

EXPLORING THE RELATIONSHIP BETWEEN FOOD SECURITY,
DIETARY CHOICES AND NUTRITIONAL STATUS AMONG
HEALTH SCIENCE STUDENTS AT USM KUBANG KERIAN

by

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Dissertation submitted in partial fulfilment of the requirement for
The Degree of Bachelor of Health Science (Honours) (Nutrition)

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CERTIFICATE

This is to certify that the dissertation entitled “**Exploring the relationship between food security, dietary choices and nutritional status among health science students at USM Kubang Kerian**” is the bona fide record of research work done by **Nur Elhanna Tasnim binti Che Jamaluddin** with matric number: **161563** during the period April 2025 to January 2026 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfilment for the degree of Bachelor of Health Science (Honours) (Nutrition).

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at USM or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research and promotion purposes.

... ..

NUR ELHANNA TASNIM BINTI CHE JAMALUDDIN

Date: 8th January 2026

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SYMBOLS AND ABBREVIATIONS

BMI	Body Mass Index
FIES	Food Insecurity Experience Scale
FCQ	Food Choice Questionnaire
H_0	Null hypothesis
H_a	Alternative hypothesis

ABSTRAK

Keterjaminan makanan dan pilihan pemakanan merupakan faktor penting yang mempengaruhi status pemakanan serta kesihatan keseluruhan dalam kalangan pelajar universiti. Pelajar dalam bidang Sains Kesihatan seharusnya mempunyai pengetahuan pemakanan yang baik namun begitu, tekanan akademik, kekangan masa dan masalah kewangan boleh menjejaskan tabiat pemakanan serta akses terhadap makanan yang berkhasiat. Oleh itu, kajian ini dijalankan bagi meneroka hubungan antara keterjaminan makanan, pilihan pemakanan dan status pemakanan dalam kalangan pelajar Sains Kesihatan di Universiti Sains Malaysia, Kubang Kerian. Kajian ini adalah kajian keratan lintang yang melibatkan seramai 289 orang pelajar prasiswazah yang dipilih melalui kaedah pensampelan rawak berstrata mengikut kadar. Data dikumpul menggunakan borang soal selidik yang mengandungi empat bahagian iaitu maklumat sosiodemografi, ukuran antropometrik, Food Insecurity Experience Scale (FIES) dan Food Choice Questionnaire (FCQ). Hasil kajian menunjukkan bahawa kira-kira 36.3% pelajar berada dalam kategori keterjaminan makanan, manakala 62.7% mengalami tahap ketidakjaminan makanan tertentu. Harga merupakan faktor paling penting yang mempengaruhi pilihan diet ($\text{min}=3.55$, $\text{SD}=0.52$), diikuti oleh daya tarikan sensori, emosi dan kemudahan. Walaupun mempunyai latar belakang pendidikan berkaitan, motivasi kesihatan mereka adalah agak rendah. Dari segi status pemakanan, 57.4% mempunyai BMI normal, 16.3% kurang berat badan manakala 26.3% adalah berlebihan berat badan dan obesiti. Status keterjaminan makanan tidak mempunyai hubungan signifikan dengan BMI ($\chi^2=0.54$, $p=0.911$), namun ia selari dengan keutamaan keputusan di mana pelajar yang tidak mempunyai jaminan makanan mengutamakan kos, manakala pelajar yang mempunyai jaminan makanan menekankan daya tarikan sensori ($p<0.01$). Secara keseluruhannya, kajian ini menunjukkan bahawa keterjaminan makanan mempengaruhi pilihan diet

berbanding memberi kesan secara langsung kepada status pemakanan dalam kalangan pelajar Sains Kesihatan.

ABSTRACT

Food security and dietary choices are important factors that influence nutritional status and overall health among university students. Health science students are expected to have good nutritional knowledge, however, academic pressure, time constraints and financial problems may affect their eating habits and access to nutritious food. Therefore, this study was conducted to explore the relationship between food security, dietary choices and nutritional status among health science students at Universiti Sains Malaysia, Kubang Kerian. This cross-sectional study involved 289 undergraduate students selected using proportionate stratified random sampling. Data were collected using a self-administered questionnaire consisting of four sections: sociodemographic information, anthropometric measurements, the Food Insecurity Experience Scale (FIES) and Food Choice Questionnaire (FCQ). The results indicated that approximately 36.3% of students were food secure while 62.7% experienced some level of food insecurity. Price was the most important factor influencing dietary choices (mean=3.55, SD=0.52), following sensory appeal, mood and convenience. Despite their education, their health motivation was relatively low. In term of nutritional status, 57.4% had a normal BMI, 16.3% were underweight and 26.3% were overweight and obese. Food security status was not significantly associated with BMI ($X^2=0.54$, $p=0.911$), but it did correspond with decision priorities of food-insecure students prioritised cost, while food-secure students emphasised sensory appeal ($p<0.01$). Overall, the study demonstrated that food security influences dietary choices rather than directly affecting nutritional status among Health Science students.

