MEAL TIMING, EATING SELF-REGULATORY SKILLS, DIET QUALITY AND QUANTITY AMONG DIETETICS AND NON-DIETETICS STUDENTS IN UTAR KAMPAR: A CROSS-SECTIONAL STUDY

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By

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ABSTRACT

MEAL TIMING, EATING SELF-REGULATORY SKILLS, DIET QUALITY AND QUANTITY AMONG DIETETICS AND NON-DIETETICS STUDENTS IN UTAR KAMPAR: A CROSS-SECTIONAL STUDY

Lau Celine

Meal timing plays an important role in regulating diet quality, quantity, and overall health. However, irregular meal patterns are common among university students, potentially impacting their eating self-regulation and nutritional outcomes. This study aimed to investigate the meal timing patterns, eating self-regulatory skills, diet quality, and diet quantity among dietetics and non-dietetics students at UTAR Kampar campus. A cross-sectional study was conducted on 186 undergraduate students recruited through convenience sampling. Data were collected using the Self-Regulation of Eating Behaviour Questionnaire (SREBQ) and a 2-day 24-hour dietary recall. Meal timing patterns were categorised into morning, afternoon, and evening dominant eaters. SPSS version 30.0 was used to analyse the data. Chi-square tests compared meal timing distribution between groups, while Mann-Whitney U and independent t-tests compared the continuous variables. Kruskal-Wallis and one-way ANOVA tests assessed differences across meal timing patterns, and Spearman's correlation determined the correlation between self-regulation and dietary outcomes. Among the 186 subjects, 53.2% were dietetics students and 46.8% were non-dietetics students. Evening-dominant eating was the most common

pattern (47.3%), followed by afternoon (40.3%) and morning eaters (12.3%). Dietetics students demonstrated significantly higher intention to have a healthy diet and take corrective actions ($p<0.05$). They also had significantly higher diet quality compared to non-dietetics students. However, no significant differences were observed in SREBQ scores or diet quantity between the groups. Meal timing was not significantly associated with SREBQ or dietary outcomes ($p>0.05$). Higher protein intake was positively correlated with eating self-regulation ($\rho = 0.153$, $p = 0.037$), while higher fat intake was negatively correlated with diet quality ($\rho = -0.171$, $p = 0.020$).While meal timing was not found to significantly affect the measured variables, the findings highlight the importance of nutrition education and dietary composition in promoting healthier eating behaviours and supporting students' overall well-being and academic performance.

Subject Area: RA773-788 Personal health and hygiene Including clothing, bathing, exercise, travel, nutrition, sleep, sex hygiene.

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DECLARATION

I hereby declare that the 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.

_____

Lau Celine

APPROVAL SHEET

This project report entitled "**MEAL TIMING, EATING SELF-REGULATORY SKILLS, DIET QUALITY AND QUANTITY AMONG DIETETICS AND NON-DIETETICS STUDENTS IN UTAR KAMPAR: A CROSS-SECTIONAL STUDY**" was prepared by LAU CELINE and submitted as partial fulfilment of the requirements for the degree of Bachelor of Science (Hons) Dietetics at Universiti Tunku Abdul Rahman.

Approved by:

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(Ms. Nurul Aimi binti AB Kadir)   Date: …11/9/2025….

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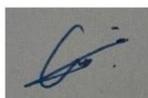
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Date: 11/9/2025

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LIST OF ABBREVIATIONS

% EI	Percentage of energy intake
ADE	Afternoon dominant eaters
BMI	Body Mass Index
CPG	Clinical Practice Guidelines
DT	Dietetics
EDE	Evening dominant eaters
HDL	High density lipoprotein
IQR	Interquartile range
MD	Median
MDE	Morning dominant eaters
RNI	Recommended Nutrient Intake
SREBQ	Self-regulation Eating Behaviour Questionnaire
SD	Standard deviation
S-MHEI	Standardised Malaysian Healthy Eating Index
SPSS	Statistical Packages for Social Sciences
UTAR	Universiti Tunku Abdul Rahman

CHAPTER 1

INTRODUCTION

1.1   Research background

Meal timing is defined as the periods during which individuals consume their main meals, such as breakfast, lunch or dinner and the distribution of daily energy intake across the day (Leech *et al*., 2015). It also includes behaviours such as late-night eating, which is defined as consuming food after going to bed (Leech *et al.*, 2015). Meal timing patterns can be classified broadly into regular and irregular. Regular meal timing involves consistent and predictable eating times daily, such as having breakfast, lunch, and dinner at fixed times. Generally, regular meal timing incorporates balanced nutrient distribution and adequate meal frequency. Conversely, irregular meal timing involves inconsistent or variable mealtimes. For example, skipping meals, eating at erratic hours, or frequently consuming late-night snacks. This pattern is common among university students due to fluctuating class schedules, late-night study habits, and social engagements (Leech *et al.*, 2015). For instance, Wan Zakaria *et al.* (2021) found that 44.9% of university students have irregular meals in terms of frequency and time. In this case, factors contributing to this behaviour include busy academic schedules, irregular sleep patterns, social and environmental factors, financial constraints, stress and mental health issues, and lack of meal planning (Moy *et al.*, 2009; Wan Zakaria *et al.*, 2021).

This inconsistency disrupts the body's circadian rhythm, which negatively impacts metabolism efficiency. Studies have shown that eating at irregular times lowers the body's ability to burn energy after meals, raises the fasting blood cholesterol and causes higher insulin spikes (Farshchi, Taylor and Macdonald, 2004). In addition to metabolic concerns, irregular meal timing has been shown to negatively impacts cognitive function. For instance, it leads to reduced concentration, impaired memory, and lower academic performance, which is especially concerning for university students managing intense academic demands (Adolphus, Lawton and Dye, 2013; Cheng and Rebecca Yew, 2025). Besides that, irregular meal timing also contributes to dietary consequences. To elaborate, it is evident by breakfast skipping, which is associated with lower daily intake of energy and essential nutrients (El Ati *et al.*, 2024). Thus, it leads to compromised overall diet quality and an increased risk of nutrient inadequacies (El Ati *et al.*, 2024). Furthermore, irregular eating patterns has been linked to effect on psychological and emotional stress. Studies show that unhealthy and irregular eating behaviours that possessed by young adults who skip meals or eat erratically more likely to experience stress, anxiety, and disordered eating symptoms (Li *et al.*, 2022). Collectively, these consequences highlight the critical importance of regular meal timing in maintaining physical, cognitive, and emotional well-being.

Another important concept is eating self-regulation. It is referring to the ability to manage one's eating habits in line with personal health goals (Kliemann et al., 2016). This involves skills like mindfulness, self-monitoring, and resisting emotional or environmental triggers (Reed et al., 2015). Research showed that

self-control overeating tends to be stronger earlier in the day and may weaken later, making irregular or late meals harder to manage (Bouwman et al., 2021). Thus, meal timing influences not just when people eat, but also how effectively they can regulate their eating behaviour. It is important to understand how meal timing impacts university students' eating self-regulation to help tailor interventions aimed at promoting better diet quality and quantity.

1.2   Problem Statements

Malaysian university students often face challenges in maintaining healthy eating habits, largely due to academic pressures and social demands. These challenges frequently result in poor diet quality and unbalanced calorie consumption (Jayaveloo, Daud and Rahman, 2021). Although previous studies show that meal timing plays an important role in influencing dietary patterns, there is a noticeable lack of recent research that looks at how meal timing affects eating self-regulation, diet quality, and diet quantity altogether. Some research has compared healthy eating habits between dietetics (DT) and non-dietetics (non-DT) students in Malaysia. However, these studies tend to focus on nutrition knowledge or specific meals, rather than exploring how meal timing impacts both eating self-regulatory skills and overall diet outcomes (Lee et al., 2023).

In recent years, Malaysia was experiencing a rise in obesity and related health problems linked to poor eating behaviours (Lee *et al.*, 2019). It is important to understand how meal timing interacts with self-regulation and dietary habits

among university students. While DT students generally have better nutrition knowledge, it is still unclear whether this knowledge helps them adopt better meal timing and eating control compared to their non-DT peers (Jayaveloo, Daud and Rahman, 2021). This study aims to fill these gaps by investigating the relationships between meal timing, eating self-regulation, diet quality, and diet quantity among both groups at UTAR, Kampar. The insights gained will help to design targeted nutrition programs to improve students' eating behaviours and overall health.

1.3   Objectives

The general objective of this research project is to explore the associations between meal timing, eating self-regulatory skills, diet quality and diet quantity among dietetics (DT) and non-dietetics (non-DT) students at UTAR, Kampar. The specific objectives are as follows:

i.   To identify meal timing patterns, eating self-regulatory skills, and dietary outcomes (diet quality and diet quantity) among DT and non-DT UTAR students.

ii.   To compare eating self-regulatory skills across different dominant meal timing patterns.

iii.   To compare dietary outcomes (diet quality and diet quantity) across different dominant meal timing patterns.

iv.   To explore the correlation between eating self-regulatory skills and dietary outcomes among UTAR students.

1.4   Research hypotheses

i.   Meal timing patterns, eating self-regulatory skills, and dietary outcomes

H01: There is no significant difference in meal timing patterns, eating self-regulatory skills, and dietary outcomes between DT and non-DT students at UTAR.

H1: There is a significant difference in meal timing patterns, eating self-regulatory skills, and dietary outcomes between DT and non-DT students at UTAR.

ii.   Eating Self-Regulatory Skills Across Meal Timing Patterns

H0: There is no significant difference in eating self-regulatory skills across dominant meal timing patterns among UTAR students.

H1: There is a significant difference in eating self-regulatory skills across dominant meal timing patterns among UTAR students.

iii.   Diet Quality Across Meal Timing Patterns

H0: There is no significant difference in diet quality across dominant meal timing patterns among UTAR students.

H1: There is a significant difference in diet quality across dominant meal timing patterns among UTAR students.

iv.   Diet Quantity Across Meal Timing Patterns

H0: There is no significant difference in diet quantity across dominant meal timing patterns among UTAR students.

H1: There is a significant difference in diet quantity across dominant meal timing patterns among UTAR students.

v. Correlation Between Eating Self-Regulatory Skills and Dietary

Outcomes

H0: There is no significant correlation between eating self-regulatory

skills and dietary outcomes (diet quality and diet quantity) among

UTAR students.

