**: Correlation between knowledge, attitude, and practice of breakfast consumption among subjects.

| Variables | Correlation coefficient (r) | p-value |
|---|---|---|
| Knowledge – Attitude [a] | 0.344 | <0.001** |
| Knowledge – Practice [a] | 0.307 | <0.001** |
| Attitude – Practice [b] | 0.277 | <0.001** |

Significant difference at **p<0.001, tested using [a] Spearman's correlation test and [b] Pearson's correlation test.

## 4.7 Association between breakfast consumption and body mass index (BMI)

The association between breakfast consumption with BMI were demonstrated in Table 4.9. Among 126 breakfast consumers, 52.4% of the subjects were normal weight, subsequently followed by underweight (27.0%), obese (11.1%),

and overweight (9.5%). Moreover, among 64 breakfast skippers, half of the subjects (50.0%) were normal weight, subsequently followed by underweight (26.6%), overweight (14.1%), and obese (9.4%). The results showed that there was no significant association between breakfast consumption with BMI ($\chi^2=0.962$, $p=0.810$). However, breakfast consumers (52.4%) have a slightly higher percentage of normal-weight individuals compared to breakfast skippers (50.0%). In terms of underweight individuals, breakfast consumers (27.0%) also have a slightly higher percentage compared to breakfast skippers (26.6%). In terms of overweight and obese individuals, breakfast skippers (23.5%) have a higher percentage compared to breakfast consumers (20.6%).

**Table 4.9**: Association between breakfast consumption with BMI.

| Variables | Total, n (%) | | | $\chi^2$ (p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Breakfast consumers (n=126) | Breakfast skippers (n=64) | |
| Underweight | 51 (26.8) | 34 (27.0) | 17 (26.6) | 0.962 |
| Normal weight | 98 (51.6) | 66 (52.4) | 32 (50.0) | (0.810) |
| Overweight | 21 (11.1) | 12 (9.5) | 9 (14.1) | |
| Obese | 20 (10.5) | 14 (11.1) | 6 (9.4) | |

Data are expressed as number (percentage), n (%).

Significant difference between breakfast consumers and breakfast skippers at *p<0.05 and **p<0.001, tested using Chi-square test.

## 4.8 Association between breakfast consumption and academic performance

The association between breakfast consumption with academic performance were shown in Table 4.10. The results demonstrated that there was no significant association between breakfast consumption with academic performance ($\chi^2=0.412$, $p=0.521$). Among 126 breakfast consumers, a majority of the

subjects (72.2%) had good academic performance while 27.8% of the subjects had a poor academic performance. Furthermore, among 64 breakfast skippers, most of the subjects (76.6%) also had good academic performance while 23.4% of the subjects had a poor academic performance.

**Table 4.10**: Association between breakfast consumption with academic performance.

| Variables | Total, n (%) | | | $\chi^2$ (p-value) |
|---|---|---|---|---|
| | Overall (n=190) | Breakfast consumers (n=126) | Breakfast skippers (n=64) | |
| Good academic performance | 140 (73.7) | 91 (72.2) | 49 (76.6) | 0.412 (0.521) |
| Poor academic performance | 50 (26.3) | 35 (27.8) | 15 (23.4) | |

Data are expressed as number (percentage), n (%).

Significant difference between breakfast consumers and breakfast skippers at *p<0.05 and **p<0.001, tested using Chi-square test.

# CHAPTER 5

# DISCUSSION

## 5.1 Sociodemographic characteristics of the subjects

In terms of body mass index (BMI), most of the subjects (51.6%) have normal weight, with a median of 20.2 kg/m$^2$. This result was consistent with a study conducted by Jayaveloo, Daud and Rahman (2021), in which a majority of their subjects (60.4%) has a normal weight. Besides, this study revealed that the BMI was significantly lower in dietetics students compared to non-dietetics students. Although there was a paucity of studies studied on the BMI between dietetics and non-dietetics students, comparisons can be done using research that studied the BMI between medical and non-medical students as medical students also have certain concerns about their health, especially their body weight. Therefore, the findings of this study were parallel to a study conducted by Singh, et al. (2022). They reported that the BMI of medical students was 22.5 ± 3.12, which was slightly lower than non-medical students (22.6 ± 1.98), although the outcomes were not statistically significant (Singh, et al., 2022). Qin, et al. (2018) also stated that medical students had significantly lower BMI compared to non-medical students. In the current study, there were more underweight individuals in dietetics students while more overweight and obese individuals in non-dietetics students. However, in general, both dietetics and non-dietetics students have normal BMI.

## 5.2 Breakfast consumption patterns of the subjects

In terms of the frequency of breakfast consumption in a week, about one-third of the subjects (33.7%) consume breakfast 6 to 7 times per week, one-third of the subjects (32.6%) consume breakfast 3 to 5 times per week, and the remaining one-third of the subjects (33.7%) consume breakfast 2 times or less per week. Another study also reported the same results, in which only 35.9% of students had breakfast almost every day, which was between 6 to 7 days per week (Jayaveloo, Daud and Rahman, 2021). The classification of breakfast consumers and breakfast skippers was based on the frequency of breakfast consumption in a week. The results showed that there were more subjects being classified as breakfast consumers (66.3%) and fewer subjects being classified as breakfast skippers (33.7%). Previous studies have shown similar trends, in which the percentages of breakfast consumers among Malaysian university students were 61.8% in Chawla, et al. (2019), 68.2% in Jayaveloo, Daud and Rahman (2021), and 70.8% in Moy, et al. (2009).

A significant difference was noted in breakfast consumption between dietetics and non-dietetics students. Dietetics students (73.7%) have a significantly higher number of breakfast consumers compared to non-dietetics students (58.9%). There was a paucity of studies studied on the prevalence of breakfast consumption between dietetics and non-dietetics students. However, comparisons can be done using research that studied the prevalence of breakfast consumption between medical and non-medical students as medical students also have brief exposure to nutrition-related knowledge. In this case, the result of this study was supported by another research conducted by Lu, et al. (2020)

that reported medical students have a higher prevalence of breakfast consumption compared to non-medical students. This result might be explained by the health concepts incorporated in dietetics or medical courses, which emphasize healthy eating patterns. Alghamdi, et al. (2021) declared that medical students had better knowledge of healthy dietary behaviours compared to non-medical students, which might contribute to the higher prevalence of breakfast consumption.

