UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH DIET QUALITY ASSESSMENT AMONG YOUNG ADULTS IN LOW-INCOME FAMILIES IN SELANGOR, MALAYSIA

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This project entitled “Factors Associated with Diet Quality Assessment among Young Adults in Low Income Families in Selangor, Malaysia” was prepared by Nurul Aida Syafiqah Binti Mohd Ghalil and submitted to the Faculty of Medicine and Health Sciences as a partial fulfilment of the requirement for the degree of Bachelor of Science in Nutrition and Community Health from the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
B40	Below 40 income group
NHMS	National Health Morbidity Survey
GPAQ	Global Physical Activity Questionnaire
RNI	Recommended Nutrient Intake
SES	Socioeconomic Status
WHO	World Health Organization

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ABSTRACT

FACTORS ASSOCIATED WITH DIET QUALITY ASSESSMENT AMONG YOUNG ADULTS IN LOW INCOME FAMILIES IN SELANGOR, MALAYSIA

Nurul Aida Syafiqah Binti Mohd Ghalil

Young adults in Malaysia continue to face the burden of malnutrition, which includes both undernutrition and overnutrition problems. As young adults are more vulnerable to any health and nutrition problem that may impair their later life, this age group should be given extra attention to their diet quality. The objective of this study was to determine the associations of sociodemographic, physical activity, dietary behavior, smoking behavior, energy intake, body mass index with diet quality assessment among young adults in low-income families in Selangor, Malaysia. The sample size for this cross-sectional study was 200 participants. The inclusion criteria of participants were Malaysian young adults aged 18 to 59 years who were from the B40 group while the exclusion criteria were young adults with physical inability that have a limitation on physical functioning and mobility. An online questionnaire was distributed among young adults who were divided into seven parts that comprised questions on sociodemographic, physical activity, dietary behavior, smoking behavior, energy intake, diet quality and anthropometric measurements of height and weight of the young adult. Diet quality index was used to assess the diet quality status of young adults by using the Malaysian diet quality index developed by Fokeena et al., (2016). Based on the findings, most of the participants had high diet quality status with a mean score of 42.34 ± 7.55. In addition, women (91%) showed higher frequencies for high diet quality status than men (29%). Snacking behavior (x^2=0.010, $p<0.005$) and energy intake (r=-0.227, $p<0.005$) were found to be associated with diet quality status. In conclusion, snacking behavior and energy intake were significantly associated with diet quality status. Increase snacking behaviour would increase the quality of diet while increase energy intake will inversely affect the diet quality. A holistic observation should be done to the factors that may associate with diet quality status of the young adult. Also, health promotion and awareness should focus more on promoting health among the low-income community.

ABSTRAK

FAKTOR YANG MEMPENGARUHI PENILAIAN KUALITI PEMAKANAN DALAM KALANGAN DEWASA MUDA DI SELANGOR, MALAYSIA

Nurul Aida Syafiqah Binti Mohd Ghalil

Individu di usia dewasa muda menghadapi permasalahan malnutrisi yang berterusan termasuk masalah kurang nutrisi dan lebih nutrisi. Oleh kerana usia dewasa muda merupakan kumpulan yang berisiko kepada permasalahan kesihatan dan nutrisi yang kemungkinan memberi kesan kepada mereka di masa hadapan, maka kumpulan ini wajar diberikan perhatian yang lebih terhadap kualiti diet mereka. Objektif kajian ini adalah untuk mengenal pasti faktor yang mempengaruhi penilaian kualiti diet dalam kalangan individu di usia dewasa muda dari keluarga berpendapatan rendah di Selangor, Malaysia. Seramai 125 orang peserta telah terlibat dalam kajian ini. Kriteria yang ditetapkan bagi kajian ini adalah remaja Malaysia berumur 18 hingga 59 tahun dari kumpulan B40 manakala kriteria pengecualian adalah remaja yang mempunyai ketidakmampuan fizikal yang mempunyai Batasan fungsi fizikal dan pergerakan. Satu soal selidik secara atas talian telah diberikan kepada peserta dan mengandungi 7 bahagian yang terdiri daripada soalan mengenai sosiodemografi, aktiviti fizikal, tabiat pemakanan, tabiat merokok, pengambilan tenaga (dari makanan) dan pengukuran antropometri bagi tinggi dan berat peserta. Berdasarkan keputusan kajian, majoriti peserta mempunyai status kualiti diet yang tinggi dengan purata penilaian sebanyak 42.34 ± 7.55. Tambahan pula, peserta perempuan (91%) mempunyai frekuensi bilangan yang lebih tinggi bagi status kualiti diet yang tinggi berbanding dengan peserta lelaki (29%). Tabiat pengambilan snek (x^2=0.010, p<0.005) dan pengambilan tenaga (r=-0.227, p<0.005) adalah berkait dengan status kualiti diet. Sebagai kesimpulan, tabiat pengambilan snek dan pengambilan tenaga mempengaruhi status diet kualiti dalam kalangan remaja di awal usia. Satu pemerhatian yang holistik perlu dilakukan terhadap faktor-faktor yang mempengaruhi kualiti diet dalam kalangan remaja di awal usia. Di samping itu, promosi kesihatan dan kesedaran juga perlu lebih fokus untuk mempromosikan kesihatan bagi golongan komuniti yang berpendapatan rendah.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

According to Act 1971, adult age in Malaysia is categorized as 18 years old and above. Socially, adult determinants typically concentrate on a person who has expanded responsibility for their lives in different ways (Short et al., 2015). Completing school, commencing full-time employment, getting married and parenthood expose the adults to stress and lack of time. Since this is the critical time during which they are exposed to stress, time restriction and start establishing independence, they are more likely to adopt unhealthy dietary habits including low consumption of fruits, vegetables and milk and preference for fast foods (Gan et al., 2011; Ganasegeran et al., 2012). Eating habits have been a major concern among adults.

The relevance of diet quality in the prevention and management of disease and premature death caused by non-communicable diseases (NCDs) is scientifically supported by epidemiological data. Diet quality is associated with the quality of life, better quality diets can reflect better quality of life (Maree et.al., 2014). Eating patterns

may positively impact on healthy growth and development throughout childhood and adolescence and on the mitigation of health problems in adults. Diet quality is one of the parameters that can identify adequate nutrients intake and aimed to prevent diet-related diseases. Parameters such as macronutrient distribution and a balance between the food groups are usually present and this instrument allows the monitoring of dietary changes in population groups (Eliane et.al., 2014). Due to the insufficient recommended nutrients intake among adults has been reported, diet quality among adults can be affected with some factors such as the money get the food, the dietary habits practices and might be due to the improper food consumption daily.

The study stated that the terms work-life balance could be described as a situation in which 'a person has sufficient power and autonomy over where, when and how they work to allow them to carry out their duties both within and outside paid work'. Some adults face busyness with their work responsibilities. As a result, the most frequently reported barrier to healthful eating is lack of time (Escoto et.al., 2012) which then they tend to choose eating outside. Due to the global health issue currently faced nowadays, everyone is more cautious in people contacts, thus they resorted to accessing food by ordering through online mediums instead of eating out.

Socioeconomic gradients are proportionate to morbidity and mortality rates in industrialized societies (Warren et al., 2007). The bottom 40% income group, commonly known as the B40, is a group that is classified based on their monthly income, which is RM3,000 and less per month. Adults within this group may be subjected to skipping meals due to financial limitations accessing food, which can result in poor diet quality. They can obtain lower-priced food but sometimes these types

of food may be lower in quality, containing high fat and lack of nutrient content. A study shows that a poor food environment in lower-income areas may be exacerbated by an abundance of fast-food restaurants serving high-calorie, high-fat meals at relatively low prices (Parker et.al., 2009). Studies on the social gradient of obesity rates have found that the correlation between poverty and obesity can be mediated, in part, by the low cost of energy-dense foods and can be strengthened by the high palatability of sugar and fat (Drewnowski & Specter, 2004). This indicated that individuals in this socio-economy group tend to consider more about meal satisfaction and fulfilment rather than the healthy aspect of the food itself.

These four factors; socio-demographic, behavioral, energy intake and anthropometric factors, may be associated with diet quality among young adults in low-income families, thus this study is carried out so that future intervention can be done to improve the nutritional status and to assess the need to provide nutrition education for young adults, specifically in the low-income bracket.

1.2 Problem Statement

Diet quality is one of the parameters that can be measured and categorized as either having good dietary intake or poor dietary intake. There was a cross-sectional study from Australia which reported that poor diet is characterized by a low diet quality score and has been associated with a greater prevalence of obesity and hypertension

(Livingstone et al., 2016). For example, a study reported fast-food consumption was associated with a diet high in energy and energy density and low in essential micronutrient density (Bowman et al., 2004). Frequent fast-food consumption may contribute to weight gain (Mohammad et al., 2018). Furthermore, studies also showed that individuals with low diet quality practised adverse health behaviors such as consuming more alcoholic drinks, consuming more sugary drink, they are more likely to adopt unhealthy dietary habits including low consumption of fruits, vegetables and milk and prefer fast foods (Gan et al., 2011; Ganasegeran et al., 2012) as well as being physically inactive compared to high diet quality.

The general finding of diet quality was found in a previous study in a different population group. Some studies reported that lower-income households purchase foods of lower nutritional quality compared to higher-income households. Lower nutritional quality of foods purchased could contribute to the lower diet quality as observed among lower-income individuals (Barbara et al., 2017). The previous study reported that the Orang Asli women were poor in diet quality (Geeta et al., 2016). A study on the higher dietary cost associated with higher diet quality was also conducted by Gan et al. (2017) in three districts in the state of Selangor, Malaysia.

There are many known factors associated with diet quality assessment consumption among young adults in low-income families, including socio-demographic factors, behavioural factors, dietary intake (energy intake) and anthropometry status. However, studies on the association between these factors and

diet quality assessment among young adults of low-income families are insufficient or have produced inconsistent findings.

A study reported that diet quality was strongly associated with age for both women and men (Silke et al., 2003). However, a study conducted in United Kingdom found a negative association between diet quality and age in men and women (Ilse et al., 2017). For sex, diet quality among women was higher than men in three types of Diet Quality Indexes, DQI's (HEI-2010, AHEI-2010, and DASH). In contrast, contradicted finding was found on diet quality among genders by using another type of DQI's which is aMED (Kang et al., 2019). Apart from that, a study found no association between ethnicity and diet quality assessment among adult in low-income families (Leung et al., 2014). However, Rezali et al., (2015) reported that ethnicity was correlated with the diet quality. For educational level and household income, most studies had shown a positive correlation of these factors with diet quality.