H1: There is a significant correlation between eating self-regulatory

skills and dietary outcomes among UTAR students.

1.5   Significance of the study

This study provides critical insights into the associations between meal timing,

eating self-regulatory skills, and diet quality and quantity among dietetics

(DT) and non-dietetics non-DT) students at UTAR, Kampar. Through an

understanding of these relationships, it encourages students to adopt healthier

eating habits by emphasising the importance of self-regulation and

maintaining a balanced diet. Besides, an early recognition of the significance

of meal timing and dietary outcomes can help prevent long-term health issues

and promote better lifestyle choices (Jayaveloo, Daud and Rahman, 2021).

Furthermore, this study can act as a basis for developing future intervention

programs focused on improving dietary habits and nutritional education,

especially regarding regular meal timing. Thus, these interventions could

effectively address the prevalent poor diet quality observed among Malaysian

university students, thereby supporting better health and academic

performance (Lee *et al.*, 2022).

CHAPTER 2

LITERATURE REVIEW

2.1 Meal Timing

2.1.1 Definition of Meal Timing

Meal timing refers to the temporal distribution of food and beverage consumption throughout the day, including timing relative to waking hours, frequency and intervals between eating occasions, and alignment with circadian rhythms (Peters *et al.*, 2024). It acts as a key external cue synchronising peripheral clocks in metabolic tissues such as the liver and pancreas, thereby affecting metabolic homeostasis (Peters *et al.*, 2024). Food intake timed within 2 to 3 hours of waking is often classified as a morning meal, promoting optimal nutrient assimilation (Davis *et al.*, 2022). Conversely, irregular eating will disrupt circadian rhythms and is linked to adverse metabolic consequences such as impaired glucose metabolism, insulin resistance, and increased obesity risk (Leech et al., 2017; Davis et al., 2022).

2.1.2 Prevalence of Irregular Meal Timing

Irregular meal timing is highly prevalent among university students worldwide. A large study of Brazilian university students reported that 51.0% skipped breakfast, with 13.9% skipping lunch, and 35.6% skipping dinner regularly. It highlighted an irregular meal consumption pattern in this population. Lifestyle-related issues also contributed to irregular meal timing

which is evidenced by a previous study that showed short sleep duration was positively associated with skipping breakfast and lunch (Jéssika Patatas de-Arruda et al., 2024). Similarly, a cross-sectional study in Saudi Arabia found 44.6% of students in health colleges and 41.3% in non-health colleges reported unhealthy eating habits, which include frequent breakfast skipping and irregular meals (Bayomy et al., 2024). In Brunei, more than half of university students skipped breakfast regularly, favouring snacking and fast food, especially among overweight or obese groups (Chen Yun, Ahmad and Soo Quee, 2018).

In Malaysia, irregular meal timing and meal skipping are also common. A recent study conducted during the COVID-19 pandemic among Malaysian university students reported that 71.9% skipped one or more main meals, primarily breakfast, with frequent snacking behaviour (Lim et al., 2024). Among Malaysian female university students, the prevalence of skipping breakfast was high (77.8%) and was strongly correlated with poor diet quality and irregular meal patterns (Lee et al., 2025). Additionally, frequent fast-food consumption among Malaysian university students contributes to irregular meal timing and poor dietary habits (Ali Basyah, Mohd Shukri and Sowtali, 2025). Other than that, the night eating behaviours reported in Malaysian university students are associated with higher BMI and stress, which further demonstrates lifestyle factors affecting meal timing (Emmy et al., 2024).

2.1.3 Factors Affecting Meal Timing

Busy academic schedules significantly disrupt regular meal timing among university students. To illustrate, several factors cause students to skip meals or consume meals irregularly such as the demands of early classes, extensive coursework, and exam preparation (Abdelwahab et al., 2025). Thus, they may prioritised study time over consistent eating (Abdelwahab et al., 2025). This pattern of meal skipping has been associated with poor diet quality and adverse health (Lee *et al.*, 2025). Similarly, irregular sleep patterns common in university populations lead to delayed breakfasts and altered hunger signals, which contributes to an erratic meal timing (Souza et al., 2024).

Besides, financial constraints also play an important role. Healthier food options often require more time to prepare and come with higher costs. Thus, it is less accessible to university students who are constrained by tight budgets and demanding academic schedules. This leads many students to prioritise convenience foods that are quicker and cheaper over balanced and nutritious meals (Wongprawmas *et al.*, 2022).

On the other hand, stress and poor mental health have been strongly linked with meal timing irregularities. Studies among Malaysian medical students had showed an elevated stress levels associated with unhealthy eating habits, including frequent snacking and meal skipping (Abdelwahab et al., 2025). Moreover, psychological distress also contributes to emotional eating and

increased night eating (Ekici, Mengi Çelik and Metin, 2025). As a result, it worsens the meal irregularity and metabolic health.

Moreover, social and environmental factors also influence the eating patterns of university students. To elaborate, students tend to conform to group eating behaviours that frequently involve fast food consumption (Jurado-Gonzalez et al., 2025). Hence, it shows that peer pressure often affects the food choices to more convenient processed foods and irregular meal schedules. Additionally, prolonged screen time and exposure to media correlate with higher intake of ultra-processed foods (Mònica Rodríguez-Barniol, Pujol-Busquets and Bach-Faig, 2024). It suggested that the use of modern technology may promote erratic eating behaviours and delayed meal timing.

2.1.4 Consequences of Irregular Meal Timing

Irregular meal timing has been consistently linked with adverse metabolic health outcomes, particularly increasing the risk of metabolic syndrome. A recent review found that skipping meals and eating late at night correlate with increased incidence of obesity, insulin resistance, and cardiovascular risk factors such as high triglycerides and low HDL-cholesterol (Alkhulaifi and Darkoh, 2022). Beyond metabolic effects, inconsistent meal timing can negatively affect cognitive function. In a cross-sectional study of Malaysian university students, those who habitually skipped breakfast showed significant poorer results compared to regular breakfast consumers. This included poorer memory and attention, slower reaction times in executive functioning tasks,

and lower academic performance (Cheng and Rebecca Yew, 2025). In terms of dietary outcomes, regular omission of main meals like breakfast has been consistently linked with poorer diet quality among university students. Skipping breakfast leads to reduced intake of essential micronutrients such as calcium, iron, and vitamins, as well as an increased reliance on energy-dense, nutrient-poor foods later in the day (Jayaveloo et al., 2025). According to Lee et al. (2023), it was found that breakfast skippers had lower overall diet quality scores, consumed fewer whole grains, legumes, and dairy products, and ate lunch less frequently than their breakfast-consuming peers. Finally, irregular meal patterns also affect the psychological and emotional well-being, in terms of mood disturbances and stress. According to Li et al. (2024), circadian misalignment caused by inconsistent meal timing has been correlated with anxiety and other mental health symptoms.

2.2   Eating Self-Regulatory Skills

2.2.1   Definition of Eating Self-Regulation

Eating self-regulation refers to the capacity of individuals to consciously monitor, control, and adjust their eating behaviour in accordance with health goals and dietary needs (Kliemann et al., 2016). It involves both cognitive and behavioural processes, which include resisting temptation, managing portion sizes, delaying gratification, and prioritising long-term health goals over immediate desires (Bouwman *et al.*, 2022). In dietary contexts, effective eating self-regulation has been associated with improved diet quality and quantity among university students. A cross-sectional study of Malaysian

healthcare undergraduates found that students with higher eating self-regulatory skills consumed less calorie dense food and had better adherence to dietary guidelines (Lee et al., 2022).

2.2.2   Factors Affecting Eating Self-Regulatory Skills

Eating self-regulatory capacity is influenced by a range of psychological, physiological, environmental, and demographic factors. Psychological stress, fatigue, and low mood can impair executive function, reducing one's ability to resist highly palatable foods and maintain dietary goals (Heatherton & Wagner, 2011). For example, academic stress among students is associated with increased consumption of comfort foods rich in sugar and fat, undermining self-regulation (Sogari *et al.*, 2018). Sleep deprivation further weakens impulse control and increases the sensitivity to food cues, thus amplifying the risk of overeating and snacking (Lowe et al., 2019). Besides, environmental contexts also exert a significant influence on self-regulatory strength. According to Bouwman *et al.* (2022), it was found that self-regulation is generally stronger at breakfast and during home meals but is reduced when individuals are tired, distracted, or eating socially. Socio-demographic factors also play a role. In this case, younger adults typically exhibit lower self-regulatory capacity compared to older adults (Tăut et al., 2015). Not only that, but the gender differences emerge as well. The previous study showed that women often report greater dietary restraint but also higher vulnerability to emotional eating triggered by stress that can compromise regulatory efforts (Neumark-Sztainer et al., 2006).

2.2.3 Consequences of Low Eating Self-Regulation

Low eating self-regulation is a major risk factor for both physical and psychological health. To illustrate, individuals with reduced self-regulatory capacity are more likely to experience increased risk of physical health issues. For instance, individuals with diminished ability to resist energy-dense foods and manage caloric intake effectively also experienced a higher body mass index (BMI), greater adiposity, and an elevated risk of obesity (Lowe *et al.*, 2019). Poor self-regulation is also linked to lower diet quality. In a previous study, low self-regulation, as evidenced by emotional eating was negatively associated with the consumption of fruits and vegetables (Konttinen *et al.*, 2019). It is also positively associated with higher consumption of sweet, high-fat and processed foods, which further exacerbates long-term health risks (Konttinen et al., 2019).

Psychologically, weak eating self-regulation contributes to increased emotional distress, feelings of guilt, and low self-esteem (Neumark-Sztainer et al., 2006). Among university populations, poor eating self-regulation is consistently associated with greater emotional eating and depressive symptoms (Yang *et al.*, 2023). Thus, it complicates the healthy dietary maintenance. In addition, a large recent study in Saudi Arabia found that only 15.5% of participants showed high self-regulatory capacity for eating, where a greater regulation was linked to lower BMI and fewer symptoms of generalised anxiety disorder (Ghabashi, 2024). These findings emphasise the

importance of enhancing eating self-regulation to prevent obesity and improve mental health outcomes.