CHAPTER 1: INTRODUCTION

Food security is achieved when individuals have both physical and financial access to sufficient nutritious food to meet dietary requirements and food preferences for an active and healthy life (World Food Summit, 1996). According to (Food Security Information for Action, 2008), there are four major dimensions of food security namely physical availability, economic and physical access to food, food utilisation and stability over time. Among university students, these dimensions influence nutritional intake and can impact their ability to maintain a balanced and nutritious diet in their daily life

Dietary choices also play an important role in shaping the nutritional status of students. The type of foods selected whether healthy and unhealthy including consumption of high-calorie foods or unhealthy dietary patterns such as skipping meals which may affect overall health and influence Body Mass Index (BMI). Unhealthy dietary choices may contribute to increase student's BMI levels potentially leading to overweight or obesity. A BMI of 25 to 29.9 kg/m² is classified as overweight while a BMI of 30 kg/m² or above indicates obesity (Weir & Jan, 2023). Healthy eating is related with better academic performances, reduces the risk of non-communicable diseases, improved mental well-being and support in maintaining a healthy weight (Zhang, 2025) Therefore, dietary choices and food security is greatly influenced students' nutritional status.

Despite academic exposure to health-related knowledge, Health Sciences Students at USM Kubang Kerian continue to lead behaviours that may compromise their health and well-being. This may be due to academic stress, time constraints and limited access to sufficient and nutritious food option. Inadequate food preparation and storage facilities can make it difficult to develop healthy eating habits. These

challenges highlight the complexity of turning health knowledge into practical practices among university students.

Given the growing concern about food insecurity and unhealthy dietary habits among young adults in university setting, it is vital to investigate these concerns in the USM Kubang Kerian. Hence, this study aimed to explore the relationship between food security, dietary choices and nutritional status among Health Sciences students. Understanding the relationship can provide valuable insight that may be used to construct effective interventions aimed at encouraging healthy lifestyle and improving university students' overall health.

1.1 PROBLEM STATEMENT

University students in Malaysia were increasingly concerned with food insecurity due to factors such as limited financial, time constraints, unhealthy eating habits or academic pressure. These factors place many students at risk for making poor dietary choices that impact their nutritional status, including those in the health sciences. A recent study reported that nearly half which is 44.76% of undergraduate students at USM Health Campus experienced food insecurity (Norfarizan-Hanoon N.A. & Nur Izzati Syahirah M.R, 2024). This may contribute to the increasing prevalence of both underweight and overweight students.

In five Malaysian universities, a study found that 21.2% were overweight and 16.3% were obese (Radzi *et al.*, 2019). These behaviours are most due to sedentary lifestyles and unhealthy eating habits. Therefore, this cross-sectional study was conducted to explore the relationship between food security, dietary choices and nutritional status among health sciences students at USM Kubang Kerian. The findings aimed to provide insights into the underlying causes of overweight and obesity and

strategies to explore the relationship between food security, dietary choices and nutritional status among health sciences students at USM Kubang Kerian.

1.2 RESEARCH QUESTIONS

1. What are the food security status among Health Sciences students at USM Kubang Kerian?
2. How to describe the dietary choices of Health Sciences students at USM Kubang Kerian?
3. What is the nutritional status among Health Sciences students at USM Kubang Kerian?
4. Is there a relationship between food security and dietary choices?
5. Is there a relationship between dietary choices and nutritional status?

1.3 RESEARCH HYPOTHESIS

H_0 = There is no significant relationship between food security, dietary choices and nutritional status among health sciences students at USM Kubang Kerian.

H_a = There is a significant relationship between food security, dietary choices and nutritional status among health sciences students at USM Kubang Kerian.

1.4 RESEARCH OBJECTIVES

1.4.1 General Objectives

To explore the relationship between food security, dietary choices and nutritional status among health sciences students at USM Kubang Kerian.

1.4.2 Specific Objectives

1. To determine the food security status among health sciences students at USM Kubang Kerian.
2. To describe the dietary choices among health sciences students at USM Kubang Kerian.
3. To assess the nutritional status among health sciences students at USM Kubang Kerian.
4. To examine any relationship between food security, dietary choices and nutritional status among health sciences students at USM Kubang Kerian.

1.5 SIGNIFICANCE OF THE STUDY

This research advances our understanding of how food security and dietary choices affect students' nutritional status especially in the health sciences. Despite the fact that these students have better knowledge about health and nutrition, they can still struggle with eating because of financial limited resources, academic stress and limited access to nutritious food. Emphasising this gap between practice and understanding gives important insights into the real-world behaviours.

The findings helped create and enhance food security policies, dietary guidance and nutrition health education programs for health sciences students. Furthermore, this study was beneficial in informing authority and policymakers in planning appropriate interventions such as cafeteria food offerings, subsidizing healthy meals or implementing focused awareness campaigns to support student health and well-being. This study's findings eventually help national initiatives to enhance student wellbeing and fit in with more general objectives like expanding access to nutritious food and encouraging healthy lifestyles.

CHAPTER 2: LITERATURE REVIEW

2.1 Factor Influencing Food Security on Nutritional Status

University students frequently face multiple type of challenges that affect their food security and as a result nutritional status. One of the key factors is time constraints. University students often experience hectic academic schedules, multiple assignments and involvement in extracurricular activities. These pressures leaving them with insufficient time to prepare balanced or nutritious meals which can lead towards convenient but less nutritious option such as fast food (Escoto *et al.*, 2012). Studies by Abu Bakar *et al.* (2019) highlighted Malaysian students who are limited time are more likely to skip meals and consume unhealthy food particularly during hectic academic periods. Similarly, Almoraie *et al.* (2021) found that pattern among international students, showing that restricted time is a common factor influencing students' dietary habits globally. However, while both studies show the similar behavioural pattern, the Malaysian context may differ due to cultural food availability and student lifestyle. If these habits are sustained over time, they can have health problems such as poor concentration, fatigue and also increased risk of obesity.