Furthermore, the results demonstrated that most of the subjects consumed their breakfast between 8.00 a.m. to 10.00 a.m. (90.5%) and spent RM2 to RM5 on their breakfast (42.6%). Jayaveloo, Daud and Rahman (2021) also reported the same results, in which most of the students generally had their breakfast between 8.00 a.m. to 10.00 a.m. (64.4%) and spent RM2 to RM5 on their breakfast (55.6%). Besides, a majority of the subjects (67.9%) usually consumed their breakfast at their residence, which is home or hostel. This result was supported by Awang Damit, Rahman and Ahmad (2019), who stated that half of the students at Universiti Brunei Darussalam consume their breakfast at home. The possible justification for this was that it might seem to be more convenient if the students consume their self-prepared breakfast before attending classes. Moreover, subjects generally consumed their breakfast on their own (71.1%) rather than with friends (28.9%). This was evidenced by a question in the attitude part of the questionnaire, in which the subjects in this study would not mind eating breakfast alone as 45.3% strongly disagreed with the statement “I think that I would not eat breakfast if I am alone”.

## 5.3 Analysis of knowledge, attitude, and practice questionnaires of breakfast consumption among subjects

### 5.3.1 Knowledge of breakfast consumption

The correct answers for the knowledge part of the questionnaire were chosen by majority of the subjects. In general, 48.9% to 92.1% of the subjects were able to choose the correct answers. This result was comparable with a study conducted by Jayaveloo, Daud and Rahman (2021), which reported that 52.5% to 81.6% of the students were able to answer the questions correctly. In the current study, about half of the subjects (52.1%) disagreed with the false statement, in which breakfast consumption will not increase the calorie intake in the next meal. Nicklas, et al. (2003) reported that skipping breakfast is more likely to increase energy intake in the next meal by consuming more food due to the increased feeling of hunger. A very high percentage of subjects (92.1%) understood that breakfast provides numerous vitamins and minerals for our bodies. According to Ramsay, et al. (2018) stated that breakfast consumers have a higher intake of dietary fibre, folate, vitamin A, vitamin C, iron, and calcium.

Besides, 84.2% of the subjects believed that a high-fiber breakfast helps them to feel full for a longer time. Saboo, et al. (2022) claimed that soluble fiber is water soluble and has gel-forming properties, thus leading to increased satiety due to delayed gastric emptying. There were 88.4% of the subjects agreed that breakfast consumption helps students to concentrate and retain new information in class. A study conducted by Gao, Zhao and Shu (2021) declared that breakfast consumption improves students' focus and concentration in class, thus

improving their academic performance. Moreover, a majority of the subjects (76.8%) were aware that breakfast consumption would not lead to unhealthy snack consumption. Schimelpfening (2017) noted that breakfast skipping tends to increase the consumption of unhealthy snacks including snacks that are high in sugar, carbohydrates, and fats.

Nearly half of the subjects (48.9%) disagreed that breakfast with high content of fibre and protein, but low content of fats and sugars can reduce the concentration levels during the learning process. Furthermore, there were 71.1% of the subjects agreed that consuming a healthy breakfast regularly will help to reduce body weight. According to Tee, et al. (2018), regular breakfast consumption was associated with a lower body weight. More than half of the subjects (59.5%) answered correctly that consumption of high-energy and fibrous breakfasts can reduce the risks of heart disease. High fiber intake can improve cardiovascular health by reducing body lipids, controlling blood pressure, and decreasing chronic inflammation, thus reducing the risk of cardiovascular disease (Satija and Hu, 2012). A majority of the subjects (82.6%) agreed that the best time for having breakfast is between 6 a.m. to 10 a.m. It is recommended to consume breakfast regularly at earlier in the day as delayed breakfast consumption can lead to delayed consumption of other meals in the day.

In addition, 73.2% of the subjects disagreed with the false statement, in which breakfast will not increase the consumption of high-fat food such as fried foods. Breakfast skipping tends to increase the consumption of snacks which is mostly

high in fats, due to hunger. A majority of the subjects (83.2%) were familiar that breakfast provides glucose as fuel to the brain to function properly after long overnight fasting. During sleep, the liver converts stored glycogen into glucose and released them into the bloodstream to maintain the blood glucose level. Hence, the glycogen stores are depleted in the morning (Tang, et al., 2017). In this case, breakfast replenishes the glycogen stores in the body and provides energy for cognitive function (Tang, et al., 2017). Most of the subjects (87.9%) agreed that breakfast consumption helps to have a good mood and improve the academic performance of students. Taha and Rashed (2017) found a positive correlation between breakfast intake and the academic performance of students, in which students who consume breakfast regularly have improved academic performance. Additionally, there were 89.5% of the subjects agreed that breakfast that is high in fiber will help in digestion.

### 5.3.2 Attitude of breakfast consumption

In the current study, there were 65.3% of the subjects strongly agreed that breakfast intake helps to maintain a healthy body. Rampersaud (2009) stated that breakfast consumption can maintain a healthy lifestyle for children and adolescents, as well as have positive effects on their health and well-being. More than half of the subjects (52.6%) strongly agreed that breakfast intake will increase the absorption of vitamins and minerals. A study conducted by Matsumoto, et al. (2020) reported that skipping breakfast is associated with vitamin and mineral deficiencies. Besides, nearly half of the subjects (47.9%) strongly agreed that breakfast intake will help to meet their daily total dietary

fiber intake. Gibney, et al. (2018) claimed that the consumption of breakfast especially ready-to-eat cereals leads to a higher intake of dietary fiber.

