THE RELATIONSHIP BETWEEN FOOD ACCESS TO FRUITS AND VEGETABLES, BODY MASS INDEX (BMI), AND FAST-FOOD CONSUMPTION BEHAVIOUR AMONG HEALTH SCIENCES UNDERGRADUATE STUDENTS IN UNIVERSITI SAINS MALAYSIA (USM), KELANTAN.

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SCHOOL OF HEALTH SCIENCES

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By

INTAN NOR ZAIMISHA BINTI ROSDEE

Dissertation submitted in partial fulfillment of

the requirements for the degree of Bachelor of

Health Sciences (Honours) (Dietetics)

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CERTIFICATE

This is to certify that the dissertation entitled “The Relationship Between Food Access To Fruits And Vegetables, Body Mass Index (BMI), and Fast-Food Consumption Behaviour Among Health Sciences Undergraduate Students in Universiti Sains Malaysia (USM), Kelantan” is a bona fide record of research work done by Ms Intan Nor Zaimisha Binti Rosdee during period from October 2023 to June 2024 under my supervision. I have read this dissertation and 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 fulfillment for the degree of Bachelor of Health Sciences (Honours) (Dietetics).

DECLARATION

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

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
IJT	Indeks Jisim Tubuh
CPG	Clinical Practice Guidelines
MDG	Malaysian Dietary Guidelines
NHMS	National Health and Morbidity Survey
WHO	World Health Organization
FAO	Food Agriculture Organization
USM	Universiti Sains Malaysia
PPSK	School of Health Sciences
PPSP	School of Medical Science
PPSG	School of Dental Science
KFC	Kentucky Fried Chicken
Mb	Marrybrown
SPSS	Statistical Package for Social Science Software

HUBUNGKAIT ANTARA AKSES MAKANAN KEPADA BUAH DAN SAYURAN, INDEKS JISIM TUBUH (IJT), DAN TINGKAH LAKU PENGAMBILAN MAKANAN SEGERA DALAM KALANGAN PELAJAR SARJANA MUDA SAINS KESIHATAN, UNIVERSITI SAINS MALAYSIA (USM), KELANTAN.

ABSTRAK

Kajian ini bertujuan untuk mengkaji hubungkait antara akses makanan kepada buah dan sayuran, indeks jisim tubuh (IJT), dan tingkah laku pengambilan makanan segera dalam kalangan pelajar sarjana muda sains kesihatan, Universiti Sains Malaysia (USM), Kelantan. Kajian ini merupakan kajian rentas keratan melalui teknik persampelan rawak mudah. Pengumpulan data telah dijalankan dari Mac 2024 hingga Mei 2024 secara atas talian melalui borang Google yang merangkumi ciri-ciri sosio-demografi, akses makanan kepada buah dan sayuran, IJT dan tingkah laku pengambilan makanan segera. Seramai 99 responden telah menyertai kajian ini. Majoriti responden adalah wanita (77.8%) dan Melayu (71.7%). Majoriti responden adalah pelajar tahun 3 daripada Pusat Pengajian Sains Kesihatan (PPSK). Hasil kajian menunjukkan bahawa 89.9% responden tidak mempunyai sebarang masalah dalam mengakses makanan manakala hanya 10.1% responden mempunyai masalah dalam mengakses makanan. Bagi kategori indeks jisim tubuh, 19.2% responden berada dalam kategori kurang berat badan, 47.5% dalam kategori normal, 20.2% dalam kategori berlebihan berat badan dan akhir sekali 13.1% responden dalam kategori obes. Bagi tingkah laku pengambilan makanan segera, 45.5% responden melaporkan kadar pengambilan makanan segera yang tinggi. Walaubagaimanapun, tiada perkaitan yang signifikan antara akses makanan kepada buah dan sayuran dan tingkah laku pengambilan makanan segera dimana nilai $p>0.05$ ($p=0.178$), diuji menggunakan ujian Fisher's Exact manakala hubungan antara indeks jisim tubuh dan tingkah laku

pengambilan makanan segera juga tiada perkaitan dimana nilai $p>0.05$ ($p=0.866$), diuji dengan ujian Pearson's Chi-Square.

THE RELATIONSHIP BETWEEN FOOD ACCESS TO FRUITS AND VEGETABLES, BODY MASS INDEX (BMI), AND FAST-FOOD CONSUMPTION BEHAVIOUR AMONG HEALTH SCIENCES UNDERGRADUTE STUDENTS IN UNIVERSITI SAINS MALAYSIA (USM), KELANTAN.