However, the studies on the association of educational level and household income with diet quality were lacking in Malaysia. Individuals' behavioural factors including physical activity, dietary behaviour and smoking behavior are important determinants of diet quality among young adults in low-income families. A study reported that physical activity was positively associated with diet quality (Storey et al., 2009). However, Huffman et al., (2012) reported that diet quality was inversely associated with physical activity level. In addition, several studies found that the dietary behavior of skipping meals was associated with diet quality assessment (O'Neil et al., 2014; Ramsay et al., 2018).

A study conducted by Andrade et al., (2016) found a negative association between smoking behavior with diet quality. However, the studies on smoking behavior and diet quality are limited in Malaysia. For energy intakes, there was a significant difference between energy and diet quality assessment (Silke et al., 2003). However, these studies are limited among adults in low-income families in Malaysia. Several studies reported that body mass index was positively associated with diet quality assessment (Maree et al., 2015; Wern et al., 2019). However, Livingstone et al., (2008); Lopez et al., (2019) found no association between body mass index and diet quality assessment. However, the study on the association of anthropometry status with diet quality assessment among adults of low-income families in Malaysia is lacking.

Therefore, this study aims to identify factors associated with diet quality assessment among young adults in low-income families and attempt to answer the following research questions:

1. What is the diet quality among young adults in low-income families?
2. Are there any associations between sociodemographic characteristics, behavioral factor (physical activity, dietary behavior and smoking behavior), energy intake, and anthropometric factors with diet quality among young adults in low-income families?

1.3 Significance of the Study

No published study has been done about the diet quality assessment among young adults in low-income families in Malaysia. This proposed study would give benefits on several aspects. Firstly, this study could provide the latest and updated data about diet quality among young adults specifically in low- income families. Poor diet quality can be one of the factors that may influence an individual's health status which will lead to the consequences of morbidity and mortality. Therefore, it is very important to identify the diet quality level among young adults in low-income families to know the factors associated with the poor diet quality result. Understanding the factors associated with this study could help nutritionist and health promotion planners develop an appropriate intervention in improving the nutritional status and health status of young adults in low-income families. Furthermore, the findings could serve as baseline data for other researchers.

The validated diet quality tool by Fokeena et al. (2016) may be used as a reliable tool for future studies in investigating the diet quality among the populations in the country. Previous shows that this method is a reliable and valid instrument to assess diet quality of Malaysian university students and is consistent with Malaysian Dietary Guidelines and recommendations from the Malaysian Food Pyramid but, it may also be tested among other Malaysian adults since the index was based on Malaysian Dietary Guidelines and Malaysian Food Pyramid.

1.4 Research Objective

1.4.1 General objective:

To determine the factors associated with diet quality among young adults in low-income families in Selangor.

1.4.2 Specific objectives:

1. To determine the diet quality of subjects
2. To determine the sociodemographic characteristics (age, sex, ethnicity, monthly household income, marital status, educational level) among subjects.
3. To assess the behavioral factors (physical activity, dietary habits, and smoking behavior) of subjects
4. To determine the energy intake and BMI among subjects
5. To determine the associations between sociodemographic characteristics (age, sex, ethnicity, monthly household income, marital status, educational level), behavioral factors (physical activity, dietary behavior, and smoking behavior), energy intake, BMI, and diet quality among subjects.

1.5 Hypothesis

1. There are significant associations between sociodemographic characteristics (age, sex, ethnicity, monthly household income, educational level, marital status), and diet quality among subjects.
2. There are significant associations between behavioral factors (physical activity, dietary behavior, and smoking behavior) and diet quality among subjects.
3. There are significant associations between energy intake, BMI, and diet quality among subjects.

1.6 Conceptual Framework

This study aimed to determine the association of sociodemography, physical activity, dietary intake, smoking behavior, energy intake, body mass index and diet quality status among young adults in low-income families in Selangor, Malaysia. The sociodemography, physical activity, dietary intake, smoking behavior, energy intake and body mass index were independent variables while the diet quality status among young adults in low-income families in Selangor was the dependent variable. The relationship between the factors and body weight status are conceptualized in figure 1.0.

The figure 1.0 shows the conceptual framework of this study. The previous research established factors that may be correlated with diet quality in individual life, sociodemographic, dietary behaviour, physical activity, smoking status, dietary intake, and anthropometry. Diet quality is generally characterized as a dietary pattern or a variety measure across key food groups compared to the recommended dietary guidelines (Wirt & Collins, 2009). Chong et al., (2019) found that the diet quality of Orang Asli women was low, with low compliance with the recommended Malaysian dietary intake of vegetables, fruit, meat, poultry and eggs, legumes, and milk. In the other hand, Thorpe et al. (2013) found that the DGI score was normally distributed among students aged 18-36 in Melbourne.

Sociodemographic factors, such as sex and ethnicity, have been described as variations in the quality of individual diets (Rezali et al., 2015). Diet quality changes significantly with older age, higher educational status scores were higher than the median for all four DQIs of both men and women (Minji et al., 2018). Kurotani et al., (2020) found higher dietary scores for Japanese students 6-18 years of age in those with higher household income. Shariff et al., (2015) found that the low socioeconomic status of urban Malaysians between 1 and 10 years of age, as indicated by low household income, could limit access to adequate diets.

Dietary behaviour, physical activity and individual smoking status have been seen to be a difference in dietary quality. A research conducted among adult Koreans found individuals with daily breakfast consumption increases their diet quality (min et

al., 2011). Zizza et al., (2011) found that snacking was modestly correlated ($P<0.001$) with higher overall HEI-2005 scores indicating high diet quality. In a cross-section analysis of Alberta students, it was found that Alberta adolescents did not comply with the minimum Canada Food Guide to Safe Eating CFGHE guidelines and thus had under-optimal diets and low diet consistency (Storey et al., 2009). In the smoking relationship, a study showed that becoming a smoker in 2010 was associated with a decrease in DGI-2013 ($\beta = -4.77: -6.76, -2.78: P < 0.001$ and $\beta = -4.11: -6.92$) (Thorpe et al., 2019).

Energy consumption and anthropometry measurements were found to be differences in the quality of individual diets. Silke et al., (2003) found that total energy consumption is positively correlated to the deficit index and the surplus index for both males and females. In a Malaysian adult study, the average HEI score was significantly lower in the overweight/obese category than in the normal weight category. Results have shown that the overweight/obese category has significantly higher levels of energy, macronutrients, sugar, saturated fat, cholesterol, and sodium than the normal weight group (Wern et al., 2019).

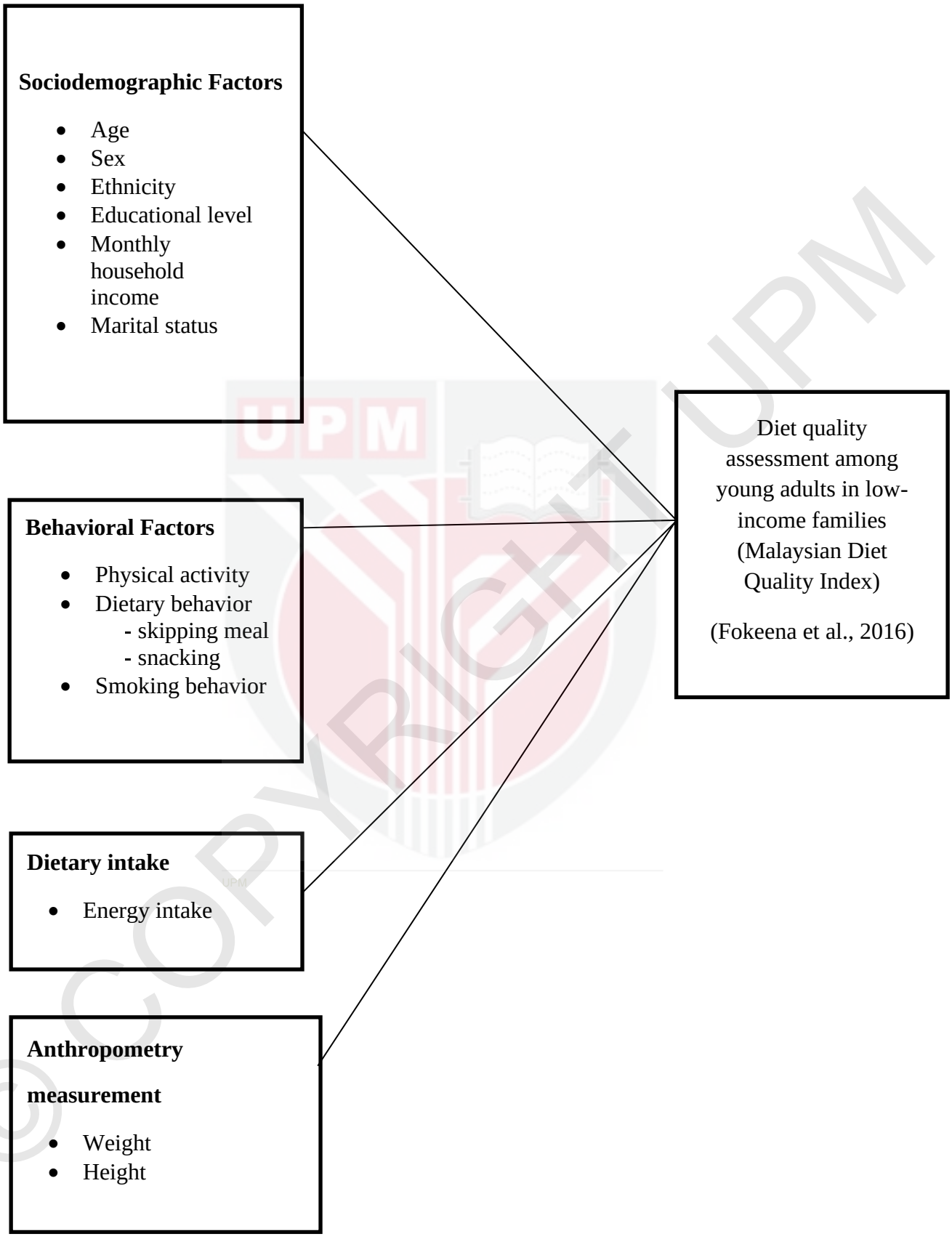

Figure 1.0: Conceptual framework of this study

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Literature review is the reviewing of secondary sources that have been published to give an overview of the research topic. This chapter consists of literature review on the current information and findings from international and local studies. There are seven sections in this literature review, which cover diet quality, sociodemographic, physical activity, dietary behavior, smoking behavior, energy intake and body mass index.

2.1 Diet Quality

A study in rural areas in Burkina Faso revealed that nutritional problems might be quantitative in the most underprivileged areas, including rural areas during occasional food deficiencies or urban areas in acute poverty (Savy et al., 2005). In these circumstances, it has been shown that the issue of dietary variety is urgent and therefore, the assessment of dietary quality is vital (Allen et al., 1991).