In addition, there were 43.2% of the subjects strongly agreed that breakfast intake helps to reduce the risk of heart disease, diabetes, and high blood pressure. Li, et al (2021) reported that regular breakfast consumption decreases the risk of developing chronic diseases such as cardiovascular disease, type 2 diabetes mellitus, hypertension, stroke, and obesity. More than half of the subjects (52.1%) strongly believed that they will be more focused during studying if they consume breakfast. Breakfast consumption can improve students' focus and concentration in class, thus improving their academic performance (Gao, Zhao and Shu, 2021). However, there were only 8.9% of the subjects strongly disagreed and 19.5% of the subjects disagreed that they prioritized their morning classes over consuming breakfast. This may suggest that students might not have enough time to eat breakfast before their morning classes and they believed that attending their morning classes was more important than consuming breakfast, as they do not want to miss out on important material or fall behind in their coursework. Comparably, a study conducted by Jayaveloo, Daud and Rahman (2021) also showed the similar results, in which only 9.1% of the subjects had chosen the most ideal answer for this statement.

Also, only 3.7% of the subjects strongly disagreed and 16.4% of the subjects disagreed that it is difficult to get well-balanced nutritious food for breakfast in the university. The possible justification for this was that the university might

have limited options available for breakfast, which makes it difficult for students to find nutritious breakfast options. Hence, it is important for the university to consider the needs and preferences of the students when it comes to providing nutritious breakfast options. Moreover, 45.3% of the subjects strongly disagreed that they would not consume breakfast if they were alone. This shows that most of the subjects believed that breakfast consumption is important regardless of whether they are eating alone or with others. Most of the subjects (40.0%) strongly disagreed that they skip breakfast to save money. This indicates that a majority of subjects value the advantages of consuming breakfast and are less likely to prioritize cost over health. They may skip breakfast due to some unavoidable reasons such as inadequate time for breakfast consumption.

More than 50% of the subjects agreed that the university cafeteria sells similar and common Malaysian foods for breakfast. Notably, there were only 5.8% of the subjects strongly disagreed and 11.6% of the subjects disagreed that early morning classes lead students to skip breakfast. This result was consistent with a study conducted by Jayaveloo, Daud and Rahman (2021), in which only 9.1% of the subjects strongly disagreed with this statement. Similar to the statement discussed earlier, students might have inadequate time to consume breakfast before their early morning classes, thus causing them to skip breakfast. In addition, students might prioritize their morning classes over consuming breakfast. However, this is a wrong attitude as skipping breakfast can have negative effects on academic performance as well as their overall health status. This underlines the need for the university to consider ways to promote breakfast consumption among students such as offering easy, ready-to-eat, and healthy

breakfast options such as sandwich, breakfast cereals, and yoghurt bowl in campus.

### 5.3.3 Practice of breakfast consumption

In the current study, there were 31.6% of the subjects strongly disagreed that they substituted breakfast with snacking. Replacing breakfast with high-calorie or unhealthy snacks can have negative effects on health such as obesity, cardiovascular disease, diabetes mellitus, and hypertension (Bastami, Zamani-Alavijeh and Mostafavi, 2019). Notably, only 9.5% of the subjects strongly disagreed and 8.9% of the subjects disagreed that they would have brunch if they did not have breakfast before 10.00 a.m. This result was comparable to a study conducted by Jayaveloo, Daud and Rahman (2021), in which only 10.1% of the subjects strongly disagreed with this statement. The possible justification for this was that students might not have enough time to consume breakfast early in the morning and began to feel hungry in the late morning or early afternoon, causing them to choose to have brunch instead. Moreover, 25.3 % of the subjects strongly disagreed that they only take dairy products as breakfast. Also, there were 25.3% of the subjects strongly disagreed that they only take protein-based food for breakfast. A balanced breakfast should be compromised of a variety of foods from various food groups including carbohydrates, proteins, lipids, and micronutrients to provide all the necessary nutrients (Marangoni, et al., 2009).

Remarkably, less than 40% of the subjects strongly agreed with the statement of always consuming cereals for breakfast compared to local foods such as Nasi

lemak. A majority of the subjects indicated a neutral attitude. In this context, most of the students were more flexible to try different breakfast options and they did not have a strong preference for cereals over local foods or vice versa. However, the most ideal answer for this statement should be strongly agree. This suggested that there might be students who were not familiar with the benefits of consuming cereals instead of local foods. Cereals provide numerous nutrients such as carbohydrates, proteins, fats, vitamins, minerals, and also dietary fibre (Baniwal, et al., 2021). Hence, consuming cereals is a healthier breakfast option compared to local foods such as Nasi Lemak which is high in fat content. However, there are also some healthy eating tips for these unhealthy local foods to increase their vitamins, minerals, and fibre content whereas decreasing their fat content. For example, the rice cooked with coconut milk can be replaced with white rice. Besides, hard-boiled egg can be chosen instead of fried chicken or fried egg. Also, more cucumber can be requested from the stall owner.

Besides, there were 31.1% of the subjects strongly disagreed that they only eat breakfast if they are at their parents' home compared to on the campus. Students should have a regular pattern of breakfast consumption regardless of their location or changes in their environment. Additionally, the current study revealed that about 50% of the subjects disagreed that they only take breakfast if they are hungry. Breakfast should be viewed as a regular meal and should not be skipped regardless of the level of hunger. However, only 18.9% of the subjects strongly disagreed that they skip breakfast if their class starts at 8.00 a.m. This result was consistent with a study conducted by Jayaveloo, Daud and Rahman (2021), in which there were more students agreed to this statement

instead of disagreed. One possible explanation for this was students might feel rushed in the early morning as they might need to leave earlier to account for traffic or public transportation delays. Therefore, they might prioritize for getting dressed and ready for the day over consuming breakfast. It is important for students to prioritize their breakfast by making time for breakfast even if they have early classes. Furthermore, there were 41.6% of the subjects strongly disagreed that they skip breakfast because they are lacking money. Similar for the statement in the attitude part, in which most of the subjects strongly disagreed that they skip breakfast to save money. Students may skip breakfast due to other unavoidable reasons instead of financial issues. In addition, 27.4% of the subjects strongly disagreed that they do not have enough time to buy breakfast.