ABSTRACT

This study aimed to investigate the relationship between food access to fruits and vegetables, body mass index (BMI), and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan. This study was a cross-sectional study using convenience sampling technique. Data were collected from March 2024 until May 2024 through online Google Form which consisted of sociodemographic characteristics, food access to fruits and vegetables section and fast-food consumption behaviour section. A total of 99 respondents were participated in this research. Majority of participants were female (77.8%) and Malay (71.7%). Most respondents were students from year 3 from School of Health Sciences (PPSK). The result showed that 89.9% of the respondents do not has any problem in accessing food while only 10.1% does have problem in accessing food. For body mass index (BMI) category, 19.2% was identified as underweight, 47.5% was normal weight, 20.2% was overweight and another 13.1% was identified as obese. Regarding fast-food consumption behaviour, 45.5% of respondents reported that they have high fast-food consumption. However, there is no significant relationship between food access to fruits and vegetables and fast-food consumption behaviour tested using Fisher's Exact test as p-value > 0.05 (p=0.178). Meanwhile, there is no significant relationship between BMI and fast-food consumption behaviour tested by using Pearson's Chi-Square test as p-value > 0.05 (p=0.866).

CHAPTER 1: INTRODUCTION

1.1 Background of Study

Food access refers to the process of accessing food physically and economically (Ogot, 2020). Food access measure individual's ability to obtain food from the suppliers. According to the Food and Agricultural Organization, FAO (1997), there were two distinct types of food access which were direct or physical access. Direct food access is food produced at home by the members of the household or food purchased outside the household while physical access process might be through agriculture practice at domestic and commercial level (Ogot, 2020). In United States, food access concerns have escalated considerably since Covid-19 pandemic with 11% of the population facing access issues in 2018, rising to more than 25% by 2020 (Janda et al., 2021). Access to food is influenced by various factors such as transportation availability, food production, and socioeconomic factor. For example, the presence of nearby food markets within reasonable travel time for residents and affordable price of fresh foods at nearby food markets could increase the consumption of healthier food among individuals (Bessems et al., 2020).

Undergraduate students were individual who did not graduate yet from their university and most of the undergraduate students were usually busy with their life due to pack schedule (Sumardi et al., 2022). This causes them for not having enough time to find more healthy food options. Students tend to choose something that can be easily obtained to save their time. As fast food is usually quick and always ready to go, leading to many students opted for fast food rather than nutritious food (Isa et al., 2022). According to the Ministry of Health, fast foods were described as foods that are

manufactured in huge quantities using standardized technique and served quickly meanwhile the World Health Organization (WHO), defined fast food as food that can be made quickly and simply and is marketed as a quick meal or to be taken out in restaurants and snack bars (Hatta et al., 2022). Overall, fast food can be defined as food that is served on demand and instantly, that is often associated with a high number of calories, sugar, fat, and sodium. It may include hamburgers, fried chicken, soda, and fries.

Through the 9th Malaysian plan, the government has taken initiative to promote and encourage Western fast-food franchise, as one of many efforts to boost the country's economy (Abdullah et al., 2017). Hence, it came as no surprise that the proliferation of fast-food establishments continues to rise in Malaysia. The number of fast-food franchises in Malaysia in 2022 amounted to around 7.72 thousand and expected to increase to 9.72 thousand by 2026 (Statista Research Department, 2023). Example of popular fast-food brands in Malaysia are Kentucky Fried Chicken (KFC), McDonalds, A&W, MarryBrown (Mb), and Pizza Hut. In Malaysia about 34% of adults had consumed at least one type of fast food in a week and it was reported about 84% of Malaysian student's consumed fast food in a month (Habib et al., 2011).

1.2 Problem Statement

Chen & Antonelli (2020) stated that there were three factors that can influence individual food choice. The first one is food-related category that include features such as colour and aroma of the food. Second category is individual difference and biology characteristics that include features such as hunger/appetite, access of food, beliefs/knowledge of foods, and mood/stress level. The third factor is society-related category that include features such as culture, economic variables and government policy (Chen & Antonelli, 2020). In summary, it can be inferred that various factors contribute to individual food choices, with food accessibility standing out among the determinants influencing eating habits and individual dietary preferences. Limited access to healthy foods and affordable food options may promote individuals to rely more on the convenient and readily available fast food. Furthermore, poor access to healthy foods has been identified as factors contributing to inequalities in healthy diet. Such inequalities when observed, partially explained the disproportionate increase in chronic illnesses among vulnerable populations (Drisdelle et al., 2020).