Diet quality is defined as one of the parameters that have emerged from a number of the score indices that have been currently in use. They are progressively being used to examine the epidemiological association between dietary intake and nutrition-related health effects (Annika & Clare, 2009). Diet quality refers to both the number of nutrients and the consumption of nutrients from food to facilitate body maintenance, growth, physiological state (e.g., maternity and lactation), physical activity and defense against infection. The quality of the diet is also reflected in the variety (diversity) of food groups intake.

Diet quality was measured by determining the intake of individuals' and compare the data with the intake of recommendations for each individual. The comparison of the data can categorize each individuals either they are having good diet quality or having poor diet quality which can lead to bad consequences.

Several questionnaires could be used to evaluate the diet quality of individuals, such as the Healthy Eating Index (HEI), the Food Quality Index-International (DQI-I) and therefore the Mediterranean Diet Score (MDS) of the United States Department of Agriculture (USDA) developed in 1995 the Healthy Eating Index (HEI) designed by Kennedy et al. to assess improvements in the consistency of American diets and to establish and assess strategies of dietary intervention methods consists of 10 variables covering nutrient consumption, food-group intake and dietary variation based on MyPyramid (2005). In 2003, Kim et al. created the Diet Quality Index-International (DQI-I) to measure diet quality between populations with different eating habits and to determine their current dietary transition phase initially applied to China and therefore

the United States. The index focused on three main aspects of diet: adequacy, moderation, and general balance. Trichopoulou et al., (1995) developed the original Mediterranean Diet Score (MDS) to evaluate the quality of the Mediterranean diet consumed by the Greek population, considering the apparent beneficial effects of this diet on health and longevity. The MDS index is already widely used in studies on the Mediterranean disease diet, in some cases introducing modifications to indicate the intent of the study.

Diet quality is attributed to morbidity and mortality. A study conducted by Mercedes et al., (2017) reported a 20% improvement in diet-quality scores were related to an 8% to 17% decrease in the risk of death for a few causes. The study found that participants with high diet quality (defined as Diet Screening Tool (DST) scores >75] had a significantly lower risk of death compared to those with poor diet quality (defined as DST scores <60) after adjusting for possible risk factors [adjusted HR = 0.76; 95% CI = 0.59-0.97). (Yi-Hsuan et al., 2019). Higher diet quality also can reduce the risk of mortality as seen in a study among Chinese adults. The findings of the study revealed that both indexes, participants in the highest diet quality quintile compared to the lowest quintile, had a lower risk of CVD mortality of 19–28%, a lower risk of respiratory mortality of 14–28% and a lower risk of cancer mortality of 5–12% after adjustment for potential confounders (Nithya et al., 2018).

Diet quality is different for each individual due to certain factors associated with the quality of individual diets. Research by Silke et al., (2007) showed that high dietary quality in terms of consumption of vitamins, minerals and trace elements are positively related to income, education, age, energy intake, food variety, physical activity, and

vegetarianism. Another study among Canadian adolescents reported that there were suboptimal macronutrient intakes and elevated skipping and having meals away from home for those with poor dietary quality (Storey et al., 2009).

A local study conducted by Chong et al., (2019) among Orang Asli (Mah Meri) women between the ages of 19 and 59 years of age in the Kuala Langat district of Selangor to evaluate the quality of diet and its predictors among Aboriginal women of the Mah Meri ethnic group in Malaysia. The findings indicated that the overall quality of the participants' diet was poor, with an average Malaysian HEI score of 45.3%. Household income ($r = 0.242$, $p < 0.001$) and nutrition knowledge ($r = 0.150$, $p < 0.05$) were significantly associated with diet quality.

A local study conducted among adolescents aged 13-16 years in Kuala Lumpur found that, based on diet quality, most participants (80.7%) were at risk of poor diet quality while the remaining 19.3% were at low risk of poor diet quality (Rezali et al.,2015). Leila et al., (2005) conducted a study among adults 19 years and older to determine the HEI score of Tehranian adults. The results of this study have shown that the diet of most Tehranian adults needs improvement ($p<0.01$). There have been connections between the intake of nutrients, the number of portions, the number of food items consumed, and each category.

Andrade et al., (2016) conducted a cross-sectional population-based study comprising 2,376 individuals surveyed in 2003 and 1,662 individuals surveyed in 2008

(São Paulo Health Survey, ISA- Capital) among adolescents, adults, and older adults. This research showed that diet quality remained worrying over the five years studied (BHEI-R = 54.99 versus 56.42, $p < 0.005$) with an increase in scores for total and whole fruit, milk, and milk items, saturated fat, and sodium with a decline in scores for total carbohydrates, oils and SoFAAS components. Diet quality has been enhanced in adults and older adults and has been affected by an improvement in overall and whole fruit scores, as well as saturated fat and sodium.

Storey et al., (2009) carried out a cross-sectional study in Canada among 4936 students within the grade of 7 to 10 which engaged in the school-based study revealed that overall diet quality indicated that 42% of students had poor diet quality, 50% had average diet quality and 8% had higher diet quality. Among boys, 32%, 56% and 12% had poor, average, and superior dietary content, respectively. In contrast, 50%, 45% and 5% of girls had low, average, and superior dietary consistency. This study concluded that adolescents in Alberta did not comply with minimum Canada's Food Guide to Healthy Eating (CFGHE) guidelines and thus had under-optimal diets and poor diet consistency.

In order to carry out the diet quality assessment among adults in Malaysia, this study will use the Diet Quality index by Fokeena et al., (2016). Fokeena et al., (2016) developed and validated a diet quality tool that can be used as a reputable tool for future studies in the investigation of diet quality among populations in the world. Previous data suggests that this approach could be a reliable and appropriate tool for determining the nutritional standard of Malaysian university students and is compatible with the

Malaysian Dietary Guidelines and the Malaysian organic phenomenon recommendations but may be evaluated against other Malaysian adults because the index is based on the Malaysian Dietary Guidelines and also the Malaysian food pyramid.

2.2 Sociodemographic Characteristics and Diet Quality

A study conducted by Silke et al., (2003) used nutritional data of 1763 men and 2267 women who participated in the German Nutrition Survey of 1998 aged 18–79 years by the Robert Koch Institute (RKI), Berlin. The result of the study which used regression analyses showed that diet quality was strongly associated with age for both women and men. Besides, diet quality increased with the increase of age constantly for women and men at approximately 45 years upwards. A longitudinal cohort study conducted by Ilse et al., (2017) among 1048 men and 862 women (59 and 73 years; mean 66 years old) in the United Kingdom at baseline (1998-2001) revealed that mean (SD) in prudent diet, the score was significantly lower in men -0.245 (1.216) than women 0.388 (1.109), indicating less healthy diets ($p<0.001$). In addition, this finding showed that prudent diet scores at follow-up were highly correlated with baseline scores (men: $r=0.696$; $p<0.001$; women: $r=0.656$; $p<0.001$). In men, average diet quality remained stable with increasing age, but there was an overall decline in diet quality with age in women.

Previous studies found that women tend to have better diet quality than men by using 4 different diet quality indices (DQIs): The Healthy Eating Index 2010 (HEI-2010), the Alternative Healthy Eating Index 2010 (AHEI-2010), the alternate

Mediterranean Diet (aMED), and the Dietary Approaches to Stop Hypertension (DASH). A study conducted by Kang et al. (2019) among 160 353 African American, Native Hawaiian, Japanese American, Latino, and non-Hispanic white at ages of 45 to 75 years, who entered the Multiethnic Cohort Study. This finding showed that mean scores were significantly higher in women compared to men for the three DQIs, (HEI-2010, AHEI-2010, and DASH). Contradict result was found at the mean score of aMED which was significantly higher in men than women (all $P < 0.001$) in this study. Likewise, in a local study conducted among 373 adolescents aged from 13 to 16 years old revealed that males (34.2 ± 8.2%) had poorer diet quality than females (39.9 ± 9.0%) ($t = -5.941$, $P < 0.05$) (Rezali et al., 2015).

Hazel et al., (2013) conducted a study among 3,286 children (2 to 17 years), 3690 young and middle-aged adults (18 to 64 years), and1296 older adults (65+ years) in America. Results showed that there was a significant difference between high education and diet quality ($p \leq 0.05$), and they observed that adults and older adults with the highest education level had higher total scores than almost any lower level of education. Grown-ups with a college confirmation had higher scores for whole fruit, total vegetables, whole grains, and calories from solid fats, alcoholic beverages, and added sugars compared to all other education levels. A similar finding was reported by Silke et al., (2003) among 1763 men and 2267 women participants in Berlin, Germany, in which results showed the relationship between education and diet quality was significant for the deficient index only ($p < 0.05$). Men with a low level of education have a lower index than men with an intermediate level of education (the reference population), whereas women with a higher level of education have a lower index than women with an intermediate level of education.

Drewnowski et al., (2016) conducted a cohort study to examine the impact of the built environment (BE) on diets, physical activity, and weight outcomes at baseline and at follow up among 387 adults with aged of 22-55 years old. The findings from the study revealed that higher income was associated with significantly higher HEI scores at baseline (β: 2.82 in > =100 K, 95 % CI: 0.24, 5.40). The higher valuation of residential property and baseline higher education demonstrated an inverse correlation with the prevalence of obesity. ($p \leq 0.05$). In other studies, families with livelihoods of $30 000 had a significantly higher mean variety score than those with a salary <$15 000. The high-income households had a higher vegetable score than did the medium- and low-income households. Higher family salary was related to eating a diet high in variety. Household income was significantly different in diet quality ($P < 0.03$) (McCabe-Sellers et al., 2007).

Leung et al. (2014) conducted a cross-sectional study to assess differences in dietary intake and diet quality by household food security among 8,129 lower-income American adults (300%) of the federal poverty level. The results showed that there was no evidence of significant heterogeneity by sex or race/ethnicity in the associations between food insecurity and dietary quality. In another study conducted among ethnicity of American (Hispanics, blacks, and whites) analyze that, Hispanics had better quality diets compared to blacks and whites ($p \leq 0.05$). Hispanics had higher scores than whites for total fruit, dark green and orange vegetables and legumes, saturated fat, and sodium and lower scores for whole grains, milk, and oils. Hispanics had higher scores than blacks for whole fruit, total vegetables, dark green and orange vegetables and legumes, milk, and calories from solid fats, alcoholic beverages, and added sugars (Hazel et al., 2013).

In a local study conducted by Rezali et al., (2015) among 373 adolescents aged from 13 to 16 years old revealed that ethnicity was positively correlated with diet quality. The finding of the study is Malay participants (36.9 ± 8.7%) had a significantly lower composite score of the HEI than Indian participants (41.3 ± 10.0%) ($F = 2.762$, $P < 0.05$).