## 5.4 Knowledge, attitude, and practice scores and levels on breakfast consumption

Overall, the knowledge score of the subjects was the highest compared to attitude and practice scores. The total score in each category was scored and categorized, in which less than 40% indicates a low score, 40 to 80% indicates a moderate score, and more than 80% indicates a high score. In this case, the subjects had high knowledge levels but moderate attitude and practice levels. Jayaveloo, Daud and Rahman (2021) also reported the same results, in which most of the students have moderate levels of attitude and practice on breakfast consumption. This indicates that students had good knowledge of breakfast consumption, but they were still unable to have a positive attitude and good practice in consuming breakfast. The result of this study was comparable to a

study being carried out in Saudi Arabia that reported although medical students had better knowledge of healthy lifestyles and dietary habits compared to non-medical students, the knowledge was not reflected in their practice of maintaining healthy dietary behaviours (Alghamdi, et al., 2021). This indicates that superior nutrition knowledge might not necessarily result in good daily practices. In addition, comparisons between groups demonstrated that dietetics students had significantly higher knowledge, attitude, and practice (KAP) scores and levels compared to non-dietetics students. It ought to know that dietetics students have better knowledge and awareness of healthy dietary habits and lifestyles compared to non-dietetics students. Notably, the practice scores and levels of dietetics students were significantly higher when compared with non-dietetics students. This finding has mirrored the analysis of breakfast consumption prevalence between the groups, in which the dietetics students had a higher breakfast consumption prevalence compared to non-dietetics students.

## 5.5 Correlation between knowledge, attitude, and practice of breakfast consumption

There were statistically significant weak positive correlations between attitude and practice, knowledge and practice, and knowledge and attitude variables. In general, there was a significant positive correlation between knowledge, attitude, and practice (KAP) variables. The findings were comparable with Jayaveloo, Daud and Rahman (2021), as they reported to have a significant positive correlation between KAP variables. There were significant moderate positive correlations between attitude and practice as well as knowledge and attitude whereas a very weak correlation between knowledge and practice (Jayaveloo,

Daud and Rahman, 2021). Besides, the results were also consistent with a study on healthy diet among university students in Portugal that stated that there were significant very weak positive correlations between knowledge and practice as well as knowledge and attitude whilst a significant weak correlation between attitude and practice (Alves and Precioso, 2020). Furthermore, Gupta and Chhabra (2022) found that there were significant positive correlations between KAP variables, which further showed consistent findings with the current study.

In the current study, the significant positive correlation between knowledge and attitude suggested that good knowledge of the benefits of breakfast consumption increases the positivity of attitude towards breakfast consumption. Furthermore, the significant positive correlation between knowledge and practice highlighted that individuals with more knowledge of the advantages of breakfast consumption are more likely to engage in practices of breakfast consumption. In addition, the significant positive correlation between attitude and practice indicated that positive attitudes lead to an increased frequency of breakfast consumption. If the students have good nutrition-related knowledge such as the benefits of breakfast consumption, the students will have more positive attitudes towards breakfast consumption and they will have a stronger belief in the importance of consuming breakfast, thus leading to a higher prevalence of breakfast consumption. Since the current study found that there was only 5.8% of students have good practices toward breakfast consumption, the correlation results highlighted the need to provide more evidence-based information on breakfast consumption to improve their knowledge level, thus achieving the

effect of increased positive attitudes and good practices towards breakfast consumption.

## 5.6 Association between breakfast consumption and body mass index (BMI)

In the current study, there was no significant association between breakfast consumption and BMI, which was in line with previous studies (Moy, et al., 2009; Awang Damit, Rahman and Ahmad, 2019; Seedat and Pillay, 2020; Karim, et al., 2021; Yamamoto, et al., 2021). These studies claimed that breakfast consumption was not significantly associated with BMI among university students. The possible justification for this was that there might not be a direct relationship between breakfast consumption and BMI, in which breakfast consumption was not the main reason that affects BMI. Although breakfast consumption might be slightly associated with BMI, the association between breakfast consumption and BMI might be influenced by other factors. Qin, et al. (2018) suggested that gender and lifestyle such as physical activity levels, sleeping hours, and duration spent on sedentary activities might also impact on the BMI and overweight or obese status. Munoz-Pareja, et al. (2013) also highlighted that obesity-related eating behaviours (OREB) were associated with a higher intake of energy-dense food, high-sugar foods, and alcoholic beverages.

Although the findings of the current study showed that there was no significant association between breakfast consumption with BMI, breakfast consumers have a slightly higher percentage of normal-weight individuals compared to

breakfast skippers. This suggested that there might be a slight association between breakfast consumption and BMI, just that the association might not be that significant in the current study. The findings of a higher percentage of normal-weight individuals in the breakfast consumers group can be supported by previous studies that reported breakfast consumers had a lower BMI compared to breakfast skippers among university students (Mathiyalagen, et al., 2019; Mansouri, et al., 2020). Since there was a trend shown in the current study, in which breakfast consumers have a slightly higher percentage of individuals for normal weight compared to non-dietetics students, further research can be done to determine whether there is a significant association between breakfast consumption and BMI.

## 5.7 Association between breakfast consumption and academic performance

In the current study, there was no significant association between breakfast consumption and academic performance. The findings were parallel to a study conducted by Soheilipour, Salehiniya and Pishgahroudsari (2019) that declared breakfast consumption was not significantly associated towards academic status. The potential reason for this was that academic performance might be affected by other factors instead of breakfast consumption. Islam and Tasnim (2021) claimed that a variety of factors can influence the academic performance of undergraduate students. Regular attendance, hard work, dedication, regular study, self-confidence, family support, and support from others are positively associated with academic performance whilst lack of interest, inadequate study effort, and an uncomfortable environment are negatively associated with

academic performance (Islam and Tasnim, 2021). Furthermore, Mushtaq and Khan (2012) also stated that good communication, proper guidance, and adequate learning facilities positively impacted the academic performance of students whereas family stress shows a negative influence.

## 5.8 Significance of results

This study specifically studied the breakfast consumption patterns as well as knowledge, attitude, and practice (KAP). A previous study conducted by Jayaveloo, Daud and Rahman (2021) focussed on this topic. However, they only assessed the breakfast consumption patterns and KAP among general university students in Malaysia. To the best of our knowledge, there is a paucity of studies that examine the breakfast consumption patterns and KAP among dietetics and non-dietetics students specifically, and a complete absence of studies in Malaysia. Hence, this will be the first study to determine the breakfast consumption patterns and KAP among dietetics and non-dietetics undergraduate students in Malaysia. In addition, this study provided a clearer concept of breakfast consumption patterns, including the prevalence of breakfast consumption among university students as well as provided more insights into the KAP of breakfast consumption among university students. The results of this study could be valuable for developing interventions in the future, that aim to promote breakfast consumption and raise awareness of breakfast consumption effectively among university students, which could potentially have a positive impact on their health and academic performance. These interventions could help to bridge the gap between knowledge and actual practice of breakfast consumption among university students in their daily life.