2.3 Association and Influence of Meal Timing on Dietary Outcomes and Eating Self-Regulation

2.3.1 Association Between Meal Timing and Dietary Outcomes

Overseas studies have consistently shown that irregular or delayed meal timing is associated with poorer diet quality. For example, Leech et al. (2017a) found that later temporal eating patterns were linked to lower nutrient density and higher adiposity. Another study also demonstrated that prolonged eating windows among adults with overweight or obesity were correlated with reduced overall diet quality (Flanagan et al., 2020). Similarly, Phoi et al. (2021) emphasised that chronotype and eating timing interact to influence nutrient intake, supporting the role of circadian alignment in dietary health. BaHammam and Pirzada (2023) further highlighted that early mealtime alignment with circadian rhythms promotes better metabolic and nutritional outcomes, while delayed eating may disrupt glucose metabolism and increase fat storage.

In Malaysia, similar associations have been observed. Moy et al. (2009) reported that breakfast skipping among undergraduates was linked to poorer nutrient adequacy, such as fruits and vegetables. More recently, Lee et al. (2025) identified that irregular meal timing among Malaysian university students was associated with excessive intake of sugar-sweetened beverages

and fast food, which contributed to a lower overall diet quality score. Nonetheless, Wy, Nasir Mt and As (2011) also highlighted that both male and female students exhibited suboptimal nutrient intakes, with late-night eating and inconsistent mealtimes can contribute to a higher body weight and poor dietary balance. These findings suggest that the challenges of university life can exacerbate unhealthy temporal eating patterns and dietary behaviours among Malaysian students.

2.3.2 Influence of Meal Timing on Eating Self-Regulation

Meal timing plays an important role in shaping how well individuals can regulate their eating behaviours to meet health and nutrition goals (Eschenbeck et al., 2016). As an illustration, taking meals at structured and earlier times in the day is often linked to better control of hunger signals and less impulsive eating (Bouwman *et al.*, 2021). While irregular or delayed meals tend to increase vulnerability to disinhibited eating and unhealthy food choices (Bouwman *et al.*, 2021). This is partly related to the circadian rhythms. According to BaHammam and Pirzada (2023), self-regulatory capacity is generally stronger in the morning and declines as the day progresses. Thus, late-evening eating is more prone to reduce in self-control and making poorer dietary choices (Yan, Caton and Buckland, 2024).

2.4 Summary of Evidence

The evidence demonstrates that meal timing strongly influences both diet quality and diet quantity, and that self-regulatory skills can either reinforce or

undermine these effects. In short, earlier meals support better nutrient intake and lower calorie consumption, while irregular or late-night eating is linked to poor diet quality, higher energy intake, and greater risk of overweight and obesity. Among university students, these effects is amplified due to the unique lifestyle they face.

However, research directly examining the interaction between meal timing, self-regulation, and dietary outcomes among university students in Malaysia remains limited. Most local studies have focused on breakfast skipping or general dietary habits (Norimah *et al.*, 2008; Moy *et al.*, 2009) rather than the combined interaction between meal timing, eating self-regulation, and dietary outcomes. Cultural and environmental influences, such as food availability and social dining patterns, may also shape these associations in unique ways. This highlights the need for the current study, which aims to investigate these variables among UTAR students. Thus, it provides insight for targeted interventions to promote healthier eating patterns and improved nutritional outcomes.

CHAPTER 3

MATERIAL AND METHODS

3.1   Study Design

The research was conducted as a cross-sectional study and was carried out from December 2024 to August 2025 at the Kampar campus of University Tunku Abdul Rahman (UTAR). A cross-sectional study is an observational study that analyses data from a population at a specific point in time (Wang and Cheng, 2020). It is applicable in this study because it can investigate the associations between multiple outcomes and exposures of the study subjects (Wang and Cheng, 2020). Besides, a cross-sectional study is easy to conduct as it requires less budget and less time to complete. Throughout the study, a set of questionnaires was used as a data collection method.

3.2 Ethical Approval

This research study had received ethical approval from UTAR Scientific and Ethical Review Committee before data collection (Appendix A). Subjects were informed about the purpose of the study and the personal data. In detail, all information obtained was kept confidential and not disclosed to the public or any other unauthorised personnel. Subjects who agreed and volunteered to participate were required to sign consent forms and withdraw from the study at any time.

3.3 Sampling

3.3.1 Type of Sampling

A convenience sampling method was applied for the recruitment of the subjects from the UTAR Kampar campus. The convenience sampling method is a non-probability sampling method that drawn participants that is conveniently accessible to the researcher (Andrade, 2021). Initially, the study was intended to use quota sampling, whereby the population was divided into DT and non-DT student in equal proportions. So, the recruitment of samples was continued until each subgroup had reached 50% of the quota. However, the final distribution of participants did not achieve equal representation between the two groups. Thus, convenience sampling was employed in practice.

3.3.2 Inclusion and Exclusion Criteria

Subjects included students from UTAR Kampar campus, Malaysian adults aged 18 and above. DT students must be in Year 2 and above. Students were excluded from the study if they were pregnant or lactating, with a medical diagnosis of chronic diseases such as cardiovascular disease, diabetes, obesity, and hypertension, adhering to certain weight control programs such as intermittent fasting, and taking medications that altered appetite.

Table 3.1: Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
From UTAR Kampar campus	Pregnant or lactating
Malaysian adult	With a medical diagnosis of chronic diseases
Aged 18 and above	Adhering to certain weight control programs
Dietetics students Year 2 and above	Taking medications that alter appetite

3.3.3 Sample Size

Two formulas were applied for the estimation of sample size. Firstly, the Cochran's (1977) formula was used to calculate the sample size. Cochran's formula is shown below:

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

Where n_0 refers to the initial sample size; Z refers to the Z-value at the desired confidence level; p refers to expected prevalence or estimated proportion in the population; e refers to the desired level of precision, or known as the margin of error.

In the present study, a 95% confidence level was used. It corresponds to a z-score of 1.96. According to Wan Zakaria et al. (2021), the prevalence of regular meal consumption patterns in undergraduate students was 85.6%. Besides, a 5% margin of error was used to balance between precision and practicality.

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

$$n_0 = \frac{1.96^2 \, (0.856) \, (1 - 0.856)}{0.05^2}$$

$$n_0 = 189.41$$

$$n_0 \approx 189$$

As the UTAR student population size was known, where the population size is equal to 20000, the Cochran's (1977) modified formula for finite populations was used and shown as below:

$$n = \frac{n_0}{1 + \dfrac{n_0 - 1}{N}}$$

$$n = \frac{189}{1 + \dfrac{189 - 1}{20000}}$$

$$n = 187.24$$

$$n \approx 187$$

The calculated sample size was added by 10% for non-response rate. So that minimise any error during data collection:

$$n = 187 + (187 \times 0.1)$$

$$n = 205.7$$

$$n \approx 206$$

In the current study, 207 responses were collected. 106 were DT students, whereas the remaining 101 were non-DT students.

3.4   Data Collection

3.4.1   Questionnaire

The survey questionnaire was a combination of the Self-regulation Eating

Behaviour Questionnaire (SREBQ) and a 2-day 24-hour Dietary Recall form.

SREBQ was adopted from Kliemann et al. (2016), while the dietary recall

form was adopted from the Ministry of Health Malaysia (2018). The pilot test

was not conducted as both questionnaires were valid and established by prior

researchers. The questionnaires were distributed physically and took

participants approximately 15 to 20 minutes to complete. It consisted of three

sections:

Section A: Sociodemographic Information

Section B: Self-regulation of Eating Behaviour Questionnaire (SREBQ)

Section C: 2-day 24-hour dietary recall

3.4.2   Section A: Sociodemographic Information

Six sociodemographic variables were collected from the subjects, including

age, gender, ethnicity, study program, weight, and height. These variables

were selected as potential covariates due to their established impact on eating

behaviours, diet quality, and nutritional intake. In detail, age was recorded in

years, gender was categorised as male or female, and ethnicity was self-

reported, such as Malay, Chinese, Indian, and others. The subjects' study

program was dichotomised into DT and non-DT groups for comparative

analysis. Body weight and height were measured. Then, the body mass index

(BMI) was calculated by using the following formula:

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

BMI was categorised according to the Clinical Practice Guidelines (CPG)

Management of Obesity 2nd Edition (Ministry of Health Malaysia, 2023) and

further assessed the subjects' nutritional status.

Table 3.2: BMI-based weight classification for adults. (>18 years old)

Classification	$BMI\ (kg/m^2)$
Underweight	<18.5
Normal	18.5-22.9
Pre-obese (overweight)	23.0-27.4
Obese I	27.5-32.4
Obese II	32.5-37.4
Obese III	≥37.5

3.4.3   Section B: Self-Regulation of Eating Behaviour Questionnaire (SREBQ)

The SREBQ adapted from Kliemann et al. (2016) was utilised to assess

subjects' ability to regulate their eating behaviours. This instrument comprises

several Likert-scale items that measure aspects such as goal setting, self-

monitoring, and impulse control related to eating behaviours. It was further

divided into two parts. Part A consists of three screening questions, which

assess the subjects' intentions to regulate eating behaviour. Part B is the 5-item

Self-Regulation of Eating Behaviour Questionnaire listed as A, B, C, D and E. For Part A, the first question requires subjects to tick all foods that tempt them. This includes chocolate, crisps, cakes, ice cream, bread/toast, fizzy drinks, biscuits, sweets, popcorn, pastries, pizza, fried foods, chips and other foods that need to be specified. If subjects found no tempting food, they will tick the option of "I don't find any food tempting". The second question assesses the subjects' intentions regarding whether they eat too much of the food tempting them from the first question. The third question assesses the subjects' intentions to have a healthy diet. Subjects who intend to control their consumption of foods they find tempting and/or intend to have a healthy diet are eligible to answer the SREBQ session, which is Part B or question 4. For Part B, it used Likert scales that range from "Never", "Rarely", "Sometimes", "Often" and "Always". The items A, C and E were given a score of 5 for the category of "Never", further ranged in descending order to a score of 1 for the "Always" category. While items B and D score conversely, a score of 5 for "Always" and 1 for "Never". The total score was further categorised to represent different levels of eating self-regulation. Higher scores on the SREBQ indicate stronger self-regulatory skills. To illustrate, subjects were categorised as "high self-regulation" with a score above 3.6, "moderate self-regulation" with a score between 2.8 and 3.6, and "low self-regulation" with a score less than 2.8.