2.3 Physical Activity and Diet Quality

A cross-sectional study had been done by Xu et al., (2018) using details gathered from 5,311 adults aged 60+ years who participated in the 2007-2014 National Health and Nutrition Examination Survey showed that there was a significant difference in physical activity according to the diet quality. The finding manifested that 45.1% met current PA recommendations, 65% had less healthful diets according to the Healthy Eating Index-2015. For every 1-point diet quality score increase, the likelihood of participants rating their general health as being excellent/good increased by 3% (OR=1.03, 95%CI: 1.02, 1.04), and the number of inactive days (β =-0.03, 95%CI: -0.05, 0.00) and mentally unhealthy days (β =-0.03, 95%CI: -0.05, -0.01) declined by 0.03 days. As we know, diet quality was associated with our quality of life. This study revealed that PA was associated with all HROQL measures and participants with high PA levels reported better general health (OR=3.53, 95%CI: 2.69, 4.63), less inactive days (β =-1.53, 95%CI: -2.11, -0.95), less physical unhealthy days (β =-1.88, 95%CI: -2.74, -1.02) than individuals with low PA levels yet not less mentally unhealthy days.

Similarly, Huffman et al., (2012) conducted a cross-sectional study among 868 participants (Cuban American, Haitian American, and African American) with and without type 2 diabetes collected from the year 2008–2010 showed that diet quality was inversely associated with physical activity level as measured by the Chi-squared test and the z-test. The association of diet quality with physical activity level was examined by the Chi-squared test [$\chi 2$ (9) (N = 8 2 6) = 28.1, P = 0. 0 0 1].

Likewise, Story et al., (2009) carried out a study among 2264 boys and 2623 girls (mean of age13.6years) to assess the overall quality of the diet of a population of adolescents living in Alberta Canada, and to decide if the quality of the diet, nutritional intakes, meal behaviour and physical activity are linked. The finding showed significant differences in physical activity levels between diet quality groups (P<0.001) based on ANOVA. Students with poor dietary quality (2.80±0.02) had significantly lower levels of physical activity compared with those with both averages (2.91±0.01), P <0.001) and superior dietary quality (3.16±0.04), P < 0.001) respectively. Further, students with average diet quality had significantly lower physical activity levels than their superior quality peers (p < 0.001).

As diet quality are able to reflect individual dietary diversity, a study conducted among 1,177 university students (aged 19 and above) showed that the findings of this study primarily point to physical activity and fruit/vegetable intake patterns. This study recorded that selected university students did not comply with current recommendations at 18.6% [95% CI: 16.9-20.5], which is at a moderate frequency and only 3.7% [95% CI: 3.0 – 4.5] demonstrated a sufficient frequency of fruit/vegetable intake. By comparison, 61.2% [95% CI: 58.9 – 63.7] and 16.6% [95% CI: 15.5 – 17.8]

of students reported low to no frequency of fruit/vegetable consumption, respectively.

Xu et al., (2020) presented a cross-sectional analysis of US adults to determine the association between physical activity (PA), diet quality, body composition, and fat distribution, finding showed that PA and diet quality were inversely correlated with the body fat content (β = −0.0042, 95% CI: −0.0084 to −0.0001; β = −0.28, 95% CI: −0.42 to −0.14) and the fat mass index: −0.42 to −0.14 (β =−a0.0125, 95% CI: −0.0209 to −0.0041; β = −0.56, 95% CI: −0.81 to −0.32).

A study conducted by Shuval et al, (2017) among United Stated adults showed that those in higher annual household income is linked to more intensive, less regular (per week) levels of physical activity and more daily sedentary time while those with lower income is positively linked to light exercise, inversely to sedentary time.

2.4 Dietary Behavior and Diet Quality

Chae et al., (2018) conducted a cross-sectional study among Korean adults who eat alone assessed the relation between diet quality of the modern Korean adult population's diet quality based on eating behaviour and socio-economic factors impacting their diet quality. Results have demonstrated that the diet quality of individuals who eat alone is poorer than that of individuals who eat together in both males (β: -0.110, p=0.002) and females (β: -0.069, p=0.005).

Ramsay et al., (2018) conducted a study to examine the differences in nutritional intakes and food consumption between children who enjoy breakfast relative to those

who do not take the breakfast among children, 2 to 5 years children (n = 3443) and 6 to 12 years children (n = 5147) in the United States, America. Findings reported that children who missed breakfast had poor overall diet quality and lower total intakes commonly obtained at breakfast. A similar result was observed for energy intake, children who missed breakfast ate almost 40% of the daily consumption of snacks. (2332 kJ of 5911 kJ) with 586 kJ of snacks as added sugars (Cl-95%). In children who ate breakfast, overall diet quality scores were significantly higher, as well as fruit, raw fruit, whole grains, dairy, and empty calorie subscale scores.

Another study conducted by O'Neil et al., (2014) to compare nutrient intake, diet quality, and weight/adiposity measures of the consumer which assigned different pattern with breakfast skipper. This study involved 18,988 of 19 years old and above revealed that as overall, the participants had a score of HEI-2005. Besides, consumers of the grain/100% fruit juice; grain; presweetened rtec/lower- fat milk; rtec/lower-fat milk/whole fruit/100% fruit juice; cooked cereal; lower-fat milk/whole fruit; and whole fruit patterns had higher Healthy Eating Index-2005 scores than breakfast skippers. Findings also showed that those put in seven breakfast patterns (grain/100% fruit juice; grain; presweetened rtec/lower-fat milk; rtec/lower-fat milk/whole fruit/100% fruit juice; cooked cereal; lower-fat milk/whole fruit; and whole fruit) have higher mean HEI-2005 scores than breakfast skippers. Diet quality is significantly different from the consumer with no breakfast pattern ($p<0.0042$).

A study conducted in French adolescent girls (Spyckerelle et al., 1990) revealed that low energy intake at breakfast, particularly by increased snacking, was

compensated for during the rest of the day. Snacking is common in young people: 60% in 16 ± 17-y-old young people compared to 45% in 11 ± 13-y-old children (Choquet & Ledoux, 1994). In another report, 11,209 adults aged 20 years and older who participated in the 1999-2004 National Health and Nutrition Examination Survey examined the relationship between snack frequency and overall diet quality. The results found that snacking was modestly correlated with higher HEI-2005 average scores, and for snacking zero (49.3±0.5), one (49.9±0.3), two (50.9±0.3), three (51.9±0.4), and four or more times a day (51.6±0.6) ($p<0.001$) (Claire et al.,2011).

Similarly, follow-up univariate analyzes among teenagers aged 11–17 years in Alberta, Canada, showed that those with poor diet quality had a slightly lower frequency of breakfast intake compared to those with average diet quality and those with better dietary quality ($p<0.007$) (Story et al., 2009). In the other hand, a study conducted by Rezali et al. (2015) among 373 adolescents aged 13 to 16 years. In Kuala Lumpur, Malaysia, the level of breakfast ($r = 0.038$, $P > 0.05$), lunch ($r = 0.068$, $P > 0.05$) and dinner intake ($r = 0.010$, $P > 0.05$) was not statistically associated with the diet quality of the participants.

2.5 Smoking Behavior and Diet Quality

Andrade et al. (2016) conducted a study involving 2376 individuals surveyed in 2003, and 1662 individuals in 2008 (Health Survey of São Paulo, ISA-Capital) from São Paulo, Brazil to investigate diet quality and associated factors in adolescents, adults, and older adults. Findings showed that both ISA surveys revealed that former smokers

had better diet quality food, likely because of their devotion to changing lifestyle habits. In comparison, in both survey years, smoking status was correlated with a 3-point lower BHEI-R ($p < 0.001$) regardless of age and energy consumption.

In a longitudinal study conducted by Thorpe et al., (2019) among Australian adults aged 55 years and over (n = 1005 men and n = 1106 women) to analyze changes in dietary habits using the key component study and dietary quality index among older adults and to examine dietary changes predictors over the four years. Over four years, the analysis showed an improvement in a healthier dietary pattern among higher education levels and favorable lifestyle characteristics, including nonsmoker and physical activity. Compared to those people who recorded never smoking, being a smoker in 2010 was correlated with a reduction in DGI-2013 ($\beta = -4.77: -6.76, -2.78$: $P < 0.001$ and $\beta = -4.11: -6.92, -1.31$: $P = 0.005$ for men (112) and women (92), respectively.

A meta-analysis was conducted to assess the association between smoking status and nutritional intakes, which showed that smokers' dietary patterns are described by higher intakes of energy, total fat, saturated fat, cholesterol and alcohol, and lower intakes of antioxidant vitamins and fiber compared to non-smokers who may influence their dietary efficiency (Dallongeville et al.,1998).

Alierwu et al., (2019) observed that the diet quality of heavy smokers was significantly lower than those who had never smoked independently of a variety of socio-economic, lifestyle and biological confounding factors (all p<0,001). Heavy smokers were less in line with national or international dietary guidelines, as expressed

in the Recommendation Compliance Index (RCI), Diet Quality Index-International (DQI-I) and Recommended Food Score (RFS). A study conducted by Canadian adults found that smokers had higher intakes of total and saturated fat and lower intakes of folate, vitamin C and fiber than non-smokers. This finding also showed that smokers eat slightly less fruit and vegetables than non-smokers, resulting in lower intakes of folate and vitamin C.

2.6 Energy Intake and Diet Quality

Previous studies showed that the overall energy consumption is positively related to the deficit index and to the surplus index for both males and females ($p<0.005$) (Silke et al.,2003). For instance, study conducted by Silke et al. (2003) using nutritional data from 1763 men and 2267 women involved in the 1998 German Nutrition Survey found that major variations in energy consumption and dietary quality were identified.

In addition, the finding from the same study also showed that variety of foods, reflected in terms of the number of different foods eaten, is positively related to the deficiency index. Therefore, its quality improves with a greater improvement in diet, given the intake of vitamins, minerals, and trace elements ($p<0.005$). The BHEI-R showed an opposite association with energy consumption ($r=-0.207$ in 2003 and $r=-0.260$ in 2008) and socio-economic factors such as head of household schooling ($r=-0.104$ in 2003 and $r=-0.132$ in 2008) (Andrade et al.,2016).

A study conducted by MENDES et al. (2015) among 1662 participants to examine the Diet Quality Index evaluates the adequacy of energy provided by dietary macronutrients. The observation that the association between the BHEI score and protein, lipid and carbohydrate intake has been reported, the mean BHEI score is slightly lower (β=0.96; p=0.001) than when lipid intake is below the recommended range. The outcome also revealed that the average Brazilian index score of individuals with high lipid intake was lower than that of individuals with proper lipid intake (β=0.96; p=0.004), while those with high protein intake had a higher score (β=1.10; p=0.003) than those with proper protein intake.