Apart from time constraints, financial problem also a significant factor among university students. Financial problems are common among university students especially those from low-to middle income families. In Malaysia, students often rely on study loans, scholarship, family allowances or part-time jobs to support themselves. Besides food, students also have to pay university fees, transportation, accommodation and other daily necessities (Norazlan *et al.*, 2020). This financial burden makes it difficult to them to pay for nutritious foods like fruits and vegetables which are usually more expensive than processed food or fast food like biscuits, sausage or instant noodles. When facing financial problem, they tend to prioritise to save money for

essential living costs before purchasing healthier foods (Huangfu *et al.*, 2024). Compared to Malaysia, studies from other countries highlight similar financial-driven dietary compromises though to various levels. For example, in China, many students rely on inexpensive take away meals of food delivery at least once a week due to cost and convenience (Qi *et al.*, 2023). Takeaway meals typically consist of fast food that is simple and quick to prepare making them an ideal alternative for students with limited time and finances. As a result, students are more exposed to choose inexpensive food and calorie-dense food that are satisfying but lacking in essential nutrients (Almoraie *et al.*, 2021). Over time, this can significantly impact their health which can resulting in obesity, nutrient deficiencies or other health problems.

Finally, another significant factor is access to nutritious food. According to Jurado-Gonzalez *et al.* (2025), access to nutritious food is often limited for university students. University cafeterias typically provide fried or processed foods like fried chicken, nuggets or fish balls that are frequently high in fat, sugar and sodium but lack essential vitamins and minerals. In Malaysia, university students frequently experience food insecurity as a result of their excessive consumption of fast foods. For example, Abayomi Tunde *et al.* (2023) reported that about 81.6% of Malaysian students consume fast food at least once per month, typically for convenience and taste rather than nutritional value. A similar pattern can be seen all across the world. According to Soldavini *et al.* (2019), students in the Southeast U.S. are frequently unable to afford campus meal plans due to high expenses, leaving them vulnerable to food insecurity and poorer dietary intake. Furthermore, without personal transportation, students find it difficult to drive to supermarkets which are typically located far from campus particularly when food is unavailable on campus (Dhillon *et al.*, 2019). The lack of cooking facilities such as a stove or refrigerator, along with time constraints,

makes it challenging for students to buy raw ingredients and prepare balanced meals (Bidin *et al.*, 2024). As a result, students with limited access to fresh food and healthy eating options are forced to rely on readily available food from campus cafés or convenience stores (Antwi *et al.*, 2024). Over time, frequent consumption of such meals can negatively impact students' nutritional status and overall health which can result in poor dietary habits, weight gain and increased BMI (Zhang, 2025).

2.2 Factors Influencing Dietary Choices on Nutritional Status

Understanding the factors of dietary choices is vital because these choices influence an individual's nutritional status. First and foremost, nutrition knowledge is important for developing healthy eating habits. Nutrition knowledge is an individual understanding of dietary recommendations, nutrient requirement and the health implication of food choices (Onyenweaku *et al.*, 2023). According to Mathur *et al.* (2023), students with higher knowledge are more likely to make healthier decision regarding their diet such as choosing nutrient-dense foods over processed foods and maintaining balanced eating habits that align with dietary recommendation. Consequently, this knowledge helps them to have better understanding about food labels, portion sizes and the long-term effects of nutrition on health which can reduce the risk of diet-related condition like obesity, diabetes and cardiovascular disease (Miller & Cassady, 2015). In contrast, people with low nutrition knowledge may be unaware of how much salt, sugar or calorie content in their meals. They also may not know which ingredient are healthy or which types of food should be consumed more or less depending on their age or health condition (Silva *et al.*, 2023). Furthermore, a study conducted by Mathur *et al.* (2023) highlighted those parental educational levels significantly influence children's dietary choices. Parents who are more educated are more likely to serve balanced meals and educate their children about healthy diet.

Besides nutrition knowledge, peer influence is another significant factor. According to Higgs & Thomas (2016), peer influence has significant impact during adolescence and early adulthood, when acceptance in society and developing an identity are essential development tasks. University students are particularly exposed to the eating habits of their classmates, roommates and social friends. Whether those habits are healthy or unhealthy, they frequently follow their peers' eating habits as social mirroring which can have either positive or negative effect on health (Ragelienė & Grønhøj, 2020). For example, if a student's friend group always eats fast food after class, they are more likely to join even if they would rather eat something healthy. Additionally, social media also influence on university students' dietary preferences. Peer frequently encourage each other to try trendy foods promoted online especially fast-food products advertised as appealing that are high in sugars, calories and unhealthy fat (*Chung et al.*, 2021). This can have a negative impact on overall health and increase risk of obesity.