In recent decades, a rapid process of change in dietary trends coupled with a worsening obesity crisis has been observed in many developing countries including Malaysia (Goh et al., 2020). According to Cheong et al (2019) fast food tends to be consumed in large amounts and accompanied by carbonated beverages that may result in excessive calorie intake and afterwards increase the risk of overweight and obesity. Continuous consumption of fast food will further increase the obesity risk among students (Alibabić et al., 2014). Furthermore, excessive consumption of fast food was often associated with higher risk of non-communicable disease including diabetes and hypertension (Isa et al., 2022). This was because fast meals were mainly poor in

micronutrients, low in fiber and high with density (Hatta et al., 2022). As fast food can be eaten in the restaurant or take away, it increases the consumption of fast food among students. This is because life of students is too packed with activities such as lectures, tutorials, co-curricular activity as well as abundant of assignment that need to be done, hence the students will respectively prefer to eat on the go rather than to eat clean by choosing fast food because it is convenient and can save more time (Sumardi et al., 2022).

In Malaysia, the prevalence of obesity in adults was slightly higher compared to world obesity prevalence in 2016 from 13% to 17.7% (Kyaw et al., 2022). According to latest report of National Health and Morbidity Survey (NHMS), it was revealed that 50.1% of Malaysia adult were either overweight or obese (Sumardi et al., 2022). A study which was conducted in Malaysia university discovered that university students have the prevalence of 21.2% of obesity (Radzi et al., 2019). As a matter of fact, obesity has been strongly related to excessive fast-food consumption. Based on the statement above, this study is done to identify the relationship between food access to fruits and vegetables, body mass index (BMI) and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan. The findings from this study could help students to make a better food option and living a healthy lifestyle.

1.3 Research Questions

Is there any relationship between food access to fruits and vegetables, body mass index (BMI) and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

1.4 Research Objectives

1.4.1 General Objectives:

To investigate the relationship between food access to fruits and vegetables, body mass index (BMI), and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

1.4.2 Specific Objectives:

1. To identify the food access to fruits and vegetables on and near the health sciences campus in Universiti Sains Malaysia.
2. To identify the frequency and eating habits pattern of fast-food consumption among undergraduate students.
3. To determine the relationship between food access to fruits and vegetables and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.
4. To determine relationship between BMI and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

1.5 Research Hypothesis

1.5.1 Hypothesis 1:

Null hypothesis (Ho): There is no relationship between food access to fruits and vegetables and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

Alternative hypothesis (H_A): There is a relationship between food access to fruits and vegetables and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

1.5.2 Hypothesis 2:

Null hypothesis (Ho): There is no relationship between BMI and fast-food consumption among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

Alternative hypothesis (H_A): There is a relationship between BMI and fast-food consumption among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan.

1.6 Significance of Study

This study was conducted with the aim to assess the relationship between food access to fruits and vegetables, BMI, and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan. Specifically, this study was significant for undergraduate students as prevalence of overweight and obesity has increased in the recent years (Davies et al., 2020). By conducting this study, it may benefit undergraduate students by raising awareness and increase understanding of the importance of maintaining healthy BMI. Moreover, the finding from this study may help students in determine their current state of health and making wise decisions regarding their well-being. Lastly, the result of this finding will provide a clear understanding of relationship between food access to fruits and vegetables, BMI, and fast-food consumption behaviour among undergraduate students. This information then can be used to propose better solution for the students to encourage healthy eating habits and thus help students in managing their weight and health.