## 5.9 Limitations of the study

This study implemented a cross-sectional design to study the association between breakfast consumption with BMI and academic performance. Hence, it is inappropriate to establish or draw conclusions about cause-effect relationships between the variables studied. Moreover, this study only recruited a small size of samples who are from one university only. This could limit the ability of the results and findings of this study to represent the whole population of university students in Malaysia, thus leading to non-generalized outcomes. Furthermore, the data on sociodemographic, breakfast consumption patterns, and KAP were self-reported by the subjects. This might contribute to an increased risk of information bias. Also, this study only collected the BMI of the subjects, which did not consider body fat distribution. Therefore, other anthropometric measurements such as body fat mass and waist circumference should also be evaluated to categorize the subjects in terms of underweight, normal weight, overweight, or obese more accurately in the future. In addition, breakfast consumption was the only factor used in this study to assess its association with BMI and academic performance. There might be other factors that associate with BMI and academic performance, which this study did not assess.

## 5.10 Recommendations for future studies

For future studies, it is recommended to conduct longitudinal studies such as cohort studies to investigate the association of breakfast consumption with BMI and academic performance, thus causal relationships can be studied. Besides,

future studies can recruit a larger sample size and population such as involving students from several universities in Malaysia in order to obtain more representative results. Furthermore, data such as the height and weight of the subjects can be collected physically instead of self-reported to increase the accuracy and reliability of the results. Moreover, it is suggested for future studies to include other factors such as physical activity levels, sleeping hours, quantity, and quality of breakfast, which may affect the BMI and academic performance of the students, instead of the frequency of breakfast consumption only. This may help to further examine the association towards BMI and academic performance.

# CHAPTER 6

# CONCLUSION

There was a significant difference in breakfast consumption patterns between dietetics and non-dietetics students, in which dietetics students had a significantly higher number of breakfast consumers compared to non-dietetics students. Besides, the subjects showed a high knowledge level but moderate attitude and practice levels on breakfast consumption. This highlights that although students had good knowledge of breakfast consumption, they were still unable to have a positive attitude and good practice in consuming breakfast. Furthermore, there was a significant difference in breakfast consumption knowledge, attitude, and practice (KAP) levels between the dietetics students and non-dietetics students, in which dietetics students had higher KAP scores compared to the non-dietetics students. Also, there was a statistically significant weak positive correlation between KAP variables. Moreover, there was no significant association between breakfast consumption with BMI as well as with academic performance.

To the best of our knowledge, this will be the first study to determine the breakfast consumption patterns and KAP among dietetics and non-dietetics undergraduate students in Malaysia. In conclusion, this study reveals a good knowledge of breakfast consumption with moderate attitude and practice levels among university students, especially among dietetics students who have better knowledge and understanding about the importance on nutrition and healthy

lifestyle habits. The results of this current study highlight the needs to promote the importance and practice of breakfast consumption among university students to improve overall body health and academic status. The findings could be useful for developing future interventions such as educational campaigns or policy changes that promote healthy breakfast options on campus.

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# Appendix A

Ethical Approval for Research from UTAR

**UNIVERSITI TUNKU ABDUL RAHMAN** DU012(A)
Wholly owned by UTAR Education Foundation Co. No. 578227-M

Re: U/SERC/264/2022

14 December 2022

Dr Teh Lai Kuan
Head, Department of Allied Health Sciences
Faculty of Science
Universiti Tunku Abdul Rahman
Jalan Universiti, Bandar Baru Barat
31900 Kampar, Perak.

Dear Dr Teh,

**Ethical Approval For Research Project/Protocol**

We refer to the application for ethical approval for your students' research projects from Bachelor of Science (Honours) Dietetics programme enrolled in course UDDN3108. We are pleased to inform you that the application has been approved under Expedited Review.

The details of the research projects are as follows:

| No | Research Title | Student's Name | Supervisor's Name | Approval Validity |
|---|---|---|---|---|
| 1. | Breakfast Consumption Pattern, Knowledge, Attitude and Practice Among University Students in Universiti Tunku Abdul Rahman (UTAR) | Yap Hui Fen | Ms Iman Nabihah Binti Noor Azam | 14 December 2022 – 13 December 2023 |
| 2. | Breakfast Consumption Pattern, Knowledge, Attitude and Practice Among Health Science and Non-health Science Students in Universiti Tunku Abdul Rahman (UTAR) | Lim Xiao En | | |
| 3. | Breakfast Consumption Pattern, Knowledge, Attitude and Practice Among Dietetic and Non-dietetic Students in Universiti Tunku Abdul Rahman (UTAR) | Ho Xiao Qi | | |
| 4. | Fitness Technology Usage and Physical Activity Level Among Undergraduate Students at Universiti Tunku Abdul Rahman (UTAR) | Chan Yik Kiang | Ms Lau Zhi Ch'ng | |
| 5. | Association of Diet-tracking Application Usage with Mindful Eating Behavior Among Malaysian Adults | Lakhasth a/l R Jayasilan | | |
| 6. | The Acceptance and Association of Mobile Health Application and Physical Activity Level Among Young Adults in Malaysia: Cross-sectional Study | Tang Wan Jun | | |

The conduct of this research is subject to the following:

(1) The participants' informed consent be obtained prior to the commencement of the research;

(2) Confidentiality of participants' personal data must be maintained; and

(3) Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.

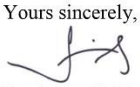
**Kampar Campus** : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
Tel: (605) 468 8888 Fax: (605) 466 1313
**Sungai Long Campus** : Jalan Sungai Long, Bandar Sungai Long, Cheras, 43000 Kajang, Selangor Darul Ehsan, Malaysia
Tel: (603) 9086 0288 Fax: (603) 9019 8868
**Website**: www.utar.edu.my

(4) Written consent be obtained from the institution(s)/company(ies) in which the physical or/and online survey will be carried out, prior to the commencement of the research.