Furthermore, dietary choices are frequently profoundly with personal identify, religious values and daily routines. Cultural traditions and beliefs have a significant impact what people eat, when they eat and how the food is prepared and consumed (*Jayasinghe et al.*, 2025). In Malaysia, cultural variety has a significant impact on shaping dietary patterns particularly among Malay, Chinese and Indians. For instance, Malay dishes like *nasi lemak* and *rendang* are influenced by halal dietary laws. Chinese food often includes *dim sum* or various noodles soups while Indians frequently eat *roti canai*, curries and vegetarian meals. Religious practices such as fasting during Ramadan also effect meal timing and dietary choices (*Jaafar et al.*, 2022).

However, it is vital to keep in mind that traditional eating patterns have changed due to modernisation and globalisation which are increasingly shifting towards diet high in

refined sugars, saturated fats and processed foods. This nutritional shift driven in part of media exposure and urban lifestyles that has contributed to an increased reliance on fast food and convenience meals which result in increasing diet-related health issues such as obesity and non-communicable diseases (Jayasinghe *et al.*, 2025). Despite this trend, some cultural norms such as traditional home-cooked meals and family dining continue to promote balanced diets and can act as protective factors against poor health outcomes.

2.3 Nutritional status related Measurement and Classification

2.3.1 Body Mass Index (BMI)

The Body Mass Index (BMI) is commonly used metric for evaluating nutritional in the population especially in adult and elderly (Cabral *et al.*, 2020). According to Muscogiuri *et al.* (2023), it is calculated using a person's height and weight which providing an easy numerical number that classified people as underweight, normal weight, overweight or obese. The practicality of BMI is one of the main factors contributing to its popularity. It is appropriate for large population studies since it is simple to measure and uses few resources.

For public health assessment and actions, this classification is essential. Particularly in variety of demographics such as adolescent and students, these anthropometric measurements provide information on body fat distribution and overall health (Todorova, 2024). Non-communicable disease (NCDs) may be more likely to affect someone with a higher BMI category being associated with higher risk factors for cardiovascular and diabetes-related disease (Pereira *et al.*, 2023).

BMI standards of Asian and general population different because Asian often have more central adiposity and have larger percentage of body fat. Based on (Lim *et al.*,

2017) World Health Organization (WHO) and Asia Pacific guidelines have established the following adult BMI classification for easier interpretation as shown in Table 2.3.1.

Table 2.3.1: Comparison between WHO and Asia-Pacific

Classification	WHO (BMI)	Asia-Pacific (BMI)
Underweight	< 18.5 kg/m ²	
Normal	18.5 - 24.9 kg/m ²	18.5 – 22.9 kg/m ²
Overweight	25 – 29.9 kg/m ²	23 – 24.9 kg/m ²
Obese	≥30 kg/m ²	≥25 kg/m ²

2.3.2 Waist Circumference (WC)

Waist circumference (WC) is a valuable indicator of general health and more accurate metric than BMI. For assessing the health issues associated with adiposity, waist circumference is more reliable anthropometric indicator than accurately calculated for percentage. This is because waist circumference directly indicator of visceral fat levels, a major cause of metabolic disease while BMI does not differentiate between fat and muscle mass distribution (Shen *et al.*, n.d.). It is easier to address the early warning signs of cardiometabolic disease especially in adolescents. High waist circumferences are associated with non-communicable (NCDs) such as hypertension, type 2 diabetes and cardiovascular disease (Darsini *et al.*, 2020). Table 2.3.2 has shown World Health Organization (2011) has presented specific cut-off values for different population and the specific corresponding risk categories for metabolic disease.

Table 2.3.2: Waist Circumference Classification

METABOLIC RISK CATEGORY	MALES	FEMALES
Normal	≤94cm	≤80cm
Increase Risk	> 94cm	>80cm
Greatly Increased	>102cm	>88cm

2.4 Theories and Conceptual Framework on the Relationship between Food Security, Dietary Choices and Nutritional Status

2.4.1 Theories Used in Previous Study

Several theories and framework have been used in the past studies to determine the relationship between food security, dietary choices and nutritional status. A study by Thomson *et al.* (2024) proposed and uses Food Security Theory to determine the relationship between food security, dietary choice and nutritional status by emphasizing a comprehensive understanding of food security beyond four dimension which is availability, access, utilization and stability. This dimension is important to ensuring that individuals and households can maintain a healthy diet.

First, availability refers to the physical availability of adequate amount of food in a region or community. It is dependent on factors including food imports, production from agriculture and efficient food distribution systems. Insufficient availability makes it impossible for even the wealthiest household to obtain enough food. Second, access which is the ability of individuals to obtain food. This can be affected by economic resources like income, food prices and for social factors like education and social networks. In addition to being available in the market, access ensured that food is accessible and reasonable priced for people. Third, utilization emphasizes on using food safety, nutritional quality, proper food preparation and health status. Proper consumption of food ensures that it will have a beneficial effect on health and well-being. Finally, the final dimension is stability. Stability considers of how consistently something is available, accessible and used throughout time. It acknowledges that food security needs to be maintained consistently with taking into consideration factors like

instability in politics, environmental shocks, changes in seasons or economic fluctuations that could affect the availability or supply of food.