1.7 Conceptual Framework

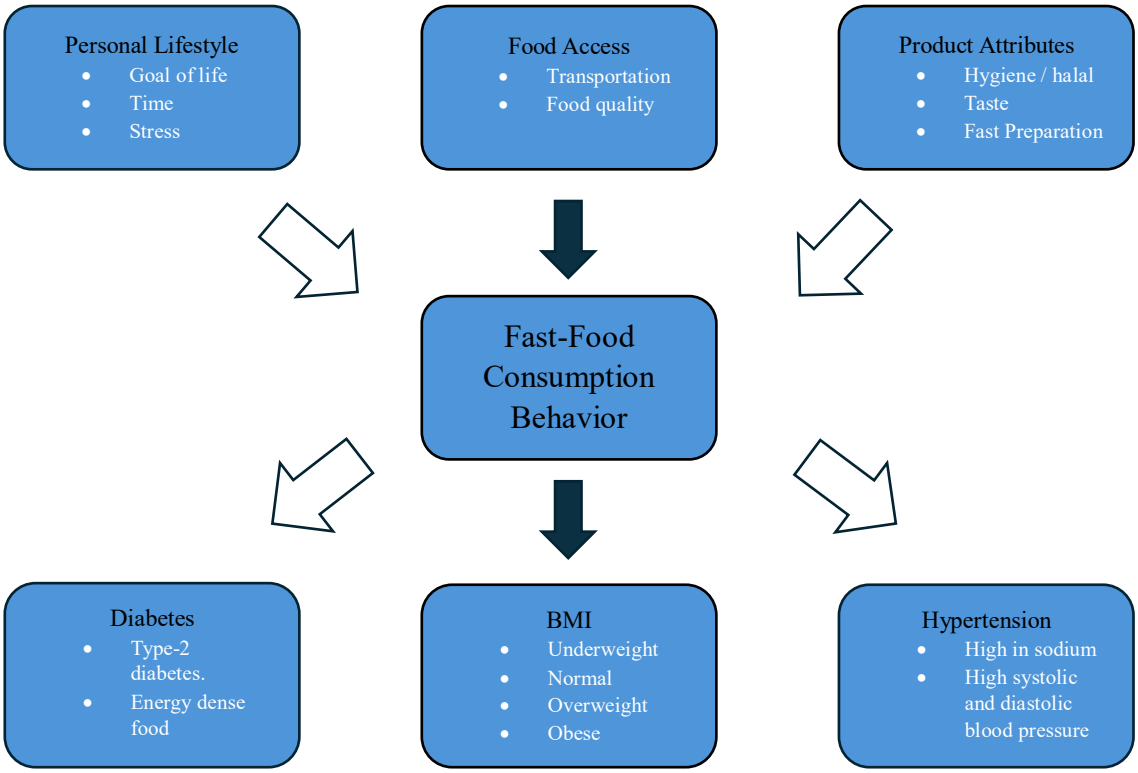

Figure 1: Conceptual Framework

Included in the study.

Not included in the study

Fast-food consumption behaviour among undergraduate students is contributed by numerous factors such as food access, personal lifestyle, and product attributes. Food access including medium of transportation and food quality play a significant role in influencing students' food purchase. Although this study does not investigate personal lifestyle and product attributes, but personal lifestyle such as stress environment and time constraint still play a role in contributing high fast-food consumption among students. Study reported that there was an important relationship between high stress and fast-food consumption at University of Seattle (Molly & Hamar, 2012). It shows that stress lifestyle

of students leads to consumption of fast-food as mechanism to reduce stress (Mokhtar et al., 2020). Moreover, product attributes such as taste, hygiene, halal, and fast preparation of fast-food provide making it as ideal food option for students. Students who consumed more fast-food tend to have health problems such as diabetes and hypertension. Given that most fast-food is high in sodium, it may increase systolic and diastolic blood pressure. Furthermore, fast-food is energy dense food with poor nutrient, its consumption might cause type-2 diabetes (Ntarladima et al., 2022). Usually, students that fall under overweight and obesity BMI range tend to consume more fast-food compared to students with normal BMI range (Banik et al., 2020).

CHAPTER 2: LITERATURE REVIEW

2.1 Food Access

There are 4 main pillars for food security which are food availability, food access, food utilization, and food stability (Shafiee et al., 2022). Food access refers to availability to purchase foods. It means that a person must have the ability to buy the food, have transportation to go and buy the food and the food itself must be easily accessible. Resolving the challenge of food access is imperative for two reasons. The first one is lack of food which can trigger deficiencies in critical nutrients and calories necessary to fight the onset of disease and secondly, a surplus of nutrient-deficient food of poor quality can ignite health problems such as obesity, diabetes, and hypertension that can compromise immune systems (O'Hara & Toussaint, 2021).

Food access plays a crucial role among undergraduate student's dietary choices. Limited access to healthy food options can make it very challenging for the students to practice and maintain a balanced diet. Food access is influenced by many factors such as socioeconomic factors, transportation and mobility, and cultural factors. Recent study shows that most of the students did not eat healthy food due to poor quality of food services and expensive, making it hard for live a healthy lifestyle (Isa et al., 2022). It was also reported that about 29.6% of students found it is difficult to access sources of food as they may need a medium of transportation such as public bus, cars, or motorbike to be able to buy healthy foods. Furthermore, living in college especially required them to follow the bus schedule hence, they cannot easily go out to buy healthy food. Moreover, students who stayed in the hostel were not allowed to bring their own transportation (Isa et al., 2022). Based on previous study more than half of students consumed less vegetables

and fruits per day (Isa et al., 2022). According to Malaysian Dietary Guidelines (MDG), a person needs to consume more than 3 servings of vegetables and 2 servings of fruits daily (Ministry of Health Malaysia, 2020). The main reason for not buying fresh fruits and vegetables was due to the poor quality of fruits and vegetables as well as the high prices of fruits and vegetables. Since not all university students come from high family's background, money could be the reason for them to not buy fruits and vegetables (Isa et al., 2022).