Research undertaken by lee et al. (2001) among 192 white girls and their mothers divided into two groups: >30% of fat energy (high fat [HF]) or ≤30% of fat energy (low fat [LF]). The study aims to compare the dietary quality and weight status of girls eating diets that follow the guidelines of the American Academy of Pediatrics for dietary fat with those of girls consuming >30% of fat calories and investigate the association between girls' dietary fat consumption, mother's nutrient intake, and mother's child-feeding activities. The finding of the study revealed that HEI Score for Girls Consuming High Fat (>30%) and Low Fat (≤30%) Diets result shows that the Low-Fat group had slightly higher average HEI scores than the HF group. (Low fat group = 78.4 ± 0.8), (High fat group = 69.6 ± 0.8) ($p < 0.05$).

2.7 Body Mass Index and Diet Quality

World Health Organization (2018) stated that more than 1.9 billion adults aged

18 and above were overweight while 650 million were obese in 2016. According to National Health Morbidity Survey (NHMS) 2015, the prevalence of underweight among adults was 6.7% and prevalence of overweight among Malaysian adults was 33.4% and prevalence of obesity was 30.6% (IPH, 2015).

Maree et al. (2012) conducted a cross-sectional study among 309 adult participants in Australia to assess the diet quality of a group of young adults (age of 18-39 years) and investigate its involvement of two food-related behaviors. Findings showed that age, sex, BMI, nationality, and maternal education, cooking meals for oneself was positively associated with diet quality with DGI score ($\beta = 0.15$; 95 % CI 1.15, 10.03; $P = 0.01$) with the mean score of DGI according to BMI is (87.1 ± 4.90), (93.4 ± 1.16), (94.8 ± 2.18), Underweight, Normal weight, Overweight/obese respectively.

In contrast, previous studies showed that there was no difference in BMI between diet quality (Lopez et al., 2019). For instance, a study conducted among Mexican 954 men and 136 women participating in the 2012 Mexican National Health and Diet Study to analyze the correlation of two diet consistency measurements with BMI and waist circumference (WC) between Mexican men and women, overall and by educational level, was assessed. The result showed that the overall score of MxDQI was not correlated with the BMI between men and women ($p = 0.09$). Likewise, the total score of MxAHEI was not correlated with BMI in both men and women ($p = 0.08$).

A U.S. adult study found that diet quality was inversely correlated with weight status variables only in men 30–39, 40–49 (BMI only) and 50–59 years of age, and in

women 50–59 years of age (P<0.05) (Pate et al., 2015). In an analysis performed by Livingstone et al., (2016), it was observed that people with the largest tertile in dietary guideline index (DGI) but not recommended food score (RFS) were less likely to be obese (men: OR 0.64, CI: 0.45, 0.92, P-trend = 0.014; women: 0.68, 0.48, 0.96, P-trend = 0.025) compared to the lowest tertile in DGI.

In a local study, Wern et al., (2019) performed a case-control study among 294 private universities students in Klang Valley, Malaysia revealed that the average of the cumulative score of the HEI was estimated to be significantly lower among OW/OB classes [45.14 (11.13)] than the NW party [51.43] (11.61)], suggesting lower diet efficiency OW/OB participants relative to NW participants.

From the previous studies conducted locally and internationally, most of the studies had provided a lack of data on diet quality for the young adult population. Previous studies in Malaysia focused on children, adolescents, and the elderly on diet quality, but only a few of them were focused on the young adult population. There is a study conducted on diet quality among adults in Malaysia, but it is in the general population of Malaysians. Thus, this present study focuses on diet quality among young adults in low-income families.

CHAPTER 3

METHODOLOGY

3.0 Introduction

Methodology is the process of gathering data and information to address the research problem. In this study, primary data was gathered from the participants through online method by using questionnaire.

3.1 Study Design

The design of this study was cross-sectional study. This study was chosen to assess the relationship between the exposures and the outcomes among study participants at one point of time. This study aimed to determine the association between sociodemographic characteristics, behavioral factors (physical activity, dietary behavior and smoking behavior), energy intake, and anthropometric factors associations with diet quality among young adults specifically in low-income families in Selangor, Malaysia.

3.2 Study Location

The study was conducted in the whole state of Selangor. Selangor is approximately 30 km south of the capital city of Kuala Lumpur.

3.3 Sample Size Determination

Sample size is the number of participants to be enrolled in this study. Table 3.0 shows the sample size determination and calculation using the formula by Cole (1997) as below:

$$\mathbf{n} = \frac{(Z_{1-\alpha/2}+Z_{1-\beta})^2}{r^2/(1-r^2)} + 5$$

where,

n = the required sample size

$Z_{1-\alpha/2}$= level of significance (1.96)

$Z_{1-\beta}$ = power set at 90% (1.28)

r = the expected correlation coefficient

Table 3.0: Sample size determination

Correlation Studies	Correlation, r	Sample size, n
Correlation of diet quality and household income (Heather et.al., 2016)	0.218	163
Correlation of diet quality and dietary intake (Clare et.al.,2014)	0.720	13
Correlation of diet quality and body mass index (BMI) (Fung et.al.,2005)	0.36	58
Correlation of diet quality and physical activity (Diane et.al.,2004)	-0.27	105

By comparing the sample size from the four correlation studies, the highest sample size came from the study on of diet quality and household income, which was 163. As shown in Table 3.1, the additional adjustment was done in computing the required sample size.

Table 3.1: Additional adjustment in computing the sample

Criteria	Adjustment	Sample size, n
Adjust for the expected proportion response rate	Response rate = 90%	179
Adjust for the expected proportion of eligible	Eligible rate = 90%	200

After consideration of the response rate and eligible rate, the final sample size required for this study was 200 participants.

3.4 Participants

The participants of this study were young adults in low-income families. This study allowed all household members. The selection of the young adults was based on the criteria as listed below in Table 3.2:

Table 3.2: The inclusion and exclusion criteria for the selection of participants

Inclusion criteria	Exclusion criteria
• **Malaysian young adults who live Selangor** • **Age 18 to 59 years old**	• Young adults with physical inability that have limitation on physical functioning and mobility

In this study, only Malaysian young adults who live in Selangor were chosen as participants. Besides, healthy young adults without any limitation on physical functioning and mobility were selected as participants as this study will study the association of physical activity and diet quality. Hence, the participants should be someone who did not have any limitation on physical functioning and mobility that may restrict them from doing physical activities.

3.5 Sampling Design

A convenience sampling design was used in this study in choosing the participants. The participants who stay in Selangor area were chosen to be included in this study. The selection of the participants was made by considering the objectives of the study to find out the factors associated with diet quality among young adults specifically in low-income families in Selangor Malaysia. The residents who fulfilled the study criteria were selected and invited to be included as the participants of this study.

3.6 Instruments

The participants of this study answered the questionnaire in bilingual version (Malay and English) of a self- administered questionnaire consisting of sociodemographic characteristics, physical activity, dietary behavior, smoking behavior, diet quality, and energy intake. Weight and height were reported by the participant in the self-reported questionnaire.

3.6.1.1 Sociodemographic characteristics

The participants were provided information's on sociodemographic that include age, sex, ethnicity, educational level, occupation, marital status, monthly household income. While for the anthropometry measurement, the participants were provided the data in the self-reported questionnaire. In case the global issue of covid-19 pandemic persists, the study will conduct by using google form.

3.6.1.2 Physical Activity

The WHO Global Physical Activity Questionnaire was created for surveillance of physical activity in countries. GPAQ was previously tested in terms of its validity and reliability in a nine-country survey carried out by Bull et al. in 2009 and more recently validated in Malaysian, Vietnamese, and American adults. The GPAQ version 2.0 has been standardized to be reliable and valid in different settings (eg, culture and language) (Su et al., 2018). GPAQ helps in collecting the data on physical activity engagement in three environments (or domains) and sedentary behaviour. These domains are activity at work, travel to and from locations and leisure. The participant had the details on the amount of time she/he spends working. Work covers items he/she needs to do, such as paid or voluntary work, domestic chores, food processing, fishing or food hunting, career searching. The measurement of the categorical measure, the overall time expended in physical exercise during the average week and the duration of the physical activity shall be considered. A particular calculation was used to know the total physical activity, which is the total physical activity of MET-minutes/week (=

the sum of the total MET-minutes of activity measured for each setting). Throughout the week, covering work, transport and leisure activities, the level of physical activity of the participants would be measured by measuring their level of physical activity (total time spent and strength of physical activity) with the physical activity prescribed by WHO 2020.

The total scoring method were used the cut off of >600 minutes after summing up all the physical activity Met-minutes/week, means meet the recommendation intakes by WHO.

Total physical activity MET-minute/week=

[$\sum$ ***time spent on an activity per day*** x no. of the days of activity per week x MET value]

3.6.1.3 Dietary Behavior

Dietary behavior of the participants was assessed by using the Eating Behavior Questionnaire (EBQ) (Chin & Mohd Nasir, 2009). There was a study that used this method and found that the Cronbach's Alpha value of the EBQ was 0.60 (Chong et al., 2016). The pretest of this method has involved the participants with a mean income of RM 3266.19±2566.90. The participants reported the number of days in a week that they had their main meals and snacks, and they also reported on their frequencies of eating out, eating at western fast food and its frequencies of consumption. The scale of 1-6 were provided as the frequency for the participant to choose (Table 3.3). The

frequencies of the main meals and snacks were counted as an evaluation. The participants were categorized as daily and non-daily intake for meal consumption and for snacking consumption.

Table 3.3 Scale and intake frequencies of the questionnaire

Scale	Intake frequencies
1	every day
2	4 to 6 days a week
3	2 to 3 days a week
4	once a week
5	1 to 3 times a month
6	never or less than once a month

3.6.1.4 Smoking Behavior

Smoking behavior was assessed using a classification based on the summary of activity score from Current Smoking Status Questionnaire for Adult (Kim et al., 2016). The participants reported their current smoking status based on the number of cigarette intake of their lifetime. They were classified into three categories either they were current smoker, former smoker, or non-smoker.

Table 3.4: Classification of smoking behavior based on the number of smoking cigarette

Categories	Characteristics
current smoker	≥100 cigarettes in lifetime and had smoked in the last one month

Table 3.4 (Cont.)

Categories	Characteristics
former smoker	≥100 cigarettes in lifetime and had no smoked in the last one month
non-smoker	<100 cigarettes in lifetime

3.6.1.5 Energy Intake

Energy intake of the participants was assessed by using a frequency food questionnaire. Food frequency questionnaire (FFQ) from Malaysian Adult Nutrition Statistic 2014 (MANS) consists of a finite list of foods and beverages with response categories to indicate the usual frequency of consumption over the time queried. The participants recalled the foods that they usually took over time queried. FFQ came with a list of food for each food groups in the food pyramid. The frequency of food consumption was assessed by a multiple response grid in which participants are asked to estimate how often a particular food or beverage is consumed. Categories ranging from 'daily', 'weekly' and 'monthly' were used and participants must choose one of these options. Participants will be asked to indicate the meal size for the type of food eaten and provide the total serving for each eaten of foods. The amount of calorie intake was obtained, and the total energy intake in daily were compared with the energy required for physical activity for adult by sex based on RNI 2017.