In addition, according to McDermott *et al.* (2015), the Theory of Planned Behaviour (TPB) have been used as framework for understanding how individuals make food choices. This theory suggests that attitudes and perceived behavioural control to form an individual's intentions which in turn shape their behaviour. Attitudes refers to how person's feeling about a specific behaviour. Intentions to select nutrient-dense foods are highly associated with positive attitudes towards healthy eating. For example, a person is more likely to have a positive attitude about choosing fruits and vegetables if they think the act of consuming them is fun and good for health. Furthermore, perceived behavioural control (PCB) represents a person's understating of their ability to perform a behaviour. Healthy eating habits are more likely to be maintained by someone who feels they can be easily find and prepare nutritious food. A higher PBC is linked to be better eating habits especially when it comes to selecting foods that are good for health.

This study aims to give a more comprehensive understanding of how environmental and individuals level factors effect students' food security, dietary choices and nutritional status especially within the academic environment at USM Kubang Kerian through the use of the Food Security Theory and the Theory of Planned Behaviour.

2.4.2 Conceptual Framework

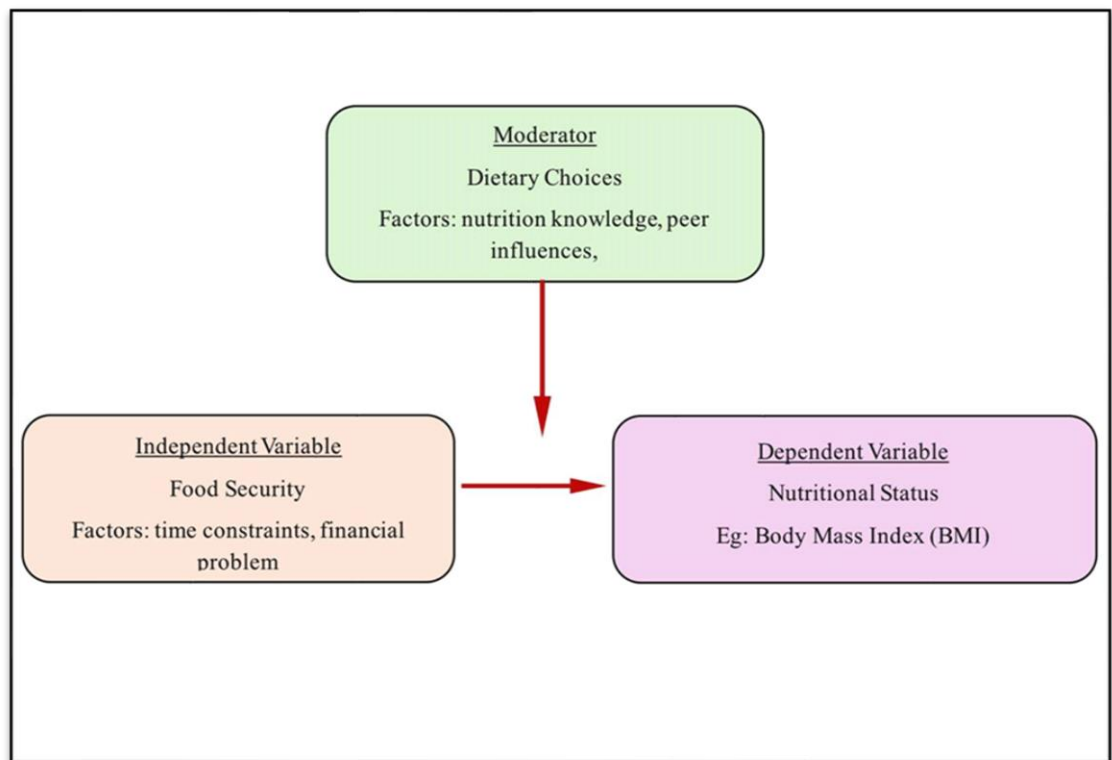


Figure 2.4: Conceptual Framework

CHAPTER 3: RESEARCH DESIGN

This study used a cross-sectional study which allowed the measurement of exposure (food security and dietary choices) and the outcome variables (nutritional status like BMI or WC) at a single point in time. This design was chosen because it was inexpensive and time consuming to conduct. The study was conducted among undergraduate Health Sciences students at Universiti Sains Malaysia (USM) that represented the general university population in Malaysia.

However, the cross-sectional study had several limitations. The findings were limited to describing exposures and the prevalence of outcomes at a given time period. Specifically, the study design was unable to establish a temporal relationship between exposure and outcome which meant that it was not possible to determine whether the exposure preceded the consequence. Furthermore, because the study was based on the prevalent cases, the findings may have been impacted by survival factors perhaps underestimating connection with short-term and high-fatality outcomes.

3.1 Study Area

The research was conducted at Universiti Sains Malaysia (USM) Kubang Kerian which provided access to a diverse group of undergraduate students from various health sciences programmes. This population was appropriate for examining the main components of this study since it showed a variety of dietary choices, levels of food security and nutritional status. The findings were more relevant and useful because the campus's academic and social environment represented a range of socioeconomic backgrounds. Thus, a cross-sectional study exploring the relationship between food security, dietary choices and nutritional status among undergraduate health sciences students was suitably conducted at USM Kubang Kerian.