Additionally, fast-food restaurants are usually located near to the university campus making it more accessible for students. According to the Bakare & Olumakaiye (2016) visiting fast-food restaurants is like habitual daily activity of most undergraduate students, resulting with the growth of most fast-food outlets around the compound of university campuses. The same scenario happens in Universiti Sains Malaysia (USM), Kelantan whereby fast-food outlets such as McDonalds, KFC, Subway, Pizza Hut, and Domino Pizza are located near to the campus, making it more accessible for USM students. Thus, it increases fast-food consumption among the students. Previous study found that, exposure to the sight of fast-food restaurants might increase the likelihood that students would choose fast food rather than home cooked meals (Asirvatham et al., 2019).

2.2 Classification of BMI

Anthropometric indices such as weight and height measurement are used for assessing nutritional status, monitoring physical growth, and for early detection of malnutrition among adolescents (Kee et al., 2017). Through direct measurement of weight and height, we can calculate Body Mass Index (BMI). According to World Health Organization (WHO), a person with BMI below than 18.5 kg/m^2 considered as underweight, BMI within 18.5 to 24.9 kg/m^2 considered as normal, BMI 25 until 29.9 kg/m^2 considered as overweight and BMI more than 30 kg/m^2 considered as obese (Weir & Jan, 2019). For South Asian population, new BMI is proposed due to difference in body fat distribution compared to general population. BMI less than 18.5 kg/m^2 is considered as underweight, BMI 18.5 to 22.9 kg/m^2 is considered normal, BMI 23.0 to 27.4 $kg.m^2$ is considered overweight and BMI 27.5 kg/m^2 and more is considered as obese (CPG Management of Obesity, 2023).

Although young adulthood is always considered as a stage of optimal health and well-being, current trends show that there has been a shift in the distribution of BMI with fewer students in the normal range and more students in the overweight and obese category (Davies et al., 2020). This shows that younger generation are not taking care of themselves very well as maintaining a healthy BMI is one of the indicators for good well-being. It is believed that students with higher BMI are more prone to eat fast food. It is reported that 12% of overweight students visit fast food per month meanwhile only 7% of underweight students visit fast food per month (Isa et al., 2022). It clearly shows that there is a slight correlation between BMI and fast-food consumption among students.

2.3 Prevalence of Fast-Food Consumption

The growing number of fast-food consumptions not only occur in Malaysia however it also seems to be occurring in other parts of the world as fast-food restaurants has fulfilled the need for young people especially undergraduate students (Mokhtar et al., 2020). Based on the study among Mutah University in Jordon showed that 81.1% students consumed fast food at least once a week meanwhile about 15.5% of students consumed fast food at least once daily. Only 11.1% students did not eat fast food at all or very rarely consume it (Mwafi et al., 2021). Additionally, lunch time was the most preferred time for the students to eat fast food as they no need to queue for long time in the university cafeteria (Mwafi et al., 2021). Although in 2003, Malaysia has enforced mandatory nutrition labelling for all fast-food outlets as studies have reported that providing nutrition information might encouraged healthier choice among consumer, it still unsuccessfully stops students from purchasing fast food because not many students use the information mainly due to the nutritional information is somewhat hidden or not provided correctly (Vijayakumaran & Nur Amalina, 2018).

Furthermore, the desire for fast food among younger people has significantly increased each day due to the influence of western culture (Mokhtar et al., 2020). Habib, Abu Dardak & Zakaria (2011) reported that about 84.5% of students purchased and consumed fast food, while 15.5% did not consume fast food as they preferred home-cooked meals due of health and financial constraints. This finding is a threatening indicator of the widespread of unhealthy lifestyle among students. As the prevalence of fast-food consumption increased, it also will increase the risk of obesity and other diet-related disease among undergraduate students.

2.4 Factors Contributing to Fast-Food Consumption Behavior

Fast-food consumption behavior was commonly associated with poor eating habits such as drinking carbonated drinks while consuming low quantities of vegetables and having insufficient nutrients requirement due to less nutrition value in the fast food (Ashdown-Franks et al., 2019). Generally, there were numerous factors that contributed to the consumption of fast food among undergraduate students. Safety, price of the food and fast preparation were the main factors influencing fast food consumption (Mokhtar et al., 2020).