Should the students collect personal data of participants in their studies, please have the participants sign the attached Personal Data Protection Statement for records.

Thank you.

Yours sincerely,



**Professor Ts Dr Faidz bin Abd Rahman**
Chairman
UTAR Scientific and Ethical Review Committee

c.c Dean, Faculty of Science
Director, Institute of Postgraduate Studies and Research

**Kampar Campus** : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
Tel: (605) 468 8888 Fax: (605) 466 1313
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Tel: (603) 9086 0288 Fax: (603) 9019 8868
**Website**: www.utar.edu.my

## Appendix B

Normality Test in SPSS Software

**Tests of Normality**

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Age | .249 | 190 | .000 | .903 | 190 | .000 |
| BMI (kg/m^2) | .107 | 190 | .000 | .942 | 190 | .000 |
| CGPA | .131 | 190 | .000 | .947 | 190 | .000 |
| Knowledge score (%) | .147 | 190 | .000 | .933 | 190 | .000 |
| Attitude score (%) | .058 | 190 | .200* | .991 | 190 | .304 |
| Practice score (%) | .054 | 190 | .200* | .993 | 190 | .457 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

# Appendix C

Online Questionnaire of Study



## Breakfast Consumption Patterns, Knowledge, Attitude, and Practice among Dietetics and Non-Dietetics UTAR Students

Dear respondent,

Good day.
I am a Year 3 student from Bachelor of Science (Hons) Dietetics in Universiti Tunku Abdul Rahman (UTAR). I would like to invite you to participate in my final year project entitled "Breakfast Consumption Patterns, Knowledge, Attitude, and Practice among Dietetics and Non-Dietetics UTAR Students" with the details as shown below.

Objective:
To determine the breakfast consumption patterns and knowledge, attitude, and practice (KAP) among dietetics and non-dietetics UTAR students.

Target Population (Criteria):
1. From Universiti Tunku Abdul Rahman (UTAR) Kampar campus
2. Malaysian citizen
3. Pursuing undergraduate degree program
4. Healthy with no history of chronic disease
5. Currently not fasting due to religious festivals

This questionnaire consists of 3 sections:
Section A: Social demographic data
Section B: Breakfast consumption patterns
Section C: Breakfast consumption knowledge, attitude, and practice (KAP)

Estimation of Time Needed: 5 - 10 minutes

Thank you very much for willing to spend your time and fill up this questionnaire. Your cooperation is highly appreciated. Your participation and contribution provide a great impact in this study.

If you have any inquiries, please do not hesitate to contact me, Ho Xiao Qi at hoxiaoqi3822@1utar.my or my supervisor, Ms Farzana Athirah at farzana@utar.edu.my. Thank you.

* Indicates required question

1. I hereby agreed to participate in this study. *

*Mark only one oval.*

- ◯ I have been notified by you and that I hereby understood, consented, and agreed to participate in this study.
- ◯ I disagree to participate in this study.

**PERSONAL DATA PROTECTION NOTICE**

Please be informed that in accordance with Personal Data Protection Act 2010 ("PDPA") which came into force on 15 November 2013, Universiti Tunku Abdul Rahman ("UTAR") is hereby bound to make notice and require consent in relation to collection, recording, storage, usage and retention of personal information.

1. Personal data refers to any information which may directly or indirectly identify a person which could include sensitive personal data and expression of opinion. Among others it includes:
a) Name
b) Identity card
c) Place of Birth
d) Address
e) Education History
f) Employment History
g) Medical History
h) Blood type
i) Race
j) Religion
k) Photo
l) Personal Information and Associated Research Data

2. The purposes for which your personal data may be used are inclusive but not limited to:
a) For assessment of any application to UTAR
b) For processing any benefits and services
c) For communication purposes
d) For advertorial and news
e) For general administration and record purposes
f) For enhancing the value of education
g) For educational and related purposes consequential to UTAR
h) For replying any responds to complaints and enquiries
i) For the purpose of our corporate governance
j) For the purposes of conducting research/ collaboration

3. Your personal data may be transferred and/or disclosed to third party and/or UTAR collaborative partners including but not limited to the respective and appointed outsourcing agents for purpose of fulfilling our obligations to you in respect of the purposes and all such other purposes that are related to the purposes and also in providing integrated services, maintaining and storing records. Your data may be shared when required by laws and when disclosure is necessary to comply with applicable laws.

4. Any personal information retained by UTAR shall be destroyed and/or deleted in accordance with our retention policy applicable for us in the event such information is no longer required.

5. UTAR is committed in ensuring the confidentiality, protection, security and accuracy of your personal information made available to us and it has been our ongoing strict policy to ensure that your personal information is accurate, complete, not misleading and updated. UTAR would also ensure that your personal data shall not be used for political and commercial purposes.

**Consent**

By submitting or providing your personal data to UTAR, you had consented and agreed for your personal data to be used in accordance to the terms and conditions in the Notice and our relevant policy.

If you do not consent or subsequently withdraw your consent to the processing and disclosure of your personal data, UTAR will not be able to fulfill our obligations or to contact you or to assist you in respect of the purposes and/or for any other purposes related to the purpose.

You may access and update your personal data by writing to us at hoxiaoqi3822@1utar.my.

2. Acknowledgment of Notice *

*Mark only one oval.*

- ◯ I have been notified and that I hereby understood, consented and agreed per UTAR above notice.
- ◯ I disagree, my personal data will not be processed.

**Section A: Social Demographic Data**

In this section, your personal information will be collected.