3.6.1.6 Diet Quality

The Malaysian Diet Quality Index was used based on a validated questionnaire by Fokeena et.al (2016). This diet quality index has been established and consists of 12 food groups and their food example. Participants were asked about each food in the food group, along with the frequency of daily intake, when matching it with the frequency of dietary guidelines 2010. The score was given based on adherence to the dietary guidelines and the level of intake of 12 food groups. The highest score which is '5' were given for each food group if the participants answered the questions in 'daily' and if the recommended daily serving size for that particular food group was reached. For the reliability and validity, this instrument has been proved to have the internal consistency as the Cronbach's alpha value of the 7-components index was 0.780. For the scoring method, the overall score for diet quality would be the total of scores from the food classes. The participant was considered to be at low risk of poor diet quality if their overall score is above 16.5, whereas the participant scores below 16.5 were considered to be at high risk of poor diet quality.

Table 3.5: Malaysian diet quality index by Fokeena et al., (2016)

Food groups	Examples of food	Dietary guidelines/recommendations	Scoring criteria	Scores
1. Cereals, cereal products and tubers	*Rice, rice porridge, noodles, Mihun, Kueh teow, laksa, laksam, pasta, sago, bread, capati, roti canai, Tosai, breakfast cereals, Instant cereal, pizza, corn, potatoes, tubers*	KM 4: "Eat adequate amounts of rice, other cereal products (preferably whole grain) and tubers." KR 1: "Consume at least 4 servings of cereal foods daily." MFP level 1: "Eat 4 to 8 serving in a day."	Daily (4 to 8 servings†)	5
			Daily (> recommended serving)	4
			Daily (< recommended serving)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0
2. Wholegrain cereals	*Capati*, Atta flour, wholemeal bread, brown rice, oats, barley	KR 2: "Choose at least half of your grain products from whole grains." KR 3: "Choose cereal products that are high in fibre, low in fat, sugar and salt." MFP level 1: "Choose grain products from whole grain such as wholemeal bread, brown rice, oats and barley. Whole grain contains more fibre."	Daily (≥½ of recommended serving)	5
			Daily (<½ of recommended serving or exceeding recommended serving)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0

Table 3.5 (cont.)

Food Group	Example of food group	Dietary guidelines/ recommendations	Scoring criteria	Score
3. Fruits	Fresh fruits, canned fruits, dried fruits	KM 5: "Eat plenty of fruits and vegetables every day." KR 1: "Eat a variety of fruits every day." MFP Level 2: "Eat at least 2 servings of fruits every day."	Daily (≥2 servings)	5
			Daily (< 2 servings)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0
4. Vegetables	Cooked vegetables, *Ulam*, salads, green leafy vegetables, bean vegetables, canned vegetables, frozen vegetables	KM 5: "Eat plenty of fruits and vegetables every day." KR 2. "Eat a variety of vegetables every day." MFP Level 2. "Eat at least 3 servings of vegetables every day."	Daily (≥3 servings)	5
			Daily (< 3 servings)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0
5. Milk and dairy products	Unsweetened liquid or powdered cow's milk, cheese, yogurt, fermented milk beverages	KM 7: "Consume adequate amounts of milk and milk products." KR 1. Consume milk and milk products every day." KR 2. Replace sweetened condensed milk and sweetened condensed filled milk with unsweetened liquid or powdered milk." MFP Level 3: "Consume 1-2 servings a day."	Daily (1 to 3 servings†)	5
			Daily (> recommended serving)	4
			Daily (< recommended serving)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0
6. Legumes and their products	Chickpeas, dhal, canned baked beans, *tempe*, *tauhu*, unsweetened plain soybean milk	KM 6: "Consume moderate amounts of fish, meat, poultry, egg, legumes and nuts." KR 5. "Consume legumes daily." MFP Level 3: Recommended daily serving of legumes is ½ to 1	Daily (½ to 1 serving†)	5
			Daily (> recommended serving)	4
			Daily (< recommended serving)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0
7. Fish	Fresh fish, frozen fish, dried fish, canned fish	KM 6: "Consume moderate amounts of fish, meat, poultry, egg, legumes and nuts." KR 1. "Consume fish more often, if possible, daily." MFP Level 3: Recommended daily serving of fish is 1	Daily (1 serving)	5
			Daily (> 1 serving)	4
			Daily (< 1 serving)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0
8. Poultry, meat, egg	Chicken, duck, beef, mutton, goat, chichen's egg, duck's egg, quail's egg	KM 6: "Consume moderate amounts of fish, meat, poultry, egg, legumes and nuts." MFP Level 3: Recommended daily serving of poultry, meat and egg is ½ to 2	Daily (½ to 2 servings†)	5
			Daily (> recommended serving)	4
			Daily (< recommended serving)	4
			2 to 6 times per week	3
			Once per week	2
			1 to 3 times per month	1
			Rarely/Never	0

Table 3.5 (cont.)

Food group	Example	Dietary guidelines / recommendations	Scoring/ criteria	Scores
9. High fat protein foods	Organ meats (liver, intestines, etc.), sausages, hotdogs, ready- made burgers	KM 8: "Limit intake of foods high in fat and minimise fats and oils in food preparation." KR 1. "Limit the intake of saturated fats to less than 10% of total daily calorie intake." KR 2. "Limit the intake of foods high in cholesterol."	More than once daily	0
			Once daily	1
			2 to 6 times per week	2
			Once per week	3
			1 to 3 times per month	4
			Rarely/Never	5
10. Fat-rich foods	Butter, margarine, peanut butter, snacks, crackers, chips	KM 8: "Limit intake of foods high in fat and minimise fats and oils in food preparation." KR 1. "Limit the intake of saturated fats to less than 10% of total daily calorie intake." KR 4. "Limit foods containing trans fatty acids."	More than once daily	0
			Once daily	1
			2 to 6 times per week	2
			Once per week	3
			1 to 3 times per month	4
			Rarely/Never	5
11. Salt-rich foods	Chilli sauce, tomato sauce, soy sauce, fish sauce, oyster sauce, shrimp paste, *Sambal belacan, Budu, Cencaluk*	KM 9: "Choose and prepare foods with less salt and sauces." KR 2. "Reduce consumption of highly salted foods and condiments." MFP Level 4: " Limit intake of foods high in fats, oils, sugarand salt and minimise the use of fats, oils, sugar and salt in food preparation."	More than once daily	0
			Once daily	1
			2 to 6 times per week	2
			Once per week	3
			1 to 3 times per month	4
			Rarely/Never	5
12. Sugar-rich foods	Sweets, candies, chocolate, cookies, cakes, ice cream, jam, *Seri kaya*, fizzy drinks, sweetened beverages	KM 10: " Consume foods and beverages low in sugar." KR 1. "Eat foods low in sugar." KR 2. "Drink beverages low in sugar." MFP Level 4: "Limit intake of foods high in fats, oils, sugar and salt and minimise the use of fats, oils, sugar and salt in food preparation."	More than once daily	0
			Once daily	1
			2 to 6 times per week	2
			Once per week	3
			1 to 3 times per month	4
			Rarely/Never	5

3.6.2 Anthropometric Measurements

The participants' body weight and height were reported and used to calculate their Body Mass Index (BMI). The participant was providing their latest of current weight and height taking within 3 months ago. After the data on body weight and height are acquired, BMI were calculated by using the formula as below:

$$Body\ Mass\ Index\ (BMI) = \frac{body\ weight\ (kg)}{height\ (m^2)}$$

Table 3.6: The classification of BMI is shown in the table below based on the WHO classification (WHO, 2000)

Classification	BMI (kg/m^2)
Underweight	< 18.5
Normal	18.5 - 24.9
Overweight	25.0 – 29.9
Obesity Class I	30.0- 34.9
Obesity Class II	35.0 -39.9
Obesity Class III	>40.00

3.7 Pre-test

Prior to the study, the questionnaire was pre-tested on 20 participants. The pre-test was conducted in February 2021, where the participants for pre-testing have similar characteristics as study sample. During the pre-testing, time taken to complete the instruments was measured. The clarity of instruction, understanding of the questionnaire and any problems faced by participants while answering the questionnaire was identified and corrected before the data collection of this study. The feasibility of the questionnaire was re-assessed after pre-testing to ensure the validity and reliability of measurement.

3.8 Study protocol

Data collection was carried out from March 2021 to May 2021. Prior to the commencement of this study, an approval for the study protocol was obtained from the University Ethics Committee for Research Involving Humans, Universiti Putra

Malaysia (UPM) (appendix A). During the data collection, participants' information sheet was included in the google form to the young adults who met the study criteria to inform them regarding the purpose of this research. Also, a consent form was included to get their approval before participating in this study. When they agreed to participate in this study, they then continued to the next section of the questionnaire.

3.9 Data analysis

After the data collection have been carried out, statistical analysis was conducted by using IBM SPSS Statistic 26, with statistical significance level set at $p < 0.05$. Descriptive data was analysed by using univariate analysis. The result for categorical variables (sex, ethnicity, educational level, marital status, monthly household income, physical activity, dietary behavior, smoking behavior, diet quality status, and BMI). Meanwhile, result for continuous variables (age, household income, physical activity scores, energy intake, diet quality scores, height, and weight values) were presented as means and standard deviations. As for inferential statistics, the correlation between categorical variables were tested by using Fisher exact test (sex with category of diet quality status, ethnicity with category of diet quality status, educational level with category of diet quality status, marital status with category diet quality status, monthly household income with category diet quality status, physical activity with category diet quality status, dietary behavior with category diet quality status, smoking behavior with category diet quality status, diet quality status with category diet quality status) whereas the correlation between continuous variables (age with category diet quality scores, energy intake with category diet quality scores, body

mass index with category diet quality status) were tested by using Spearman's correlation.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

This study aimed to determine the association between sociodemographic, physical activity, dietary behavior, smoking behavior, energy intake, body mass index and diet quality among young adults in low-income families in Selangor Malaysia. In this chapter, the results and discussions are presented in the sequence starting from sociodemographic, physical activity, dietary behavior, smoking behavior, energy intake, body mass index, diet quality and ended with the association between the independent variables and dependent variable. The participants of this study were young adults in low-income families aged 18 to 59 years old, who lived in Selangor that was conducted from March to May 2021. Based on the calculation of sample size, 200 participants should be recruited in this study. However, only 125 participants were eligible to participate and complete the questionnaire of this study, where the response rate of this study is 62.5%.