3.4.4   Section C: 2-day 24-hour Dietary Recall

The 2-day 24-hour dietary recall was adapted from the Ministry of Health Malaysia (2018), which recalls the food intake from one weekend and one weekday, respectively. The components that were recorded include mealtime, food sources in terms of cooking method or recipe, type of meal, ingredients in food or drink, and household measurements. Throughout the data cleaning and entry, Nutritionist Pro Software was used to get the nutrient contents of food and beverages. Thus, diet quantity for each day was recorded in terms of total energy (kcal) and macronutrient content such as carbohydrates, protein and fat. Besides, meal timing classification was based on Song *et al.* (2021) into morning, afternoon and evening eating. Considering to the Malaysian typical meal pattern (Manan *et al.*, 2012), the food consumed between 6.00 AM to 11.59 AM was classified as morning eating, 12.00 PM to 5.59 PM as afternoon eating, and 6.00 PM to 12.00 AM as evening eating. Then, the proportional nutrient intake was calculated by dividing the nutrients consumed during a specific time by the total nutrients consumed for the day. (Khanna *et al.*, 2011). The value of proportional nutrient intake was converted into percentage (%) and further determines the eating occasions that contribute the most to daily nutrient intake. Since there were two consecutive days of dietary recall, the average of the proportional nutrient intake was calculated. For instance, the proportional nutrient intake from Morning on weekdays and weekends was totalled and divided by 2. As so, the eating occasions that contribute the most to average nutrient intake further classified the subjects as morning, afternoon and evening eaters.

3.4.5 Standardised Malaysian Healthy Eating Index (S-MHEI)

Diet quality was assessed by using the tools generated from Jailani et al. (2021). It comprises 11 components that are total grains, whole grains, fruits, vegetables, fish, meat, poultry and eggs, legumes and nuts, milk and milk products, total fat, sodium and sugar. The maximum score from the total components is 100. For most of the index's components, a maximum of 10 points is assigned when the specific criteria are fulfilled. However, total grains and whole grains are the same food group. Thus, both were assigned 5 points to avoid overlapping scoring. The scoring system was based on the Malaysian Recommended Nutrient Intake (RNI) 2017. For both total and whole grains, the participants who ate 4 servings fulfilled the criteria to get a maximum of 5 points. Fruit and vegetables will need 2 and 3 servings, respectively, to get a maximum of 10 points. While another 4 components, such as fish, meat, poultry and eggs, legumes and nuts, milk and milk products, were assigned with maximum of 10 points when fulfilling 1 serving per day. The scoring method for total fat and sodium is referred to Chong *et al.* (2019). Total fat or oil was calculated as a percentage by multiplying 9g per kcal first, then dividing by total energy (kcal) of the day, and lastly multiple by 100%. Since the RNI for sodium is less than 2000 mg or 2 g per day, a maximum score of 10 will be assigned if the criteria are met. However, participants who exceed 4200 mg or 4.2 g of sodium intake per day will be assigned 0 points. For sugar content, the total sugar consumption was totalled, then multiplied by 4, divided by the total energy (kcal) of the day, and lastly multiplied by 100%. Subjects with sugar intake less than 10% were assigned 10 points, while more than or equal to 25% were assigned 0 points. Since there were 2 consecutive

days of dietary recall, the average of each component was taken and further totalled to classify. As a result, a dietary intake score of more than 80% shows good diet quality, while a score between 51 and 80% indicates there's improvement needed. Poor diet quality is considered when the total score is below 51%.

3.5   Statistical Analysis

The data collected were analysed using the Statistical Packages for Social Sciences (SPSS) Version 30.0 computer program (IBM Corporation, New York, USA). Before data analysis, the Kolmogorov-Smirnov test was used to check the normality and distribution of the data, as the sample size exceeded 100. In this study, most of the continuous variables included BMI, SREBQ score, percentage of average energy intake (kcal), percentage of average macronutrient intake in terms of protein and fat, and S-MHEI score were not normally distributed (Appendix B). However, the percentage of average carbohydrate intake was normally distributed. Categorical variables were summarised as frequencies and percentages, whereas continuous variables were calculated as median (MD) and interquartile range (IQR). The significance level was considered at $p<0.05$ for all statistical tests.

3.5.1   Descriptive Analysis

Sociodemographic data were summarised using descriptive statistics. Categorical variables, including gender, ethnicity, course of study, and meal timing patterns were presented as frequencies and percentages. Continuous

variables, including BMI, SREBQ score, diet quantity in terms of average daily energy intake and macronutrient intakes, and S-MHEI score were presented as MD and IQR, as all continuous variables were non-normally distributed according to the Kolmogorov–Smirnov test ($p < 0.05$). As only the percentage of average carbohydrate intake was normally distributed, it was presented as mean and standard deviation (SD).

3.5.2 Inferential Analysis for Objective 1

To answer Objective 1, the Chi-square test of independence was used to compare the distribution of meal timing patterns between DT and non-DT students. The data for the Chi-square test were presented as frequencies, percentages, Chi-square statistic (χ^2), degrees of freedom (*df*), and *p*-value.

The Mann–Whitney U test was used to compare continuous variables between DT and non-DT students. Results were presented as median, IQR, Mann–Whitney U statistic, two-tailed *p*-value, and effect size (*r*). It was calculated using the formula below:

$$r = \frac{z}{\sqrt{N}}$$

where N is the sample size. The classification of effect size is show in the table below:

Table 3.3: r value interpretation.

Scale of r value	Interpretation
r < 0.3	Small effect size
0.3 < r < 0.5	Medium effect size
r > 0.5	Large effect size

For the percentage of average carbohydrate intake, it was analysed with an independent samples t-test. The results were reported as mean and standard deviation (SD), t-statistics, degrees of freedom (df), two-tailed p-value, and effect size (Cohen's d). It was calculated as the formulas below:

$$Cohen's\ d = \frac{M_1 - M_2}{SD_{pooled}}$$

$$SD_{pooled} = \sqrt{\frac{SD1^2 + SD2^2}{2}}$$

Where M1 and M2 are the means of the two groups, SD pooled is the pooled standard deviation, and SD1 and SD2 are the standard deviations of Group 1 and Group 2. The classification of effect size (Cohen's d) is as the table below:

Table 3.4: Cohen's value interpretation.

Cohen's d value	Interpretation
d= 0.2	Small effect size
d= 0.5	Medium effect size
d= 0.8	Large effect size

3.5.3   Comparison Across Meal Timing Categories (Objectives 2 and 3)

To answer Objectives 2 and 3, different tests were applied based on the distribution of continuous outcomes. For non-normally distributed variables, the Kruskal–Wallis H test was used to compare outcomes across the three meal timing categories. Kruskal–Wallis results were reported as median, IQR, H statistic, degrees of freedom (df), and p-value.

For the normally distributed variable, which is the percentage of average carbohydrate intake, the one-way ANOVA was applied to compare means across the three categories. The results were presented as mean $\pm$ SD, F statistic, df, and p-value.

3.5.4   Spearman's Rank Correlation Test

To answer Objective 4, Spearman's rank-order correlation coefficient (ρ) was used to assess the correlation between eating self-regulatory skills and dietary outcomes. Although the percentage of average carbohydrate intake was normally distributed, Spearman's correlation was still applied for consistency across outcomes as most variables were non-normal. The correlation results were reported as Spearman's correlation coefficient (ρ) and p-value. The interpretation of correlation strength was as follows:

Table 3.5: Spearman correlation coefficient interpretation.

Scale of Spearman correlation coefficient	Interpretation
$0 < |\rho| \leq 0.19$	Very weak correlation
$0.20 \leq |\rho| \leq 0.39$	Weak correlation
$0.40 \leq |\rho| \leq 0.59$	Moderate correlation
$0.60 \leq |\rho| \leq 0.79$	Strong correlation
$0.80 \leq |\rho| \leq 1.00$	Very strong correlation

CHAPTER 4

RESULTS

4.1   Background Information

The subjects volunteered to participate in this study, contributing a total of 206 respondents. All the subjects are students from Universiti Tunku Abdul Rahman. However, approximately 10% or 20 people from all subjects were excluded from this study because they did not complete or provide the required information in the survey form.

4.2   Sociodemographic Characteristics of the Subjects

The sociodemographic characteristics of the subjects are shown in Table 4.1. A total of 186 subjects participated in this study, comprising 99 (53.2%) DT students and 87 (46.8%) non-DT students. Among the 186 subjects, majority of the DT students are at the age of 22 years, while non-DT more at the age of 20 years. In terms of gender and ethnicity, majority were females (84.4%) and Chinese (97.3%), while Indians and Malays accounted for 2.2% and 0.5% of the sample respectively. In terms of BMI classification, majority of the subjects were within the normal weight range (51.1%), followed by underweight (26.9%), pre-obese (13.4%), obese class I (5.4%), and obese class II (3.2%). The overall median BMI was 20.41 kg/m² (IQR = 4.17). A Mann–Whitney U test revealed a significant difference in BMI between groups, with non-DT students having a higher median BMI compared to DT students, U =

3447.000, z = -2.346, p = 0.019. However, the effect size was small as r ≈ -0.17.

Table 4.1: Sociodemographic characteristics of the subjects.

Sociodemographic variables	Overall (n=186)	Dietetics students [n=99 (53.2%)]	Non-Dietetics students [n= 87 (46.8%)]	p-value
Age				
18	1 (0.5 %)	0 (0.0 %)	1 (0.5 %)	
19	6 (3.2 %)	0 (0.0 %)	6 (3.2%)	
20	41 (22.0 %)	10 (5.4 %)	31 (16.7 %)	
21	34 (18.3 %)	27 (14.5 %)	7 (3.8 %)	
22	66 (35.5 %)	42 (22.6 %)	24 (12.9 %)	
23	35 (18.8%)	17 (9.1 %)	18 (9.7 %)	
24	2 (1.1%)	2 (1.1 %)	0 (0.0 %)	
25	1 (0.5%)	1 (0.5 %)	0 (0.0 %)	
Gender				
Male	29 (15.6 %)	16 (8.6 %)	13 (7.0 %)	-
Female	157 (84.4 %)	83 (44.6 %)	74 (39.8 %)	
Ethnicity				
Chinese	181 (97.3%)	99 (53.2 %)	82 (44.1 %)	-
Malay	1 (0.5 %)	0 (0.0 %)	1 (0.5 %)	
Indian	4 (2.2 %)	0 (0.0 %)	4 (2.2 %)	
Body mass index classification				
Underweight	50 (26.9 %)	29 (15.6 %)	21 (11.3 %)	
Normal weight	95 (51.1 %)	58 (31.2 %)	37 (19.9 %)	
Pre-obese (Overweight)	25 (13.4 %)	4 (2.2 %)	21 (11.3 %)	
Obese I	10 (5.4 %)	5 (2.7 %)	5 (2.7 %)	

Obese II	6 (3.2 %)	3 (1.6 %)	3 (1.6 %)	
Median body mass index (kg/m²)	20.41 (4.17) *	19.87 (3.49) *	21.22 (5.44) *	**0.019**

Data are expressed as numbers (percentage), n (%), and * median (interquartile range).