3. 1. Gender *

*Mark only one oval.*

- ◯ Male
- ◯ Female

4. 2. Age (e.g., 21) *

5. 3. Race *

*Mark only one oval.*

- ◯ Malay
- ◯ Chinese
- ◯ Indian
- ◯ Other: _____

6. 4. The academic year of study *

*Mark only one oval.*

- ◯ Year 1
- ◯ Year 2
- ◯ Year 3
- ◯ Year 4
- ◯ Other: _____

7. 5. Course programme (e.g., Dietetics) *

_____

8. 6. Daily budget on foods (Ringgit Malaysia) *

*Mark only one oval.*

- ◯ < RM10
- ◯ RM10 – RM15
- ◯ > RM15

9. 7. Monthly allowance (Ringgit Malaysia) *

*Mark only one oval.*

- ◯ < RM500
- ◯ RM500 – RM1000
- ◯ > RM1000

10. 8. Financial status *

*Mark only one oval.*

- ◯ Received scholarship (e.g. JPA, UTAR scholarship)
- ◯ Study loan (e.g. PTPTN)
- ◯ Self / family fund

11. 9. Living arrangement *

*Mark only one oval.*

- ◯ Hostel
- ◯ Rented home
- ◯ Parents' home

12. 10. Weight (e.g., 60.0kg) *

13. 11. Height (e.g., 1.60m) *

14. 12. Cumulated Grade Point Average (CGPA) points (e.g., 3.20) *

**Section B: Breakfast Consumption Patterns**

We are interested in finding out about the breakfast patterns of UTAR students. The questions will ask you about your breakfast consumption patterns.
Kindly be reminded that "breakfast" is defined as the first meal of the day which is consumed within two hours after waking up and normally before 10.00 a.m.

15. 1. Frequency of breakfast consumption in a week *

*Mark only one oval.*

- ◯ 0 – 2 time
- ◯ 3 – 5 times
- ◯ 6 – 7 times

16. 2. Time of breakfast consumption *

*Mark only one oval.*

- ◯ Before 8.00 a.m.
- ◯ 8.00 a.m. to 10.00 a.m.

17. 3. Amount of money spent on breakfast (Ringgit Malaysia) *

*Mark only one oval.*

- ◯ Less than RM2
- ◯ RM2 – RM5
- ◯ RM5 – RM8
- ◯ RM8 and more

18. 4. The location to consume breakfast *

*Mark only one oval.*

- Cafeteria in university
- Restaurant / food stall
- Fast food restaurant
- Home / hostel

19. 5. With whom having breakfast *

*Mark only one oval.*

- With friends
- Alone

**Section C: Breakfast Consumption Knowledge, Attitude, and Practice**

There are 3 parts in this section.
Part A: Breakfast Consumption Knowledge
Part B: Breakfast Consumption Attitude
Part C: Breakfast Consumption Practice

**Part A. Breakfast Consumption Knowledge**
This part will be assessing your knowledge on breakfast consumption. There will be 13 questions in this part. Read each questions and select your answer.

20. 1. Breakfast consumption will increase calorie intake in the next meal. *

*Mark only one oval.*

- True
- Not sure
- False

21. 2. Breakfast provides numerous vitamins and minerals for our body. *

*Mark only one oval.*

- True
- Not sure
- False

22. 3. High-fiber breakfasts help me to feel full for longer. *

*Mark only one oval.*

- True
- Not sure
- False

23. 4. Eating breakfast helps students to concentrate and retain new information in class. *

*Mark only one oval.*

- True
- Not sure
- False

24. 5. Eating breakfast will lead to a consumption of unhealthy snacks. *

*Mark only one oval.*

- True
- Not sure
- False

25. 6. Breakfast that high in fiber and protein, but low in fats and sugars can reduce concentration levels during the learning process. *

*Mark only one oval.*

- True
- Not sure
- False

26. 7. Regular consumption of a healthy breakfast will help to reduce body weight. *

*Mark only one oval.*

- True
- Not sure
- False

27. 8. Risks of heart diseases can be reduced by eating high energy and fibrous breakfast. *

*Mark only one oval.*

- True
- Not sure
- False

28. 9. The best time to have breakfast is between 6.00 to 10.00 in the morning. *

*Mark only one oval.*

- True
- Not sure
- False

29. 10. Breakfast will increase the consumption of food high in fat such as fried foods. *

*Mark only one oval.*

- True
- Not sure
- False

30. 11. Breakfast provides glucose as a fuel to our brain to function properly after a long overnight fasting. *

*Mark only one oval.*

- True
- Not sure
- False

31. 12. Eating breakfast helps to have a good mood and improve students' academic performance. *

*Mark only one oval.*

- True
- Not sure
- False

32. 13. Breakfast that is high in fiber will help in digestion. *

*Mark only one oval.*

- True
- Not sure
- False

**Part B. Breakfast Consumption Attitude**

This part will be assessing your attitude on breakfast consumption. There will be 11 questions in this part. Please respond to the following statements by ticking the appropriate number.

1= Strongly Agree
2 = Agree
3 = Neutral
4 = Disagree
5 = Strongly Disagree

33. 1. I believe breakfast intake helps to maintain a healthy body. *

*Mark only one oval.*

| | |
|---|---|
| | Strongly Agree |
| 1 | ◯ |
| 2 | ◯ |
| 3 | ◯ |
| 4 | ◯ |
| 5 | ◯ |
| | Strongly Disagree |

34. 2. I believe breakfast intake will increase the absorption of vitamins and minerals. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

35. 3. I think breakfast intake will help me to meet my daily total dietary fiber intake. *

*Mark only one oval.*

Strongly Agree

1

2

3

4

5

Strongly Disagree

36. 4. I believe that breakfast intake helps to reduce the risk of heart disease, diabetes, and high blood pressure. *

*Mark only one oval.*

Strongly Agree

1

2

3

4

5

Strongly Disagree

37. 5. I believe that I will be more focused during studying if I consume breakfast. *

*Mark only one oval.*

Strongly Agree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Disagree

38. 6. I prioritize my morning classes over consuming breakfast. *

*Mark only one oval.*

Strongly Agree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Disagree

39. 7. I think it is difficult to get well-balanced nutritious food for breakfast in the university. *

*Mark only one oval.*

Strongly Agree

1

2

3

4

5

Strongly Disagree

40. 8. I think that I would not eat breakfast if I am alone. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

41. 9. I skip breakfast to save money. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

42. 10. I think the university cafeteria sells similar and common Malaysian foods for breakfast. *

*Mark only one oval.*

Strongly Agree

1

2

3

4

5

Strongly Disagree

43. 11. I think early morning classes lead students to skip breakfast. *

*Mark only one oval.*

Strongly Agree

1

2

3

4

5

Strongly Disagree

**Part C. Breakfast Consumption Practice**

This part will be assessing your practice on breakfast consumption. There will be 10 questions in this part. Please respond to the following statements by ticking the appropriate number.