According to Goubraim & Chakor (2015) hygiene and food safety were the main attributes that increased demand of fast-food consumption. Besides, price also plays an important role in influencing students to buy fast food. Price refers to the amount of money that a customer spends on a product or services (Zhong & Moon, 2020). Generally speaking, price is the value that customers give up as an exchange for the benefits of using a product or services (Zhong & Moon, 2020). According to previous study by Mokhtar et al (2020) shows that 77.3% students are willing to pay more than RM30 per meal of fast food. Another factor that might influence students' fast-food consumption is sociability. Based on a previous study, 38.3% of students reported sociability as the reason for choosing to eat fast food at least once a month (Abdullah et al., 2017). This is because students frequently purchased fast-food together with their friends, hence signaling it is the time for them to socialize with their friends. Moreover, the friendly and aesthetic atmosphere that fast-food outlets provide for its consumer makes it a more suitable place for students to socialize. Next, halal certificate restaurants also play a big role for students in purchasing fast-food (Syarifah & Putri, 2022). As we all know, Malaysia is an Islamic country where more than half of its population are Muslim. It is mandatory for Muslim

to eat halal foods. Since most of the fast-food restaurants in Malaysia are halal, it increases the fast-food consumption especially among undergraduate students.

2.5 Effect of Fast-Food Consumption

Study has shown that excessive consumption of fast-food was often associated with diet-related disease (Horn et al., 2021). Diet-related disease has no specific definition however it can be defined as disease that occur due to poor diet habits. Problems like diabetes, hypertension, and obesity are common problems that occur due to poor diet habits. Diet composed of more industrialized, refined and energy dense foods such as fast-food has proven to contribute to this problem (Fardet & Boirie, 2014). In addition, both obesity and diabetes may be a risk factors for other diet-related chronic disease including cardiovascular disease and liver disease (Fardet & Boirie, 2014). According to Horn et al (2021) a 10% increase in visiting fast food outlets was significantly associated with 16% greater chances of developing obesity and 15% greater chances in developing diabetes. This shows that students who frequently visit and eat fast food may develop obesity and diabetes.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research Design

Cross-sectional quantitative research design was used in this research to identify the relationship between food access to fruits and vegetables, body mass index (BMI), and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan. The cross-sectional research design was preferred due to its ability to provide a snapshot of a population at a specific time, allowing for the efficient assessment of multiple variables simultaneously. Moreover, cross-sectional study design is relatively quick, cost-effective, and can provide important preliminary data for further research (Wang & Cheng, 2020). In this study, a set of online questionnaires was used for data collection where the participants were selected based on exclusion and inclusion criteria.

3.2 Study Area

The location of this study was at the Health Campus of Universiti Sains Malaysia (USM), Kelantan that include school of health sciences undergraduate students only. This study was carried out at USM, Kelantan due to limited research on this topic conducted in the East Coast of Malaysia, as previous studies have been more focused on universities located in major states like Selangor.

3.3 Study Population

The study population for this study was undergraduate students from School of Health Sciences, USM. The school of health sciences offer students from various program which are audiology, biomedicine, exercise and sport sciences, forensic sciences, medical radiation, nursing, environment and occupational health, and speech pathology. On the other hands, dietetics and nutrition program were excluded from this study to reduce bias. Additionally, only local students were accepted to participate in this study because foreigner students have different eating habits than local students. First year students are ineligible in this study due to their recent arrival at USM health campus. There is possibility that first year students are not familiar with other local food sources beyond USM cafe, thus disqualify them as a suitable subject for this study. Next, fourth year students were excluded because majority of them are engaged in internship outside USM health campus, rendering them unavailable for participation in this study. Hence, only year 2 and year 3 students were available to participate in this study.

3.4 Subject Criteria

3.4.1 Inclusion Criteria

- Health sciences undergraduate students
- Local full-time students
- Year 2 and year 3

3.4.2 Exclusion Criteria

- Year 1 and year 4
- Dietetics and nutrition program
- School of dental sciences and School of medical sciences

3.5 Sample Size Calculation

The sample size was determined by using Raosoft Sample Size Calculator to decide the required sample size of the population. According to the data provided by academic office of School of Health Sciences (PPSK), the total population of undergraduate student's year 2 and year 3 that currently enrolled in USM was 529 students. Therefore, with 95% of the of the confidence interval and 10% margin of error, the required sample size was 83 participants. However, the percentage of the sample size was raised to 20% in order to avoid poor response rate. As a result, a total of 99 participants were recruited for the study's sample size.