4.1 Sociodemographic Characteristics of Participants

Table 4.0 shows the sociodemographic characteristics of 125 adults in this study. In this study, 25.6% of the adults were males and 74.4% of them were females with a mean age of 28.88 ± 8.79 years. Majority of the participants were Chinese (63.2%), 31.2% were Malay, 3.2% were Indian while 3% of the participants were from other ethnics (Kadazandusun/Iban). Meanwhile, majority of the participants had bachelor's degree (75.2%), followed by 12.8% were in diploma, 8.8% were in secondary level, 0.8% were in primary level and 2.4% were in other (PHD level of education). Majority of the participants were single of marital status with 84.0% while 13.6% were married, 1.6% were divorced and 0.8% were widowed. Besides, the mean for household income was 3654.35± 2053.73. Based on the classification of household income, mostly half of the participants had monthly household income within RM 3971 - RM4850 with 44.8%, followed by 29.6% of the participants were having household income of less than RM2500, 13.6% of the participants were having RM2501 - RM3170 while the other 12.0% of the participants were having RM3171 - RM3970.

Table 4.0: Distribution of participants by sociodemographic characteristics (n=125)

Socio-demographic characteristics	n (%)	Mean ± SD
Age (years)		28.88 ± 8.79
Sex		
Male	32 (25.6)	
Female	93 (74.4)	
Ethnicity		
Malay	39 (31.2)	
Chinese	79 (63.2)	
Indian	4 (3.2)	
Others (Kadazandusun/Iban)	3 (2.4)	
Education level		
Primary level	1 (0.8)	
Secondary level	11(8.8)	
Diploma	16 (12.8)	
Bachelor's Degree	94 (75.2)	
Other's (PhD)	3 (2.4)	
Marital Status		
Single	105 (84.0)	
Married	17 (13.6)	
Widowed	2 (1.6)	
Divorced	1 (0.8)	
Monthly Household Income		3654.35± 2053.73
Less than RM2500	37 (29.6)	
RM2501 - RM3170	17(13.6)	
RM3171 - RM3970	15 (12.0)	
RM 3971 - RM4850	56 (44.8)	

4.2 Physical Activity

Physical activity level of the adult was classified into two levels, which were not meet WHO recommendations and meet WHO recommendations of physical activity (participants doing less than 150 minutes of moderate-intensity physical activity per week, or equivalent). Based on the findings from Table 4.1, the majority of the participants were categorized in "meet the recommendations" by WHO (87.2%) while another 12.8% were categorized as "not meet recommendations" with the mean and standard deviation for total Mets/min is 14721.63 ± 14941.

Based on the previous study from National Health and Morbidity Survey (NHMS 2019), it was reported that more than half of adults which is 74.9% were physically active which is it was consistent with this current finding where most of the adults were categorized as meet the recommendations. Besides, the current study also showed that men were having higher score of physical activity compared to women score. This finding was also consistent with the previous study conducted by Mangesha et al. (2019).

However, this data might be had slightly bias, as this questionnaire involves the capability of the participants in recalling and answering the questionnaire so it may lead to over-reporting or under-reporting problems by the participants.

Table 4.1: Distribution of participants by category of physical activity level (n=125)

Category	n (%)	Mean ± SD
Does not meet recommendations	16 (12.8)	
Meet recommendations	109 (87.2)	
Physical activity score (Met-mis/week)		14721.63 ± 14941
Men		18750.38 ± 16004
Women		13335.40 ± 14386

[1.] Classification based on WHO Global Physical Activity Questionnaire Version 2 (Analysis Guide)

4.3 Dietary Behavior

Table 4.2 shows the distribution of the participants by frequency of meal consumptions, including main meals intake (breakfast, lunch, and dinner) and snacking intake (morning tea, afternoon tea, and supper). More than half of the participant (67.2%) took breakfast every day, while 32.8% of the participants did not take breakfast daily with the mean score was 1.33 ± 0.47. As for the lunch consumption, majority of the participants reported taking lunch (82.4%). The same distribution also goes to the dinner consumption, whereby most of the participants (83.2%) ate dinner every day. Only a small number of participants was skipped lunch (17.6%) and dinner (16.8%) consumption with the mean score were 1.34 ± 0.88 and 1.40 ± 1.03. Apart from that, about half of the participants (43.2%) skipped their meals. Fig 1. shows specifically the most frequently missed meal was breakfast (32.8%) followed by lunch (17.6%) and dinner (16.8%)

Besides, the present findings show that participants frequently snacked during morning teatime with the mean score was 2.87 ± 1.96. About half of the participants (51.2%) snacked between breakfast and lunch daily, and 48.8% did not snack daily. As for the afternoon tea, one forth (28.8%) snacked between lunch and dinner daily and it should be highlighted that 24.8% of the participants took supper daily (Mean ± SD=3.79 ± 1.90; Mean ± SD=4.03 ± 1.92). In summary, only 11.2% of the participant snacked between each meal daily. The finding of this study is almost the same as the finding from a previous study conducted among undergraduates in a Nigerian University (Ukegbu et al., 2015). It was found that breakfast was skipped very often by their participants which was 41.5%. A study conducted among young people in the USA and Europe revealed that from 10 to 30% of young people were reported skip their breakfast meal Mohiuddin. (2018) also reported that based on a national survey, approximately 25% of American adults skip breakfast. These similar findings might be due to the lack of time in the morning and did not feel hungry in the morning. Besides, lack of time is the main reason of skipping breakfast while in general, lack of appetite, inability to cook, fasting/religion, and not being hungry (Mohiuddin, 2018).

However, the previous findings showed a contradicted finding on snacking behavior. Findings showed snacking patterns among adults and children in the US indicated that afternoon was the most popular time for snacking in all age groups while 54% adults in Malaysia were reported having afternoon tea (Cross, Babicz & Cushman, 1994; Zalilah et al., 2008). These contradicted findings might be due to the different cultures that were practiced in their countries.

Table 4.2: Distribution of participants by frequency of meal consumptions (n=125)

Category	Mean ± SD	n (%)	
	score	Daily	Non-daily
Main meal			
Breakfast	1.33 ± 0.47	84 (67.2)	41 (32.8)
Lunch	1.34 ± 0.88	103 (82.4)	22 (17.6)
Dinner	1.40 ± 1.03	104 (83.2)	21 (16.8)
Snacking			
Morning tea	2.87 ± 1.96	64 (51.2)	61 (48.8)
Afternoon tea	3.79 ± 1.90	36 (28.8)	89 (71.2)
Supper	4.03 ± 1.92	31 (24.8)	94 (75.2)

Snacking=meals intake between main meals

Table 4.3: Distribution of participants by skipping meal practices and daily snacking intake (n=125)

Category	n (%)	
	Yes	No
Skipping meals	54 (43.2)	71 (56.8)
Daily snacking	14 (11.2%)	111(88.8)

Skipping meals = skip one or more main meals in daily
Daily snacking = having snacked for each snacking time in daily

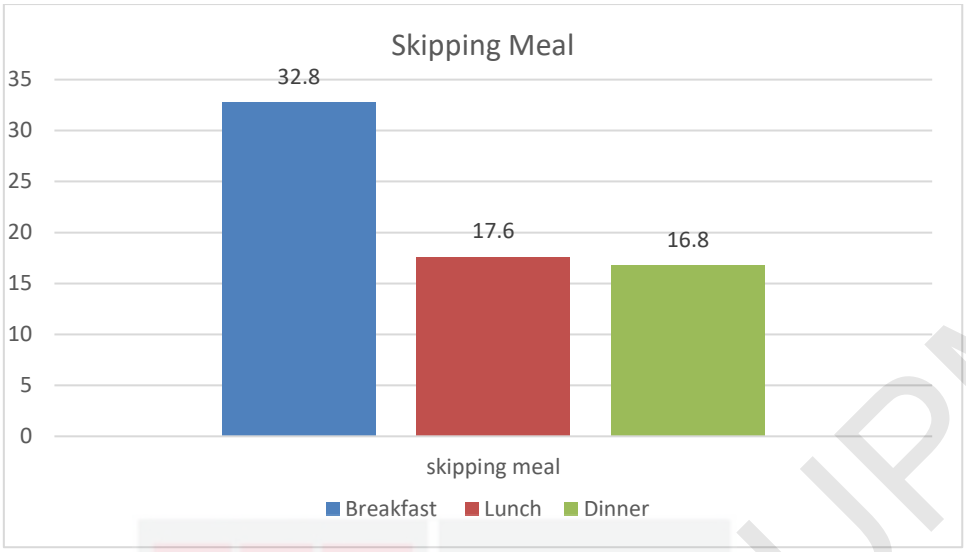

Fig.2 The number of types of meal skipping by the participants

4.4 Smoking Behavior

Based on Table 4.4, participants were classified into three categories of smoking behavior, which were current smoker, former smoker, and non-smoker. These classifications were based on questions answered from the U.S. Household Food Security Survey Module. Based on the findings from Table 4.5, only 2.4% of the participants were categorized as current smoker status. Meanwhile, the majority of the participants were non-smoker with 96.8%, while the rest which is another 1% were categorized as former smoker status.

The finding of this study has contradicted previous findings that was conducted among adults of low-income socioeconomic status in California (Kim et al., 2016). It was found that smoking prevalence was significantly higher among young adults in low

socioeconomic status who reported being food insecure (29.9%) than among those who reported being food secure (16.4%). These contradicted findings might be due to where the current study was only focused on the smoked tobacco used. However, based on observation, most of smokers nowadays had changed their smoking types from smoked tobacco used to smokeless tobacco. A study conducted by Nor et al. (2018) revealed that the prevalence of smokeless tobacco use among Malaysians had risen dramatically from 0.7% in 2011 to 10.9 percent in 2015, with current electronic cigarette use reaching 3.2% in 2016.

Table 4.4: Distribution of participants by category of smoking behavior (n=125)

Category	n (%)
Smoking Status	
Current smoker	3 (2.4)
Former smoker	1 (0.8)
Non-smoker	121 (96.8)

[1.] Classification based on summary activity score from Current Smoking Status Questionnaire for Adult (Kim et al., 2016).
[a] Current Smoker = ≥100 cigarette in lifetime and had smoked in the last one-month
[b] Former Smoker = ≥100 cigarette in lifetime and had no smoked in the last one month
[c] Non-smoker = <100 cigarette in lifetime

4.5 Energy Intake

The energy intake was assessed by using the food frequency questionnaire (MANS 2014). Based on Table 4.5, the current study found that the mean energy intake of the adult was 2619 kcal with a standard deviation of 2161 kcal. The findings showed that men had higher energy intake than women with the mean of energy intake were 2729± 1698 kcal and 2579± 2314 kcal. This finding was consistent with a study

conducted by Lee et al. (2019), which showed that male participants had significantly higher energy than women.