Since a significant proportion of the target population lived in hostels, anthropometric measurements and participant recruitment were conducted there. Measuring in the hostel made it simpler for participants to get there, encouraged participation and reduced travel obstacle. To ensure privacy and comfort, male and female participants were scheduled to have their height and weights measured separately in a designated private place such as the DM4 building's lobby. To ensure confidentiality, only the participant and the principal investigator were present during the measurement.

3.2 Study Population

The study population for this research consisted of all undergraduate Health Sciences students enrolled at Universiti Sains Malaysia (USM), Health Campus, Kubang Kerian. These students were enrolled in various programmes including Dietetics, Nutrition, Sport and Exercise Science, Biomedical Sciences, Environmental and Occupational Health, Forensic Science, Nursing, Audiology, Medical Radiation and Speech Pathology. The study's reference population consisted of all Malaysian undergraduate students studying health sciences, whereas the target group was USM Kubang Kerian students. The sampling frame was established based on official student enrolment lists acquired from the School of Health Sciences administrative office. Given that university students were expected to be aware of health-related behaviours, this sample was selected for its relevance to the study's objectives, particularly regarding the relationship between food security, dietary choices and nutritional status.

3.3 Subject Criteria

Participants of this study were chosen and recruited based on the following inclusion and exclusion criteria:

The inclusion criteria were:

- I. Malaysian
- II. Undergraduate Health Sciences students at Universiti Sains Malaysia
- III. Aged 18 years or older

The exclusion criteria were:

- I. International students
- II. Postgraduate students at Universiti Sains Malaysia

3.4 Sample Size Estimation

The required sample size for this study was 289 Health Sciences students. This figure was calculated using the Raosoft online sample size calculation based on a 95% confidence level corresponding to a Z-score of 1.96, a 5% margin of error and an expected effect size of 0.3. This assumption was applied because 95% confidence interval was widely used in health sciences research (Sun *et al.*, 2022). The Power ($1-\beta$) was 80% corresponding to a Type II error (β) = 0.20. This study used an 80% power level which was regarded as a commonly accepted measure for ensuring sufficient sensitivity in detecting significant relationship.

Raosoft®		Sample size calculator
What margin of error can you accept? 5% is a common choice	5 %	The margin of error is the amount of error that you can tolerate. If 90% of respondents answer yes, while 10% answer no, you may be able to tolerate a larger amount of error than if the respondents are split 50-50 or 45-55. Lower margin of error requires a larger sample size.
What confidence level do you need? Typical choices are 90%, 95%, or 99%	95 %	The confidence level is the amount of uncertainty you can tolerate. Suppose that you have 20 yes-no questions in your survey. With a confidence level of 95%, you would expect that for one of the questions (1 in 20), the percentage of people who answer yes would be more than the margin of error away from the true answer. The true answer is the percentage you would get if you exhaustively interviewed everyone. Higher confidence level requires a larger sample size.
What is the population size? If you don't know, use 20000	1153	How many people are there to choose your random sample from? The sample size doesn't change much for populations larger than 20,000.
What is the response distribution? Leave this as 50%	50 %	For each question, what do you expect the results will be? If the sample is skewed highly one way or the other, the population probably is, too. If you don't know, use 50%, which gives the largest sample size. See below under More information if this is confusing.
Your recommended sample size is	289	This is the minimum recommended size of your survey. If you create a sample of this many people and get responses from everyone, you're more likely to get a correct answer than you would from a large sample where only a small percentage of the sample responds to your survey.

Figure 3.4: Sample Size Estimation

The total population consisted of 1153 students across 11 academic programmes. The sample of each programme was determined using proportionate stratified sampling as follows:

$$n = \left(\frac{\text{Total students in programme}}{\text{Total population}} \right) \times \text{Total sample size}$$

Where

n_h = Sample size

N_h = Total students in programme

N = 1153 (Total Population)

n = 289 (Total Sample Size)

3.5 Sampling Method and Subject Recruitment

This study used a stratified random sampling method which was a type of probability sampling that ensured each academic programme was proportionately represented in

the final sample. The target population included 1153 undergraduate students enrolled in academic programmes at Universiti Sains Malaysia's School of Health Sciences (Pusat Pengajian Sains Kesihatan, PPSK) at Kubang Kerian.

To begin, the population of interest was identified as all active students enrolled in the listed programmes who met the inclusion criteria. Students who were on academic leave or did not agree to participate were excluded. The required sample size was determined to be 289 students, calculated using Raosoft. To achieve proportional representation, the population was divided into academic programmes, with each programme representing one stratum. The number of participants chosen from each stratum was estimated using the formula:

$$n = \left(\frac{\text{Total students in programme}}{\text{Total population}} \right) \times \text{Total sample size}$$

A complete list of students for each programme was obtained from the PPSK academic office through email. Each student was assigned a unique identification using random number generator. The table below shows a breakdown of the sample size by programme.