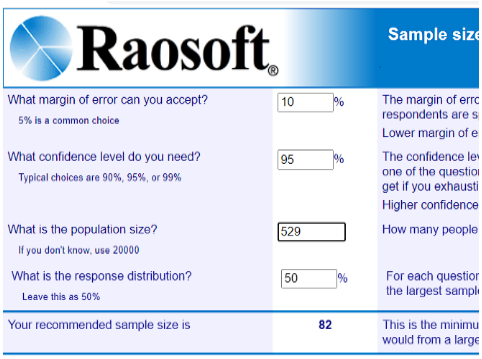

Figure 2: Sample Size Calculation

3.6 Sampling Method and Subject Requirement

Sampling technique used in this study was non-probability sampling design which is convenience sampling. Convenience sampling was used in this study because it is easily accessible to the researcher (Etikan, 2016). Moreover, convenience sampling is affordable, easy and the subjects are readily available (Etikan, 2016). Although convenience sampling method may introduce some limitations such as potential bias or limited generalizability, it is still a valuable approach for this study (Etikan, 2016).

All participants were recruited voluntarily through poster that has been blasted among health sciences undergraduate student's channel. The poster contains detail information regarding the study, which include inclusion and exclusion criteria. Those who met the inclusion criteria were accepted to participate in this study. Sociodemographic data was used to determine the eligibility of the subjects. Participants were asked first if they were willing to enrol in this study. An inform consent form was given to all participants to be filled before taking part in the study.

3.7 Research Tool

3.7.1 Anthropometry Measurement

Body weight and height of the participants were measured by using seca weighing scale and seca bodymeter. All measurements were taken twice, and the average was used in data analysis. Prior weight measurement, all participants need to wear lightest cloths and remove all the accessories to reduce error while measuring. The same thing for height measurement, all participants need to take off their shoes and stand upright on the platform against the flat wall to ensure even distribution of body weight and flat feet. The recorded weight and height were calculated into BMI with formula body weight divided by height^2. After the anthropometry measurement was done, the respondents were given directly an online google form link for self-administered questionnaire via scanning the QR code provided by the researcher.

3.7.2 Online Questionnaire

The data for this study was gathered via self-administered online questionnaire through Google Form. A set of questionnaires was used to obtain relevant data regarding food access to fruits and vegetables, BMI and fast-food consumption behaviour among health sciences undergraduate students in Universiti Sains Malaysia (USM), Kelantan. The questionnaire was adopted from a previous study by Isa et al (2022) and approval was obtained from the author prior the onset of the study via email. The obtained questionnaire was available in both English and Malay language. It consists of 28 questions and was divided into three main parts. Part A was the sociodemographic data, Part B was the food access to fruits and vegetables section, and Part C was the fast-food consumption behaviour section.

Part A: Sociodemographic data

i. Gender
ii. Ethnicity
iii. Year of Study
iv. Programs of Study
v. Height
vi. Weight
vii. BMI

Part B: Food Access To Fruits And Vegetables Section

i. Number of serves of vegetables eat everyday

ii. Number of serves of fruits eat everyday

iii. Frequency of eating certain food items

iv. Place to shop for fresh fruits and vegetables

v. Main reason does not buy fresh fruits and vegetables within the community or neighbourhood

vi. Easiness to find fruits and vegetables within the community or neighbourhood

vii. How often is transportation a problem in getting fresh fruits and vegetables