A significant difference was found between DT and non-DT students at p<0.05 as tested using the Mann-Whitney test.

4.3   Meal Timing Patterns of the Subjects

The meal timing patterns of the subjects are shown in Table 4.2. Out of the 186 subjects, nearly half were evening dominant eaters (47.3%), followed by afternoon dominant eaters (40.3%) and morning dominant eaters (12.3%). Among dietetics students, 25.8% were evening dominant eaters, 19.4% were afternoon dominant eaters, and 8.1% were morning dominant eaters. Similarly, among non-DT students, 21.5% were evening dominant eaters, 21.0% were afternoon dominant eaters, and 4.3% were morning dominant eaters. A Chi-square test of independence showed that the meal timing patterns was not statistically different between DT and non-DT students, χ^2 (2, n = 186) = 2.213, p = 0.331.

Table 4.2: Meal timing patterns of the subjects.

Meal Timing Patterns	Total, n (%)			χ^2 (p-value)
	Overall (n=186)	Dietetics students (n=99)	Non-Dietetics students (n=87)	
Morning Dominant Eater (MDE)	23 (12.3 %)	15 (8.1%)	8 (4.3 %)	2.213 (0.331) *
Afternoon Dominant Eater (ADE)	75 (40.3 %)	36 (19.4 %)	39 (21.0 %)	
Evening Dominant Eater (EDE)	88 (47.3 %)	48 (25.8 %)	40 (21.5 %)	

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

4.4 Self-Regulation of Eating Behaviour Questionnaire (SREBQ) of the subjects

The eating self-regulatory skills of the subjects are presented in Table 4.3. Majority of the subjects (62.4%) reported intending not to eat too much of tempting foods, with 36.0% among DT students and 26.3% among non-DT students. However, this difference was not statistically significant ($\chi^2 = 2.544$, p = 0.111). When asked whether they intended to have a healthy diet, 67.7% of the subjects answered "yes." This was more common among DT students (42.5%) compared to non-DT students (25.3%). A Chi-square test revealed a significant association between course of study and intention to have a healthy diet ($\chi^2 = 14.078$, p < 0.001). Similarly, the Chi-square test confirmed a significant difference between groups ($\chi^2 = 16.929$, p = 0.002) in terms of corrective action. When subjects were not eating as intended, the most

frequent response was "often" (28.5%), followed by "sometimes" (24.7%) and "always" (17.2%). In this case, DT students were more likely to report "often" making changes, whereas non-DT students more frequently reported "never".

For other aspects of eating self-regulation, the results showed the groups did not differ significantly as all $p > 0.05$. This included giving up on eating intentions, resisting tempting food, being distracted from intended eating and remembering daily intake. Most of the subjects reported "sometimes" giving up on eating intentions (25.8%), being good at resisting tempting food (31.7%), and getting distracted from intended eating behaviour (33.3%). While 30.6% of the subjects reported "rarely" finding it difficult to remember daily food intake.

Taken together, these results suggest that DT students were significantly more likely to report intending to have a healthy diet ($p < 0.001$) and making changes when not eating as intended ($p = 0.002$) compared to non-DT students. Other aspects of eating self-regulation did not differ significantly between the two groups, as all $p > 0.05$.

Table 4.3: Analysis of SREBQ among subjects

Variables	Total, n (%)			χ² (p-value)
	Overall (n=186)	Dietetics students (n=99)	Non-Dietetics students (n=87)	
Do you intend NOT to eat too much of the foods you find tempting in the previous question?				
Yes	116 (62.4 %)	67 (36.0 %)	49 (26.3 %)	2.544 (0.111) *
No	70 (37.6 %)	32 (17.2 %)	38 (20.4 %)	
Do you intend to have a healthy diet?				
Yes	126 (67.7 %)	79 (42.5 %)	47 (25.3 %)	**14.078 (<0.001) ***
No	60 (32.3 %)	20 (10.8 %)	40 (21.5 %)	
I give up too easily on my eating intentions.				
Never	29 (15.6 %)	12 (6.5 %)	17 (9.1 %)	8.508 (0.075) *
Rarely	46 (24.7 %)	26 (14.0 %)	20 (10.8 %)	
Sometimes	48 (25.8 %)	31 (16.7 %)	17 (9.1 %)	
Often	41 (22.0 %)	23 (12.4 %)	18 (9.7 %)	
Always	22 (11.8 %)	7 (3.8 %)	15 (8.1 %)	
I'm good at resisting tempting food.				
Never	23 (12.4 %)	8 (4.3 %)	15 (8.1 %)	6.899 (0.141) *
Rarely	37 (19.9 %)	22 (11.8 %)	15 (8.1 %)	
Sometimes	59 (31.7 %)	33 (17.7 %)	26 (14.0 %)	
Often	44 (23.7 %)	27 (14.5 %)	17 (9.1 %)	
Always	23 (12.4 %)	9 (4.8 %)	14 (7.5 %)	
I easily get distracted from the way I intend to eat.				
Never	31 (16.7 %)	15 (8.1 %)	16 (8.6 %)	8.628 (0.071) *
Rarely	36 (19.4 %)	17 (9.1 %)	19 (10.2 %)	
Sometimes	62 (33.3 %)	42 (22.6 %)	20 (10.8 %)	

Often	31 (16.7 %)	15 (8.1 %)	16 (8.6 %)	
Always	26 (14.0 %)	10 (5.4 %)	16 (8.6 %)	

If I am not eating in the way I intend to, I make changes.

Never	31 (16.7 %)	8 (4.3 %)	23 (12.4 %)	**16.929 (0.002) ***
Rarely	24 (12.9 %)	14 (7.5 %)	10 (5.4 %)	
Sometimes	46 (24.7 %)	29 (15.6 %)	17 (9.1 %)	
Often	53 (28.5 %)	35 (18.8 %)	18 (9.7 %)	
Always	32 (17.2 %)	13 (7.0 %)	19 (10.2 %)	

I find it hard to remember what I have eaten throughout the day.

Never	38 (20.4 %)	21 (11.3 %)	17 (9.1 %)	2.898 (0.575) *
Rarely	57 (30.6 %)	25 (13.4 %)	32 (17.2 %)	
Sometimes	29 (15.6 %)	14 (7.5 %)	15 (8.1 %)	
Often	34 (18.3 %)	14 (7.5 %)	20 (10.8 %)	
Always	28 (15.1 %)	11 (5.9 %)	17 (9.1 %)	

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

4.5 SREBQ score, Diet quantity and Diet quality of the Subjects

4.5.1 Mann-Whitney test

The SREBQ score and dietary outcomes of the subjects are presented in Table 4.4. The overall median SREBQ score was 3.2 (IQR = 0.6). The DT students scored slightly higher than the non-DT students. However, this difference was not statistically significant, as U = 3637.5, p = 0.066, with a small effect size of r = -0.13.

Regarding diet quantity, the median energy intake for the total sample was 1200.5 kcal/day (IQR = 520.3). There was no significant difference between DT students and non-DT students (U = 4295.5, p = 0.976, r = -0.002). Similarly, the protein intake and fat intake also showed non-statistically different between the groups.

In terms of diet quality, as assessed by the S-MHEI, the overall median score was 47.0% (IQR = 13.0). The DT students exhibited a higher median score (Md = 49.0, IQR = 11.0) than non-DT students (Md = 45.0, IQR = 12.0). This difference was statistically significant, where U = 3151.0, p = 0.002, with a small effect size of r = -0.23. It indicates better overall diet quality among DT students.

Table 4.4: Analysis of SREBQ score, diet quantity and diet quality of the subjects.

Variables	Value, Median (IQR)			U (p-value)	Effect size (r)
	Overall (n=186)	Dietetics students (n=99)	Non-Dietetics students (n=87)		
SREBQ score	3.2 (0.6)	3.2 (0.8)	3.0 (0.6)	3637.5 (0.066) *	-0.13
Diet quantity					
Energy intake (kcal/day)	1200.5 (520.3)	1206.0 (452.2)	1198.8 (573.7)	4295.5 (0.976) *	-0.002
Protein intake (% EI)	17.9 (7.0)	18.2 (7.8)	17.8 (5.8)	3839.5 (0.202) *	-0.09
Fat intake (% EI)	34.4 (10.7)	35.7 (9.6)	33.4 (11.6)	3919.5 (0.291) *	-0.08
Diet quality					
S-MHEI % score	47.0 (13.0)	49.0 (11.0)	45.0 (12.0)	3151.0 (**0.002**) *	-0.23

SREBQ=Self-Regulation of Eating Behaviour Questionnaire; EI=Energy intake; S-MHEI= Standardised Malaysian Healthy Eating Index.

Data are displayed in median (interquartile range).

Significant difference between DT and non-DT students at *$p<0.05$, tested using the Mann-Whitney test.

4.5.2 Independent Samples t-test

Since the percentage carbohydrate intake was normally distributed, an independent samples *t*-test was conducted. Results showed no significant difference in the percentage of carbohydrate intake between DT and non-DT students, as $t(184) = -1.56$, $p = .121$. The effect size was small, where Cohen's $d = -0.23$.

Table 4.5: Analysis of the percentage of average carbohydrate intake of the subjects.

Variables	Value, Mean (SD)			t (df)	p-value	Effect size (d)
	Overall (n=186)	Dietetics students (n=99)	Non-Dietetics students (n=87)			
Carbohydrate intake (% EI)	48.8 (9.3)	47.8 (9.2)	49.9 (9.3)	-1.558 (184)	0.121	-0.23

Data are expressed as mean (standard deviation). EI=Energy intake.

Significant difference between DT and non-DT students at p<0.05, tested using the independent sample t-test.