Table 3.5: Sampling Method and Subject Recruitment

Academic Programme	Total Students (N)	Sample per programme (n)
Diploma in Nursing	100	25
Bachelor of Nursing	133	33
Bachelor of Forensic Science	125	31
Bachelor of Audiology	51	13
Bachelor of Biomedical Sciences	123	31

Bachelor of Dietetics	111	28
Bachelor of Environmental and Occupational Health	111	28
Bachelor of Speech Pathology	45	11
Bachelor of Nutrition	88	22
Bachelor of Sports and Exercise Science	146	37
Bachelor of Medical Radiation	120	30
Total	1153	289

Following selection, all chosen participants were contacted through WhatsApp or via class representatives. Prior to data collection, the study's objectives and procedures were explained and informed consent was obtained. Only individuals who freely consented were included in the final dataset. This method ensured that the sample was representative, random and proportionately distributed across all academic programmes, thereby reducing selection bias and improving the validity and generalisability of the study findings.

3.6 Research Instrument

A self-administered questionnaire was used to collect data from participants and was distributed via Google Forms. The questionnaire was designed in English to ensure accessibility for undergraduate students. It was divided into four parts (A, B, C and D) consisting of 57 questions.

Part A: Sociodemographic

This section contained questions related to demographic data which included information on age, gender, ethnicity, year of study, living accommodation, family income, sources and amount of allowance.

Part B: Anthropometric Measurement

Respondents' height and weight data were measured using a standardized stadiometer and weighing scale to calculate BMI, which is defined as weight in kilogram divided in height in meter squared (kg/m^2). The readings were recorded to the closest 0.1 kg and respondents were told to empty their pocket before weight assessment. Respondents received instruction to take off shoes, stand straight and look straight ahead while keeping both hands by their side in order to measure their height. The closest to 0.1 cm was used to measure and report the height. The BMI calculation was based on the World Health Organization (WHO) chart which is 18.5 kg/m^2 (underweight), 18.5 to 24.5 kg/m^2 (normal weight), 25 to 29.9 kg/m^2 (overweight) and $\geq 30 \text{ kg/m}^2$ (obese).

Part C: Food Insecurity Experience Scale

The Food Insecurity Experience Scale (FIES) is a validated tool designated by the Food and Agriculture Organization (FAO) to assess people's food insecurity (Food and Agriculture Organization of the United Nations, n.d.). The FIES questionnaire consisted of eight dichotomous (Yes, No, Don't Know and Refused) items that investigated the severity of food access problem during a specific time period usually the past twelve months.

Each affirmative response (Yes) indicating food insecurity earned one point while a negative response (No) scored zero point. Respondents coded as "Don't Know" or

“Refused” were considered missing data. As a result, the total score could range from 0 to 8. Respondents were classified into food security levels based on their cumulative score which was food secure (score of 0), mild food insecurity (scores 1-3), moderate food insecurity (scores 4-6) and severe food insecurity (scores of 7-8). This scoring method was used to evaluate the severity of food insecurity of respondents.

Part D: Food Choice questionnaire

The Food Choice questionnaire (FCQ) is a multidimensional tool originally developed by Steptoe *et al.* (1995) consisting of 36 items designed to determine the motivations behind people’s food choices. The FCQ consisted of various items divided into categories such as health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern. Respondents used a Likert scale to score the relevance of each category which normally ranged from 1 to 4. The score for items within each category were summed or averaged to produce subscale scores that showed the relative importance of each motive in the respondent’s food choices.

The FCQ domain scores were interpreted using the mean values. A mean score between 4.00 to 3.00 suggested that the domain was seen as a significant influence on dietary choices. Scores of 2.99 to 2.00 indicated that the domain was moderately important. Mean scores between 1.99 and 1.00 suggested that the domain was less important while score 1.00 indicated that the domain was not important in the participants’ food choices. Higher scores suggested that the greater component had a greater influence. This scoring method enabled investigating patterns in the food choice motivations and how they differed among demographic and health-related groups.

The FCQ's internal consistency was evaluated through the use of Cronbach's alpha coefficients. The alpha values for each domain ranged from 0.70 to 0.87, indicating acceptable to excellent reliability. These results validated the FCQ's psychometric strength as a reliable instrument for assessing different food-related motivations across a range of demographic.

3.7 Data Collection Method

Starting with a thorough research strategy and approval from Universiti Sains Malaysia (USM)'s Jawatankuasa Etika Penyelidikan Manusia (JePEM), the study ensured that it was ethically sound and that the data collection procedure were transparent and well-organized.

The data collection process commenced by requesting the name list of Health Sciences students through email from the Senior Assistant Registrar (Academic) of the School of Health Sciences. Upon obtaining the list, participants were selected using a random number generator. Subsequently, class representatives were contacted to facilitate the recruitment of these selected participants and were invited them to join WhatsApp group for further information. The goal was to recruit undergraduate students at USM Kubang Kerian who were 18 years old excluding postgraduate and international students.

Participants were selected from each academic programme using a random number generator, strictly adhering to the study's inclusion and exclusion criteria. Those selected to participate were requested to provide informed consent in the questionnaire. To facilitate access to the questionnaire, recruitment announcements and posters containing a QR code were disseminated. This QR code linked to a Google Form where the five-section questionnaire was provided. The questionnaire included

informed consent, demographic information and anthropometric data where BMI was calculated from weight and Height. Additionally, the Food Insecurity Experience Scale (FIES) was used to assess food security and the Food Choices questionnaire (FCQ) was utilized to measure dietary choices.