Part C: Fast-food consumption behaviour section

i. Frequency of eating fast food

ii. The main reason why respondents prefer fast food

iii. Usual time to eat fast food

iv. Type of fast-food preference

v. Order "supersize" or not

vi. Eat in the restaurant or take out

vii. Where do usually eat if take out

viii. Go to fast food with who

ix. Is nutritional information available at the fast-food restaurant visited

x. Ever read nutritional information

xi. Does nutritional information help to decide which meal going to buy

xii. Likely to order healthy meals

xiii. Distance between resident and fast-food restaurant

xiv. Frequency of practicing certain eating habits

For Part B which is food access to fruits and vegetables part, the questionnaire was categorized into 2 groups which were has problems and has no problems in accessing food to fruits and vegetables. The group was assigned to each response option based on appropriateness. For example, questions number 1 and 2, a value 0,1,2,3,4,5,6 was assigned to the response options “I don’t eat vegetables/fruits”, “less than one serve”, “2 serves”, “3 serves”, “4 serves”, “5 serves”, and “6 or more serves”. According to Malaysian Dietary Guidelines (MDG) (2020), consuming 2 servings of fruits and at least 3 servings of vegetables per day is recommended, hence respondents who answered value 3 and above will be considered as having no problems in assessing food as individual with better access tend to have higher fruits and vegetables consumption. For question 3, the value 0,1,2,3,4,5 was assigned to the response options “Never or rarely”, “1 – 2 times per week”, “3 – 4 times per week”, “5 – 6 times per week”, “1 time per day", and "2 or more times per day”. According to the MDG, it is advisable to limit consumption of processed food and food that high in salt per day (Ministry of Health Malaysia, 2020). Study by Clonan, Roberts & Holdsworth (2016) also suggest that high intake of processed meat can be considered as one of the aspects of limited food access, thus respondents who answered equal and less than value 2 will be considered as having no problems in assessing food. For question 4, the value 0,1,2,3,4,5 was assigned to the response option “you buy them within your community or neighbourhood”, “you buy them someplace else”, “you don’t buy fresh fruits and vegetables”, “you buy them within your community or neighbourhood and someplace else”, “Don’t know”, and “Refused”. According to the Eng et al (2022) having a place to buy fresh fruits and vegetables within the community or neighbourhood is indeed considered as having no problems in assessing healthy food. Thus, respondents who answered equal or less than 2 was grouped into has no problems in assessing healthy food category. For question 7, value 0,1,2,3,4,5,6 was assigned to the

response options “always”, “usually”, “sometimes”, “rarely”, “never”, “don’t know”, and “refused”. Without transportation, respondents unable to purchase healthy food source and only can depends on the foods that were provided by nearby restaurants or shops. Additionally, lack of places to shops for fresh fruits and vegetables near the campus causes food access to respondents without transportation more difficult. Therefore, respondents who answered above and equal value 3 were categorized into has no problems in assessing healthy food group.

For Part C which was the fast-food consumption behaviour, the questionnaire was categorized into 2 groups which were high fast-food consumption and low fast-food consumption. The group was assigned to each response option based on appropriateness. For example, in questions number 1, a value 0,1,2,3,4,5,6 was assigned to the response options “times per day”, “times per week”, “times per month”, “less than once a month”, “never”, “don’t know”, and “refused”. According to study by Li et al (2020) high consumption of fast food categorized by daily and weekly consumption. Banik et al (2020) also categorized students who consume fast food in the previous 7 days as high fast-food consumers. Hence, respondents who answered value 0 and 1 will be categorized into high fast food consumption group. For question 12, value 0,1,2,3,4,5,6 was assigned to response options “very likely”, “somewhat likely”, “somewhat unlikely”, “very unlikely”, “neither likely nor unlikely”, “don’t know”, and “refused”. Respondents who answered value 0 and 1 will be grouped into low fast food consumption group. This was aligned with the previous study that categorized lower energy dense food/healthy food options in menu decrease fast food consumption (Marty et al., 2020). For question number 13, it measures the distance between health sciences campus and fast-food outlets. Value 1,2,3,4,5,6,7 was assigned to the response options “0-2km”, “3-5km”, “6-8km”, “9-

11km", "12-14km", "15-17km", and "18-20km". Previous study stated that there was high frequency of visiting fast food when a radius is between 500m to 1.5km (Liu et al., 2020). It shows that as the fast-food outlets located near to the university campus, the frequency of students visiting the restaurants also increase thus, respondents who answered value 1 will be grouped into high consumption of fast-food group.

3.8 Conceptual Definition

Food Access

Food access referring to the process of accessing food physically and economically (Ogot, 2020). Food access measure individual's ability to obtain food from the supplies. According to the Food and Agricultural Organization (FAO) 1997, there are the two distinct types of food access which are direct or physical access. Direct food access is food produced at home by the members of the household or food is purchased outside from the household while physical access process might be through agriculture practice at domestic and commercial level (Ogot, 2020).

Body Mass Index (BMI)

BMI is a statistical index using a person's weight and height to provide an estimate of body fat in males and females of any age (Weir & Jan, 2019). To calculate BMI, body weight in kilograms must divided by height in meters squared. The National Institute of Health (NIH) uses BMI to define a person as underweight, normal weight, overweight or obese (Weir & Jan, 2019). In 2023, Malaysia ministry of health has composed Clinical Practice Guidelines Management of Obesity, which provide a new BMI classification that