1= Strongly Agree
2 = Agree
3 = Neutral
4 = Disagree
5 = Strongly Disagree

44. 1. I substitute breakfast with snacking. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

45. 2. I will have brunch if I did not have breakfast before 10.00 a.m. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

46. 3. I only take dairy products as breakfast. *

*Mark only one oval.*

Strongly Agree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Disagree

47. 4. I only take protein-based food for breakfast. *

*Mark only one oval.*

Strongly Agree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Disagree

48. 5. I always take cereals for breakfast compared to local foods (e.g., Nasi lemak). *

*Mark only one oval.*

Strongly Agree

1

2

3

4

5

Strongly Disagree

49. 6. I only eat breakfast if I am at my parents' home compared to on the campus. *

*Mark only one oval.*

Strongly Agree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Disagree

50. 7. I only take breakfast if I am hungry. *

*Mark only one oval.*

Strongly Agree

1 ◯

2 ◯

3 ◯

4 ◯

5 ◯

Strongly Disagree

51. 8. I skip breakfast if my class starts at 8.00 a.m. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

52. 9. I skip breakfast because I am lacking money. *

*Mark only one oval.*

Strongly Agree

1
2
3
4
5

Strongly Disagree

53. 10. I do not have enough time to buy breakfast. *

*Mark only one oval.*

| | |
|---|---|
| | Strongly Agree |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| | Strongly Disagree |

Thank you for your response

Thank you very much for willing to spend your time and fill up this questionnaire. Your cooperation is highly appreciated. Your participation and contribution provide a great impact in this study.

# Appendix D

| Universiti Tunku Abdul Rahman | | | |
|---|---|---|---|
| **Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)** | | | |
| Form Number: FM-IAD-005 | Rev No.: 1 | Effective Date: 3/10/2019 | Page No.: 1of 1 |

UTAR
UNIVERSITI TUNKU ABDUL RAHMAN
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Co. No. 578227-M

**FACULTY OF SCIENCE**

| | |
|---|---|
| **Full Name(s) of Candidate(s)** | Ho Xiao Qi |
| **ID Number(s)** | 19ADB03822 |
| **Programme / Course** | Bachelor of Science (Honours) Dietetics |
| **Title of Final Year Project** | Breakfast consumption patterns, knowledge, attitude, and practice among dietetics and non-dietetics UTAR students |

| **Similarity** | **Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)** |
|---|---|
| **Overall similarity index: 13 %**<br><br>**Similarity by source**<br>Internet Sources: 9 %<br>Publications: 9 %<br>Student Papers: 0 % | |
| **Number of individual sources listed** of more than 3% similarity: 0 | |
| **Parameters of originality required and limits approved by UTAR are as follows:**<br>**(i) Overall similarity index is 20% and below, and**<br>**(ii) Matching of individual sources listed must be less than 3% each, and**<br>**(iii) Matching texts in continuous block must not exceed 8 words**<br>***Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.*** | |

Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

***Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.***

Signature of Supervisor
Name: Farzana Athirah binti Abdul Latif
Date: 3.5.2023

Signature of Co-Supervisor
Name: _____
Date: _____

# Appendix E



Turnitin Originality Report

Processed on: 03-May-2023 20:27 +08
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Ho Xiao Qi FYP By Ho Xiao Qi

3/5/2023

| Similarity Index | Similarity by Source |
|---|---|
| 13% | Internet Sources: 9%<br>Publications: 9%<br>Student Papers: N/A |

1% match ()
Reed, Floyd L., "The Comparative Achievement of Entering College Freshmen Based On Standardized Tests And Semester Grade Point", FHSU Scholars Repository, 1947

1% match ()
Sivagami Jayaveloo,, Norlida Mat Daud,, Hafeedza Abdul Rahman,, "Breakfast consumption patterns, knowledge, attitude, practice and barriers among Malaysian university students", 'Penerbit Universiti Kebangsaan Malaysia (UKM Press)', 2021

1% match ("20th International Congress of Nutrition: Granada, Spain, September 1520, 2013", Annals of Nutrition and Metabolism, 2013)
"20th International Congress of Nutrition: Granada, Spain, September 1520, 2013", Annals of Nutrition and Metabolism, 2013

1% match ()
Hritz, Thomas A., "THE EFFECT OF BREAKFAST CONSUMPTION ON THE ACUTE RESPONSE OF PLASMA ACYLATED-GHRELIN AND GLUCAGON-LIKE PEPTIDE 1 CONCENTRATIONS IN ADULT WOMEN", 2011

< 1% match (Internet from 16-Oct-2022)
https://www.researchgate.net/publication/337392268_Associations_Between_Habitual_School-Day_Breakfast_Consumption_Frequency_and_Academic_Performance_in_British_Adolescents

< 1% match (Internet from 21-Jul-2022)
https://www.researchgate.net/publication/353399694_Breakfast_Consumption_Patterns_Knowledge_Attitude_and_Practice_and_Barriers_

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https://www.researchgate.net/publication/363341161_Factors_to_Consider_in_Developing_Student_Academic_Performance_with_Predictic

< 1% match (Internet from 11-Oct-2022)
https://www.researchgate.net/publication/24019713_Review_on_Epidemic_of_Obesity

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https://www.researchgate.net/publication/335816336_Effects_of_eating_breakfast_on_children_and_adolescents_A_systematic_review_of

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https://www.researchgate.net/publication/7456229_Intimate_Partner_Violence_and_Disabilities_among_Women_Attending_Family_Practic

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https://worldwidescience.org/topicpages/b/breakfast+consumption+patterns.html

< 1% match (Internet from 18-Jan-2023)
https://worldwidescience.org/topicpages/p/periodontal+conditions+oral.html

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https://worldwidescience.org/topicpages/s/snack%2Bconsumption%2Bbehaviors.html

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https://worldwidescience.org/topicpages/d/dietary+behaviors+snack.html

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