4.6 SREBQ score, Diet quantity, and Diet quality across the Meal Timing Categories

4.6.1 Kruskal-Wallis H test

The SREBQ score and dietary outcomes according to meal timing patterns are presented in Table 4.6. In this case, morning dominant eaters (MDE) scored

slightly higher (Md= 3.2, IQ = 0.4) than afternoon dominant eaters (ADE,

Md= 3.2, IQR= 0.8) and evening dominant eaters (EDE, Md= 3.0, IQR= 0.6).

However, these differences were not statistically significant (H= 4.385, p=

0.112).

Regarding diet quantity, MDE group demonstrated the highest energy intake

(Md= 1341.6, IQR= 509.9) and protein intake (Md= 19.6, IQR= 7.7)

compared to ADE and EDE. While the ADE demonstrated the highest fat

intake (Md=35.7, IQR= 11.9) than the other two groups. However, all the

results showed no significant differences among the three meal timing groups.

In terms of S-MHEI, the overall median score was 47.0% (IQR = 13.0). The

MDE exhibited a slightly higher median score compared to ADE and EDE.

This difference was not statistically significant (p= 0.273).

Table 4.6: Analysis of SREBQ score, diet quantity, and diet quality across the meal timing categories.

Variable	Value, Median (IQR)			H (p-value)
	Morning Dominant Eater (MDE)	Afternoon Dominant Eater (ADE)	Evening Dominant Eater (EDE)	
SREBQ score	3.2 (0.4)	3.2 (0.8)	3.0 (0.6)	4.385 (0.112) *
Diet quantity				

Energy intake (kcal/day)	1341.6 (509.9)	1200.2 (513.1)	1181.7 (572.0)	3.069 (0.216) *
Protein intake (% EI)	19.6 (7.7)	17.6 (6.1)	17.8 (7.3)	2.085 (0.353) *
Fat intake (% EI)	34.4 (16.0)	35.7 (11.9)	33.9 (10.1)	0.742 (0.690) *
Diet quality				
S-MHEI % score	51.0 (15.0)	46.0 (13.0)	47.5 (10.0)	2.595 (0.273) *

SREBQ=Self-Regulation of Eating Behaviour Questionnaire; EI=Energy intake; S-MHEI= Standardised Malaysian Healthy Eating Index.

Data are displayed in median (interquartile range).

Significant difference across the meal timing categories at *p<0.05, tested using the Kruskal-Wallis's test.

4.6.2 One-way ANOVA test

A one-way ANOVA was conducted to compare the carbohydrate intake across meal timing groups. MDE reported a lower mean carbohydrate intake (38.0 ± 9.1) compared to ADE and EDE. However, the difference between groups was not statistically significant, where $F = 0.54$, and $p = 0.583$.

Overall, there were no significant differences in SREBQ, diet quantity, or diet quality among subjects based on their dominant meal timing pattern.

Table 4.7: Analysis of the percentage of average carbohydrate intake across the meal timing categories.

Variable	Value, Mean (SD)			F (df)	p-value
	Morning Dominant Eater (MDE)	Afternoon Dominant Eater (ADE)	Evening Dominant Eater (EDE)		
CHO intake (% EI)	38.0 (9.1)	48.1 (10.1)	49.5 (8.6)	0.541 (2, 183)	0.583

Data are expressed as mean (standard deviation). EI=Energy intake.

Significant difference across the meal timing categories at $p<0.05$, tested using the one-way ANOVA test.

4.7 Correlation Between Eating Self-Regulatory Skills and Dietary Outcomes

Table 4.8 presents the correlation between SREBQ scores and dietary outcomes, including diet quantity and diet quality. Overall, SREBQ was not significantly correlated with most dietary outcomes. Specifically, no significant associations were found between SREBQ scores and energy intake ($\rho = 0.027$, $p = 0.718$), carbohydrate intake ($\rho = -0.101$, $p = 0.171$), fat intake ($\rho = 0.045$, $p = 0.547$), or diet quality as measured by the S-MHEI ($\rho = 0.053$, $p = 0.476$). However, a small but significant positive correlation was observed between SREBQ scores and protein intake ($\rho = 0.153$, $p = 0.037$), suggesting that individuals with better self-regulation reported slightly higher proportional protein intake.

In terms of the correlation between diet quantity and diet quality, energy intake was not significantly correlated with S-MHEI scores (ρ = -0.134, p = 0.068). Similarly, carbohydrate (ρ = -0.028, p = 0.701) and protein intake (ρ = 0.098, p = 0.185) were not associated with diet quality. In contrast, fat intake was negatively correlated with S-MHEI scores (ρ = -0.171, p = 0.020). It indicates that a higher proportion of dietary fat was linked to lower overall diet quality.

Taken together, these findings suggest that self-regulatory eating behaviours were not broadly associated with dietary quantity or quality, except for a modest positive association with protein intake. Among dietary factors, fat intake emerged as a significant determinant of diet quality. To illustrate, a higher fat consumption corresponded to poorer adherence to the Malaysian Healthy Eating Index.

Table 4.8: Correlation between eating self-regulatory skills and dietary outcomes.

Variables	Correlation coefficient (ρ)	p-value
SREBQ – Diet quantity		
SREBQ – Energy intake (kcal/day)	0.027	0.718
SREBQ - Carbohydrate intake (% EI)	-0.101	0.171
SREBQ - Protein intake (% EI)	0.153	**0.037**
SREBQ - Fat intake (% EI)	0.045	0.547
SREBQ – S-MHEI	0.053	0.476
Diet quantity – Diet quality		

Energy intake (kcal/day) – S-MHEI	-0.134	0.068
Carbohydrate intake (% EI) – S-MHEI	-0.028	0.701
Protein intake (% EI) – S-MHEI	0.098	0.185
Fat intake (% EI) – S-MHEI	-0.171	**0.020**

SREBQ=Self-Regulation of Eating Behaviour Questionnaire; EI=Energy intake; S-MHEI= Standardised Malaysian Healthy Eating Index.

Significant difference at $p < 0.05$, tested using Spearman's correlation test.

CHAPTER 5

DISCUSSION

5.1   Sociodemographic Characteristics of the Subjects

In this study, the BMI distribution among the subjects indicated that the majority (51.1%) were in the normal weight category, with a median BMI of 20.41 kg/m². This finding corresponds closely with Jayaveloo, Daud, and Rahman (2021), who reported that 60.4% of their university students sample had a normal weight. Furthermore, a significant difference in BMI was found between DT and non-DT students. The non-DT students exhibiting a higher median BMI (21.22 kg/m²) compared to DT students (19.87 kg/m²). Although limited studies compare BMI specifically between DT and non-DT students, research comparing medical and non-medical students offers insight. Singh *et al.* (2022) found that medical students had a slightly lower BMI (22.5 ± 3.12) than non-medical students (22.6 ± 1.98). Similarly, another study reported that medical students had significantly lower BMI levels than their non-medical counterparts (Qin et al., 2018). In the current study, DT students had more individuals classified as underweight, while more non-DT students were overweight or pre-obese. Nonetheless, both groups predominantly had normal BMI ranges overall.

5.2   Meal Timing Patterns of the Subjects

Analysis of meal timing patterns revealed that nearly half (47.3%) of participants were evening dominant eaters, followed by afternoon dominant eaters (40.3%) and morning dominant eaters (12.3%). Previous study showed a similar finding where the evening dominance is the most common eating pattern that contributed to 56% of the data, followed by noon and morning dominance eating patterns (Song *et al.*, 2021). However, there was no significant difference observed between DT and non-DT group. This may be explained by the strong influence of environmental and lifestyle factors that are common across the university population rather than differences in nutrition knowledge. To elaborate, university students often experience irregular schedules due to lectures, assignments and exam preparations (Avram *et al.*, 2024). This may disrupt the eating schedule and lead to delayed or evening dominant meal patterns. In addition, student populations are more prone to face a high stress level, increase of mental health issues such as anxiety and depression, burnout, sleep problems, and eating disorders (O'Leary, Mooney and McCloat, 2025). All these factors may contribute to disrupted dietary intake and irregular meal timing (Lyzwinski *et al.*, 2018).

5.3   Eating Self-Regulatory Skills of the Subjects

Eating self-regulatory skills was assessed using the Self-Regulation of Eating Behaviour Questionnaire (SREBQ). The findings showed that most students reported that they intended to limit their intake of tempting foods regardless of their course of study. This means both DT and non-DT student are aware of

unhealthy eating choices and try to avoid overeating. However, the key differences appeared when looking at more specific behaviours. The DT students were more likely to have healthy diet intentions, and they would take corrective actions if they noticed they were not eating in the way they planned.

These findings suggest that DT students not only have the knowledge but also the motivation and habits to act on it, leading to stronger self-regulation. This is supported by previous research showing that higher nutrition knowledge is associated with healthier dietary intake in adults (Spronk *et al.*, 2014; Wardle, Parmenter and Waller, 2000). People with higher nutrition knowledge are more likely to consume fruits and vegetables and to meet dietary recommendations (Spronk *et al.*, 2014; Wardle, Parmenter and Waller, 2000). In contrast, people with lower knowledge especially the university students tend to eat less healthily (Almasi.and Rakicioğlu, 2021). Nutrition knowledge alone may not guarantee a perfect self-regulating behaviour, but it provides the foundation for making healthier choices and correcting eating mistakes. Thus, DT students in this study showed more consistent in their self-regulatory behaviours.

5.4   Diet Quantity and Diet Quality of the Subjects

The findings showed that there were no significant differences were found between DT and non-DT students in terms of energy intake and macronutrient composition. Thus, it indicates a similar diet quantity across groups. However, DT students scored significantly higher in diet quality, as measured by the Standardised Malaysian Healthy Eating Index (S-MHEI). Previous study also

showed a similar finding where the participants from the Nutrition and Dietetics course had better Malaysian Healthy Eating Index (M-HEI) score of 52.7±10.5 compared to non-Nutrition and Dietetics courses peers (Lee *et al.*,2023). Another study also supports the statement where health science students scored significantly higher on M-HEI than non-health science peers (Ayob and Shukri, 2020). This has demonstrated that a greater nutrition knowledge able to generate into better adherence to healthy eating guidelines, as well as translated it into diet quality choices (Yahia et al., 2016: Jezewska-Zychowicz and Plichta, 2022). In short, nutrition education can positively impact diet quality even when total caloric intake remains comparable.