All anthropometric measurement including height and weight were performed solely by the principal investigator. Measurements were taken in the lobby of the DM4 building, with male and female participants measured separately to ensure privacy. For accuracy and consistency, all equipment used was calibrated and standard operating procedures (SOP) were followed. Prior to data collection, the stadiometer and digital weighing scale were calibrated according to the manufacturer's guidelines to ensure measurement accuracy. Standard calibration weights were used to examine the weighing scale and standard measuring rod was used to verify the stadiometer. Daily calibration was performed prior to use,

Intra-examiner reliability was assessed by measuring the height and weight of 10% of the participants twice at two different times. Remeasurement was done immediately if there were differences of more than ± 0.5 cm for height and ± 0.2 kg for weight. As soon the measurements were finished, the BMI was calculated.

Before beginning the questionnaire, each participant was given an explanation the study's objective, methods and how to complete the questionnaire. The questionnaire took about 15 minutes to complete. To ensure the sufficient participation, the study was continuously promoted via WhatsApp class group through class representative throughout the data collection. Reminders were also sent out periodically to ensure each academic programme was adequately represented. Data collection continued until the goal of collecting at least 289 completed questionnaires was achieved.

3.8 Study Flowchart

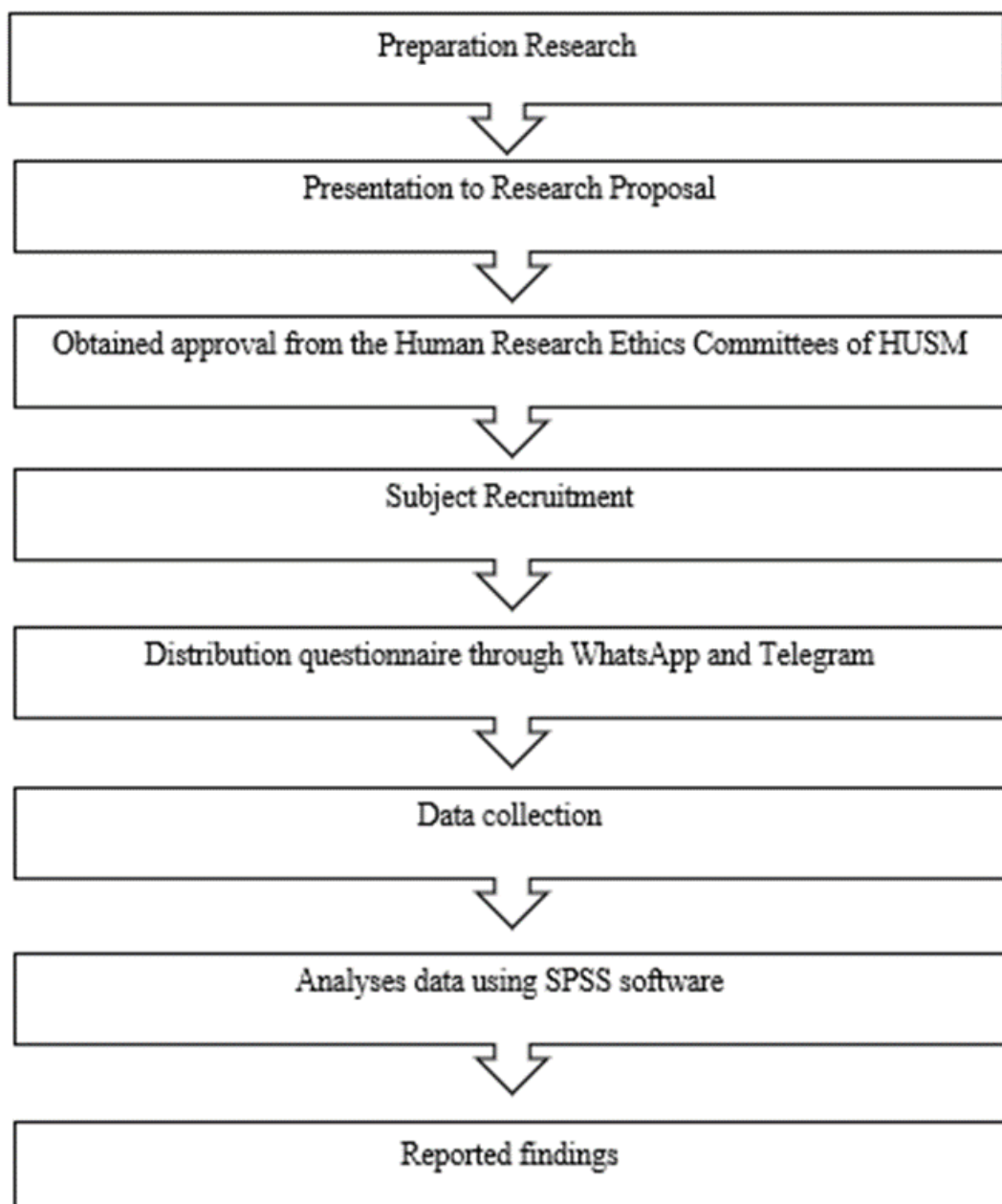


Figure 3.10 Study Flowchart

3.9 Data Analysis

Following data collection, IBM SPSS Statistics version 29.0 was used to conduct the analysis. Normality test such as Shapiro-Wilk test were used to assess whether numerical variables were normally distributed. Numerical data were reported as mean