5.5 SREBQ Score, Diet Quantity, and Diet Quality Across Meal Timing Categories

As analysing subjects' eating self-regulation and dietary outcomes according to meal timing patterns, there were no statistically significant differences observed in SREBQ scores, energy intake, macronutrient distribution, or diet quality. When assessing the SREBQ scores, the non-significant trend may indicate that self-regulation behaviour is more likely to influence by personal traits than meal timing patterns. According to Bouwman *et al.* (2021), breakfast time exhibited a higher self-regulation compared to dinner time. However, self-regulation was higher as well for individuals with higher levels of intrinsic motivation and self-efficacy (Bouwman *et al.*, 2021). To elaborate, personal factors such as emotional stability, self-discipline, motivation, cognitive control abilities play more important role that predominant to meal

timing factors (Ghabashi, 2024; Nezlek and Forestell, 2024; Nilsen, Bang and Espen Røysamb, 2024).

In terms of dietary outcomes, several studies showed a contradictory finding to the current research. Based on Almoosawi et al. (2016), later energy intake was linked with higher total daily energy and poorer diet quality. Another study also found that early eating had lower total energy intake, while later eating exhibited an opposite pattern (Aljuraiban *et al.*, 2015). The difference between previous and current findings may be due to several factors. This include the small or imbalanced subgroup sizes was used in current study. Besides, the differences in cultural or socio-environment also contributes to different definition on "late eating" over different studies. For instance, the Spanish study set it at approximately 21:00 based on its population median, compared to 20:00 used in a UK cohort (Coulthard and Pot, 2016; Martínez-Lozano *et al.*, 2020).

In short, these findings suggest that dominant meal timing pattern alone may not strongly influence overall eating self-regulation or diet quality among university students.

5.6 Correlation Between Eating Self-Regulatory Skills and Dietary Outcomes

The correlation analysis further revealed that there were no significant associations between eating self-regulatory skills and diet quantity, nor between self-regulation and diet quality. Interestingly, higher protein intake was positively correlated with a better SREBQ. It suggested that individuals who consume more protein may exhibit stronger eating self-regulatory behaviours. This aligns with previous findings showing that higher eating self-regulation predicts healthier dietary behaviours and that protein-rich diets are associated with enhanced psychological outcomes, such as improved self-worth and reduced reward-driven snacking, while also improving appetite control through hormonal mechanisms (Beasley et al., 2009; Casperson & Roemmich, 2017; Kliemann et al., 2018). Conversely, higher fat intake was linked to poorer diet quality. This is consistent with evidence that individuals in high-fat diet groups tend to have lower Healthy Eating Index (HEI) scores (Lee et al., 2001). Furthermore, a higher intake of ultra-processed foods—often rich in fats, sugars, and refined carbohydrates—has been strongly linked with lower overall diet quality (Setyaningsih et al., 2024). Thus, it reinforced the negative impact of high-fat dietary patterns on health.

5.7 Limitations of the study

Several limitations should be considered when interpreting the findings from this study. Firstly, self-reported dietary data was used. It may be subjected to recall bias and inaccuracies, which include the possibility of underreporting or

overreporting the food intake. In this case, it could affect the reliability of the results. Additionally, there was an imbalance between the DT and non-DT groups. This may have reduced the statistical power to detect smaller effects. The sample was also demographically homogeneous. To elaborate, the recruitment was limited to a single university and the majority being Chinese ethnicity. This lack of diversity limits the generalisability of the findings to broader populations with different cultural, socioeconomic, or ethnic backgrounds. Future studies with more diverse and balanced samples are needed to validate and extend these results.

5.8 Recommendations for Future Studies

As a recommendation, objective measurements of dietary behaviours can be incorporated for future studies. For instance, detailed food diaries or wearable tracking devices and mobile applications to minimise recall bias and reduce the risk of underreporting or overreporting the food intake. Besides, certain statistical approaches such as weighting adjustments could be applied to increase the influence of smaller subgroups and balance the contribution of each group. Hence, it can ideally achieve a 50:50 ratio between dietetics and non-dietetics groups. Moreover, larger and more diverse sample is recommended across multiple campuses and employing the random sampling methods. In this way, it improves the representativeness and enhance the generalizability of the findings. These steps would strengthen the study design and improve the accuracy and applicability of future research outcomes.

CHAPTER 6

CONCLUSION

This study aimed to compare meal timing patterns, eating self-regulatory behaviours, diet quantity, and diet quality between DT and non-DT undergraduate students. A total of 186 students from UTAR participated, with a majority being female and of Chinese ethnicity. The results revealed several key findings.

Firstly, nearly half of the participants were classified as evening dominant eaters, followed by afternoon and morning dominant eaters. However, there was no significant difference in meal timing patterns between DT and non-DT students. It suggests that shared university environmental and lifestyle factors may influence eating schedules more strongly than differences in nutrition knowledge. Secondly, while there was no significant difference in SREBQ scores between groups. DT students were significantly more likely to report having healthy diet intentions and taking corrective action when deviating from their planned eating behaviours. This indicates that DT students demonstrate stronger motivation and practical application of nutrition knowledge, which may contribute to healthier eating practices over time. In terms of dietary outcomes, there was no significant difference in diet quantity between the two groups. However, DT students had significantly higher diet quality scores, as measured by the S-MHEI. This finding reflects how greater

nutrition knowledge can translate into healthier food choices and better adherence to dietary guidelines, even when total caloric intake is similar.

Analysis across different meal timing categories showed no significant differences in self-regulation, diet quantity, or diet quality. This suggests that dominant meal timing patterns alone may not have a strong impact on overall dietary behaviours among university students. Additionally, correlation analysis indicated no significant relationship between eating self-regulation and either diet quantity or quality, except for a small positive correlation between self-regulation and protein intake. This implies that individuals with stronger self-regulation may be more prone to consume protein-rich foods, which are associated with enhanced appetite control and healthier eating habits. Conversely, higher fat intake was significantly correlated with lower diet quality.

This study is one of the initial investigations into the combination of meal timing, self-regulation, and dietary outcomes among DT and non-DT students in Malaysia. In conclusion, while both groups demonstrated similar meal timing patterns and total energy intake, DT students exhibited superior diet quality and stronger self-regulatory intentions. These findings highlight the importance of nutrition education in shaping dietary behaviours and improving overall eating quality. Furthermore, the results underscore the need for targeted interventions. For example, campus-based health promotion programmes to promote more on balanced meal timing and enhance self-

regulation skills among university students. Future research should build on these findings using larger, more diverse populations and objective dietary assessment methods to improve accuracy and generalisability.

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Re: U/SERC/78-465/2025

12 March 2025

Dr Ng Wen Jie
Head, Department of Allied Health Sciences
Faculty of Science
Universiti Tunku Abdul Rahman
Jalan Universiti, Bandar Baru Barat
31900 Kampar, Perak.

Dear Dr Ng,

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 applications have been approved under <u>Expedited Review</u>.

The details of the research projects are as follows:

No	Research Title	Student's Name	Supervisor's Name	Approval Validity
1.	Assessment of Depression, Frailty, Nutritional Status and Quality of Life Among Older Adults in Kampar	Chong Jia En	Ms Nurul Aimi Binti AB Kadir	12 March 2025 – 11 March 2026
2.	The Association Between Oral Health-Related Quality of Life and Dietary Quality Intake Among Middle-aged Adults in Kampar, Perak	Candy Ng Ying Ying		
3.	Meal Timing, Eating Self-regulatory Skills, Diet Quality, and Quantity Among Undergraduate UTAR Students: A Cross-sectional Study	Lau Celine		
4.	Association Between Dietary Habits, Oral Health, and Quality of Life Among UTAR Students	Sum Kai Ling		

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.

(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.

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

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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

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
BMI	.125	186	<.001	.878	186	<.001
SREBQ	.095	186	<.001	.979	186	.007
Average energy (kcal)	.091	186	<.001	.953	186	<.001
% Protein intake	.288	186	<.001	.595	186	<.001
% CHO intake	.057	186	.200[*]	.992	186	.396
% fat intake	.198	186	<.001	.633	186	<.001
S-MHEI	.068	186	.036	.976	186	.002

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

a. Lilliefors Significance Correction

Questionnaire for Final Year Project

Title: Meal Timing, Eating Self-Regulatory Skills, Diet Quality, and Quantity among Dietetics and Non-Dietetics Students in UTAR, Kampar: A Cross-Sectional Study.

Introduction

I am Lau Celine, a Y3T2 student of the Bachelor of Science (Hons) Dietetics from Universiti Tunku Abdul Rahman (UTAR) Kampar campus. I am currently conducting a research project for my final year project (FYP) regarding meal timing and its relationship to several variables such as eating self-regulatory skills, diet quality and diet quantity among Dietetics and Non-Dietetics students in UTAR, Kampar. This study aims to provide evidence to improve dietary behaviour in university students by addressing meal timing patterns and fostering better self-regulation in eating. Concerning this, the questionnaire comprises 3 sections and it takes 15-20 minutes to complete:

Section A: Sociodemographic Profile

Section B: Self-Regulation of Eating Behaviour Questionnaire (SREBQ)

Section C: 2 days 24-hour dietary recall

Eligibility Criteria:

- Aged 18 and above
- Malaysian adult
- Students from UTAR, Kampar campus
- Dietetics student Year 2 and above
- Not pregnant
- Not lactating
- No chronic conditions (e.g. diabetes, obesity, hypertension, cardiovascular disease, etc.)
- Not adhering to any weight control programs (e.g. intermittent fasting)
- Not taking any prescribed medications that altered appetite

<u>Informed Consent</u>

Before proceeding, please read the following information carefully:

1. Purpose of the Study:
   This study investigates meal timing, eating self-regulatory skills, diet quality, and quantity among Dietetics and Non-Dietetics Students in UTAR, Kampar.
2. Voluntary Participation:
   Your participation in this study is entirely voluntary. You may choose to withdraw at any time without any penalty or consequences.
3. Confidentiality:
   All information provided will be kept strictly confidential. Your responses will be anonymized, and no personally identifiable information will be shared in any reports or publications.
4. Data Protection:
   Your data will be stored securely and accessed only by the research team. Data will be retained for 5 years and then securely destroyed.
5. Risks and Benefits:
   There are no significant risks associated with participating in this study. The benefits include contributing to a better understanding of dietary behaviours among university students, which may help improve future dietary interventions.
6. Contact information:
   If you have any questions or concerns about the study, please contact:
   - Researcher: Lau Celine
   - Email: lauceline020328@1utar.my
   - Supervisor: Ms Nurul Aimi Binti AB Kadir, aimi@utar.edu.my

By proceeding with this questionnaire, you indicate that you have read and understood the above information, and you consent to participate in this study.

Section A: Sociodemographic Profile

Participation Code: _____

Gender: Male / Female

Age: _____

Ethnicity/ Race:

- ☐ Malay
- ☐ Chinese
- ☐ Indian
- ☐ Others: _____

Are you a Dietetics student?

- ☐ Yes
- ☐ No, please specify: _____

Academic year
- ☐ Year 1
- ☐ Year 2
- ☐ Year 3
- ☐ Year 4
- ☐ Year 5 and above

Weight: _____kg

Height: _____m

Email: _____

Contact Number: _____

Section B: Self-Regulation of Eating Behaviour Questionnaire (SREBQ)

1. Do you find any of these foods tempting (that is, do you want to eat more of them than you think you should)? (Tick all those that you find tempting)

Chocolate	o	Fizzy drinks	o	Pizza	o
Crisps	o	Biscuits	o	Fried foods	o
Cakes	o	Sweets	o	Chips	o
Ice cream	o	Popcorn	o	Other foods	o
Bread/toast	o	Pastries	o	I don't find any food tempting	o

If you have ticked 'Other foods', please specify:

2. Do you intend NOT to eat too much of the foods you find tempting in the previous question?

Yes	o
No	o

3. Do you intend to have a healthy diet?

Yes	o
No	o

4. Please read the following statements and tick the boxes most appropriate to you.

For the next few questions, please, understand that:

☐ 'Tempting foods' are any food you want to eat more of than you think you should.
☐ 'Eating intentions' refer to the way you are aiming to eat, for example, you may intend to avoid tempting foods or eat healthy foods.

	Never	Rarely	Sometimes	Often	Always
A. I give up too easily on my eating intentions	☐	☐	☐	☐	☐
B. I'm good at resisting tempting food	☐	☐	☐	☐	☐
C. I easily get distracted from the way I intend to eat	☐	☐	☐	☐	☐
D. If I am not eating in the way I intend to, I make changes	☐	☐	☐	☐	☐
E. I find it hard to remember what I have eaten throughout the day	☐	☐	☐	☐	☐

Section C: 2 days 24-hour dietary recall

Spoons & ladle

A. Teaspoon B. Soup Spoon C. Table Spoon D. Ladle

To reduce amount of rice, noodles taken

Bowls

A. Small Bowl B. Chinese Bowl
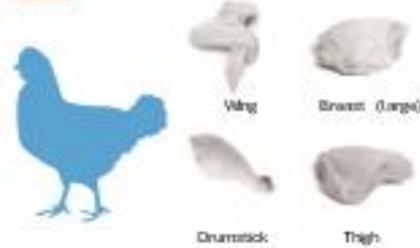

C. Large Bowl

A. Ladle B. Cup

To estimate amount of vegetables consumed

Mug

To estimate amount of liquid consumed

Chicken
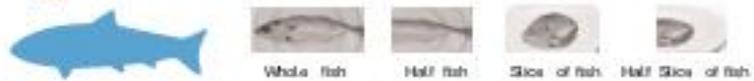

Wing Breast (large)

Drumstick Thigh

Beef

Fish

Whole fish Half fish Slice of fish Half Slice of fish

To estimate amount of meat consumed

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Food Diary: 24-Hour Diet Recall

1. Please write down all the food, snacks or drinks you consume in a day.
2. Write in detail the amount of the ingredients, sauce or gravy included in the food.

Example

A. Time for Breakfast (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurament (tablespoon, teaspoon, cup, spoon)
6.30 am	Home cooked	• Fried mee	• Mee • Chicken • Tomato • sauce • Chilli sauce • Oyster sauce Salt Carrot	• 1 cup • 1 ½ cup • 1 tbspn • 1 tbspn • ½ tspn • 1 tsp (4 serving) 1 tbspn

A. Time for Morning tea (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurament (tablespoon, teaspoon, cup, spoon)
10.00 am	Office	• Milo • Biscuit cream crackers	• Milo 3 in 1 • Biscuit Hup Seng	• 1 packet • 3 pieces

A. Time for Lunch (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurament (tablespoon, teaspoon, cup, spoon)
1.00 pm	Office	• Rice • Fried Fish • Vegetables soup	• White rice • Mackerel fish • Carrot cabbage	• 1 cup • 1 piece • 1 small bowl

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Food Diary: 24-Hour Diet Recall

1. Please write down all the food, snacks or drinks you consume in a day.
2. Write in detail the amount of the ingredients, sauce or gravy included in the food.

Public Holidays / Weekends

Day	1. Saturday	2. Sunday	3. Public Holiday
Date			

A. Time for Breakfast (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Morning tea (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Lunch (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Afternoon Tea (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Dinner (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Supper (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

Food Diary: 24-Hour Diet Recall

1. Please write down all the food, snacks or drinks you consume in a day.
2. Write in detail the amount of the ingredients, sauce or gravy included in the food.

Working Days

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Date					
A. Time for Breakfast (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)	
A. Time for Morning tea (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)	
A. Time for Lunch (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)	

A. Time for Afternoon Tea (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Dinner (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurement (tablespoon, teaspoon, cup, spoon)

A. Time for Supper (hour)	B. Food sources (buy / cook)	C. Type of food or drink	D. Ingredients in food or drink	E. Household measurament (tablespoon, teaspoon, cup, spoon)

Debriefing Information

Thank you for participating in this study! Your responses will contribute to a better understanding of dietary behaviours among university students. If you have any questions or would like to receive a summary of the study findings, please contact:

- Researcher: Lau Celine
- Email: lauceline020328@1utar.my

Table 1. Criteria scoring for Malaysian Healthy Eating Index components.

Components	Score Range	Criteria for Maximum Score 0	Criteria for Score 8	Criteria for Maximum Score 10
Food groups				
Grains and cereals	0–10	0		4–8 servings [1]
Vegetables	0–10	0		3 servings [1]
Fruits	0–10	0		2 servings [1]
Meat, poultry and eggs	0–10	0		$\frac{1}{2}$–2 servings [1]
Fish and seafoods	0–10	0		1 servings [1]
Legumes	0–10	0		$\frac{1}{2}$–1 servings [1]
Milk and dairy products	0–10	0		1–3 servings [1]
Nutrients				
Total fat	0–10	$\geq$35% energy [2] from fat		$\leq$30% energy [1] from fat
Sodium	0–10	$\geq$4200 mg [2]	2400 mg [1]	$\leq$2000 mg [1]

[1] Based on the Malaysian Dietary Guidelines 2010. [2] Based on the Malaysian Adult Nutrition Survey 2003.

Table 2. Malaysian Healthy Eating Index (HEI) scoring for nutrients.

HEI Score	0	1	2	3	4	5	6	7	8	9	10
Energy intake from fat (%)	$\geq$35.0	34.5	34.0	33.5	33.0	32.5	32.0	31.5	31.0	30.5	$\leq$30.0
Sodium (mg)	$\geq$4200	3975	3750	3525	3300	3075	2850	2625	2400	2200	$\leq$2000

MALAYSIAN FOOD PYRAMID 2020
Guide to Your **DAILY** Food Intake

*Limit intake of fats, oils, sugars and salt

Milk and milk products: 2 servings

Fish: 1 serving
Poultry/ eggs/ meat: 1-2 servings
Legumes: 1 serving

Rice, other cereals, whole grain cereal-based products and tubers: 3-5 servings

Plain water: 6-8 glasses
1 glass = 250 ml

Vegetables: ≥ 3 servings

Fruits: 2 servings

Notes:
- The number of servings is calculated based on 1500 to 2300 kcal.
- This pyramid is meant for children aged 7 years and older; for younger children, refer to the Malaysian Dietary Guidelines (MDG) for Children and Adolescents.
- For adolescents aged 13 to 15 years, the recommendation for fruits is 2-3 servings and for milk and milk products 2-3 servings.
- For adolescents aged 16 to < 18 years, the recommendation for fruits is 2-3 servings, milk and milk products 2-3 servings and for rice, other cereals, whole grain cereal-based products and tubers 3-6 servings.
- This includes ultra-processed foods which contain artificial substances such as colours, sweeteners, flavours, preservatives, and other additives.

Figure 1.1. Malaysian Food Pyramid 2020

APPENDIX F

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

FACULTY OF SCIENCE

Full Name(s) of Candidate(s)	LAU CELINE
ID Number(s)	22ADB0699
Programme / Course	Bachelor of Science (Honours) Dietetics
Title of Final Year Project	Meal Timing, Eating Self-regulatory Skills, Diet Quality and Diet Quantity among Dietetics and Non-Dietetics Students in UTAR, Kampar: A cross-sectional study.

Similarity	Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)
Overall similarity index: ___19___ % **Similarity by source** Internet Sources: ___14___ % Publications: ___7___ % Student Papers: ___14___ %	
Number of individual sources listed of more than 3% similarity: __0__	

Parameters of originality required and limits approved by UTAR are as follows:
(i) Overall similarity index is 20% and below, and
(ii) Matching of individual sources listed must be less than 3% each, and
(iii) Matching texts in continuous block must not exceed 8 words
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: Ms. Nurul Aimi binti AB Kadir

Date: ___11/9/2025_____

_____
Signature of Co-Supervisor
Name: _____

Date: _____

APPENDIX G

19% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

10/9/2025

Filtered from the Report

▸ Small Matches (less than 8 words)

Match Groups

🔴 156 Not Cited or Quoted 16%
Matches with neither in-text citation nor quotation marks

🟠 31 Missing Quotations 3%
Matches that are still very similar to source material

🟡 0 Missing Citation 0%
Matches that have quotation marks, but no in-text citation

🟢 0 Cited and Quoted 0%
Matches with in-text citation present, but no quotation marks

Top Sources

14% 🌐 Internet sources

7%   📰 Publications

14% 👤 Submitted works (Student Papers)

Integrity Flags

0 Integrity Flags for Review

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.