However, the mean energy intake for men and women was slightly higher when compared to the energy requirement by Recommended Nutrient Intakes (RNI) for Malaysia 2017. These inconsistency findings might be due to the misreporting of intake as they were required to recall that might give inaccurate and invalid information either over-estimating or under-estimating data.

Table 4.5: Distribution of participants according to mean of energy intake (n = 109).

Variables	Men	Women	Mean ± SD
Energy (Kcal/day) [1]	2729± 1698	2579± 2314	2619± 2161

[1] Classification of energy and macronutrients requirement were based on Recommended Nutrient Intakes (RNI) for Malaysia 2017. (General population *moderately active)
[a] Male= < 2240 kcal/day; Female = < 1840 kcal/day (19 – 29 years)
[b] Male = < 2190 kcal/day; Female = < 1900kcal/day (30 – 59 years)

4.6 Body Mass Index

Table 4.6 shows the mean and distribution for body weight status of participants. The mean height of the participants was 1.62 ± 0.08 m while the mean for weight was 60.88 ± 13.99 kg. Besides, the data classification of Body Mass Index by the participants shows that majority of the participants had normal BMI (52.2%) with percentage of men (59.4%) was slightly higher than women (53.8%). This finding was

consistent with previous findings conducted by Xiao et al. (2019) which revealed that females had a higher prevalence of normal BMI than males (57.27% vs 51.62%). Apart from that, 22.4% of the participants were classified as overweight and 6.4% were obese. On the other hand, 16.0% of the participants were classified as underweight.

The current data showed that obesity class had the least percentage of distribution compared to the other class of BMI, 6.4%. This finding was consistent with previous studies conducted by National Health Morbidity Survey (NHMS) 2015 and National Health Morbidity Survey (NHMS) 2019. Based on the findings from the National Health Morbidity Survey (NHMS) 2015, the prevalence of obesity in urban residents (17.7%) was similar with rural residents (17.5%), with national prevalence of 17.7%. Apart from that, the prevalence of obesity among adults based on the data National Health Morbidity Survey (NHMS) 2019, the prevalence of obesity in urban residents (12.1%) than in rural residents (11.2%), with national prevalence of 11.9%. The findings from both previous studies showed a declining pattern of obesity prevalence while if the current data were put in the year of sequence study, it also showed the continuing decline in the pattern of obesity from 2015 to 2020/2021.

Table 4.6: Distribution of participants according to the mean of anthropometry measurement and body mass index (n=125)

Variables	**Mean ± SD**	
	Men	Women
Height (m)	1.72± 0.07	1.58±0.05
Weight (kg)	72.15. ± 14.40	57.00±12.00
Body Mass Index ($kg/m^{2)}$	24.05 ± 4.27	22.62±4.66

Table 4.7: Distribution of participants according to classification of body mass index, BMI (n=125)

Class of BMI	n (%)		
	Men	women	total
Underweight	2(6.3)	18(19.4)	20 (16.0)
Normal	19(59.4)	50(53.8)	69 (55.2)
Overweight	9(28.1)	19(20.4)	28 (22.4)
Obesity	2(6.2)	6(6.5)	8 (6.4)

[1] Classification of BMI were based on WHO classification (WHO, 2000)

4.7 Diet Quality

Table 4.8 shows the distribution of the respondents by food groups in diet quality index. Based on the table, wholegrain cereals showed higher mean score of diet quality index for the carbohydrate food group than to the cereals, cereal products, and tubers. The fruit food group (2.78 ± 1.18) showed a slightly higher mean score than vegetable (2.03 ± 0.96) with most of the participants consumes fruits 2 to 6 times per week (35.5%) while 42% of the participants took Daily (< 3 servings) vegetables. For the protein groups, legumes, and their products (4.59 ± 1.60) show the highest mean score compared to other food groups. Most of the participants consumed fish from 2 to 6 times per week (41.3%) while once per week (29.7%) for poultry, meet and egg food groups. Apart from that, the mean score for the food groups of high fat protein food (4.22 ± 1.4) and fat-rich food (4.21 ± 1.25) were similar. Besides, only 6.5% of the respondents were taking salt-rich food more than once daily while only 5.1% of the respondents were taking sugar-rich food more than once daily.

Diet quality of the participants was assessed by using the diet quality index by Amin et al. (2020). The adult's diet quality status was classified into two categories: low diet quality and high diet quality (> 30 total scores indicate that the subjects had low risk of poor diet quality). Based on the findings from Table 4.5, the mean score of diet quality index was 42.34 ± 7.55 with the score of diet quality was slightly higher among women than men, 42.74 ± 7.47 vs 41.16 ± 7.78. The majority of the participants were categorized in high diet quality (96.0%) with the frequency of the women was higher than men (women= 91, men =29) while another 4.0% of the participants categorized in poor diet quality category with frequency men (women= 2, men =3) was higher than women.

The finding of this study was consistent with the previous local study conducted among adolescents. Rezali et al. (2015) revealed that males had poorer diet quality than females. This study is also consistent with a study conducted in 2019 by Kang et al which revealed that women tend to have better diet quality than men. However, the finding on adult in low-income families in this study showed a contradicted finding compared to the previous study conducted among low-income families, indigenous people *Mah-Meri* women in Malaysia. The previous study reported that the diet quality among the *Mah-Meri* women was poor. However, in this present study, the diet quality status for adults in low-income families was high (96%). The contradicted finding from a previous study may be due to the educational level of the participants where majority of them were in tertiary education which enabled them to be more aware of the nutrition knowledge and apply it in their daily lives.

Table 4.8: Distribution of participants according to diet quality score by food groups (n = 125)

Category	n (%)	Mean ± SD
Food group		
Cereals, cereal products, and tubers		2.77 ± 1.42
Daily (4 to 8 servings†)	36(26.1)	
Daily (> recommended serving)	6(4.3)	
Daily (< recommended serving)	51(37.0)	
2 to 6 times per week	23(16.7)	
Once per week	5(3.6)	
Rarely/Never	4(2.9)	
Wholegrain cereals		
Daily (≥½ of recommended serving)	18(13.0)	3.07 ± 1.49
Daily (<½ of recommended serving or exceeding recommended serving)	34(24.6)	
2 to 6 times per week	30(21.7)	
Once per week	17(12.3)	
1 to 3 times per month	16(11.6)	
Rarely/Never	10(7.2)	
Fruits		
Daily (≥2 servings)	19(13.8)	2.78 ± 1.18
Daily (< 2 servings)	30(21.7)	
2 to 6 times per week	49(35.5)	
Once per week	17(12.3)	
1 to 3 times per month	7(5.1)	
Rarely/Never	3(2.2)	
Vegetables		
Daily (≥3 servings)	38(27.5)	2.03 ± 0.96
Daily (< 3 servings)	58(42.0)	
2 to 6 times per week	19(13.8)	

Table 4.8 (cont.)

Category	n (%)	Mean ± SD
Once per week	8(5.8)	
1 to 3 times per month	1(0.7)	
Rarely/Never	1(0.7)	
Milk and dairy products		
Daily (1 to 3 servings†)	19(13.8)	4.19 ± 1.86
Daily (> recommended serving)	1(0.7)	
Daily (< recommended serving)	19(13.8)	
2 to 6 times per week	34(24.6)	
Once per week	21(15.2)	
1 to 3 times per month	12(8.7)	
Rarely/Never	19(13.8)	
Legumes and their products		
Daily (½ to 1 serving†)	8(5.8)	4.59 ± 1.60
Daily (> recommended serving)	8(5.8)	
Daily (< recommended serving)	7(5.1)	
2 to 6 times per week	31(22.5)	
Once per week	35(25.4)	
1 to 3 times per month	22(15.9)	
Rarely/Never	14(10.1)	
Fish		
Daily (1 serving)	12(8.7)	4.31 ± 1.49
Daily (< 1 serving)	8(5.8)	
2 to 6 times per week	57(41.3)	
Once per week	22(15.9)	
1 to 3 times per month	17(12.3)	
Rarely/Never	9(6.5)	
Poultry, meat, egg		
Daily (½ to 2 servings†)		
Daily (> recommended serving)	40(29.0)	2.68± 1.44
Daily (< recommended serving)	20(14.5)	

2 to 6 times per week	16(11.6)	
Once per week	41(29.7)	

Table 4.8 (cont.)

Category	n (%)	Mean ± SD
1 to 3 times per month	5(3.6)	
Rarely/Never	3(2.2)	
High fat protein foods		
More than once daily	6(4.3)	
Once daily	8(5.8)	4.22 ± 1.41
2 to 6 times per week	25(18.1)	
Once per week	26(18.8)	
1 to 3 times per month	33(23.9)	
Rarely/Never	27(19.6)	
Fat-rich foods		
More than once daily	1(0.7)	
Once daily	11(8.0)	4.21 ± 1.25
2 to 6 times per week	28(20.3)	
Once per week	25(18.1)	
1 to 3 times per month	41(29.7)	
Rarely/Never	19(13.8)	
Salt-fish foods		
More than once daily	9(6.5)	
Once daily	21(15.2)	3.59 ± 1.45
2 to 6 times per week	35(25.4)	
Once per week	22(15.9)	
1 to 3 times per month	23(16.7)	
Rarely/Never	15(10.9)	
Sugar-rich foods		
More than once daily	7(5.1)	
Once daily	12(8.7)	3.89 ± 1.38
2 to 6 times per week	30(21.7)	
Once per week	33(23.9)	

1 to 3 times per month	25(18.1)
Rarely/Never	18(13.0)

4.9: Distribution of participants according to diet quality status (n = 125)

Diet quality status	**n (%)**			**Mean ± SD**
	men	women	Total	
Low poor diet	3(9.4)	2(2.2)	5 (4.0)	
High diet quality	29(90.6)	91(97.8)	120 (96.0)	
Vegetables				2.03 ± 0.96
Fruits				2.78 ± 1.18
Fat-rich foods				4.21 ± 1.25

[1.] Classification based on summary diet quality score for Dwelling Older Adult (Amin et al., 2020).

4.10: Distribution of participant according to the mean of diet quality score (n = 125)

variable	**Mean ± SD**		
	men	women	total
Diet quality score	41.16 ± 7.78	42.74 ± 7.47	42.34 ± 7.55

4.8 Association between sociodemographic with diet quality

Table 4.11: Association between socio-demographic characteristics with diet quality status of participants.

Socio-demographic characteristics	**Diet quality**		x^2	*p*
	High risk of poor diet quality (n%)	Low risk of poor diet quality (n%)		
Sex			0.106	0.106
Male	3 (60.0)	29 (24.2)		
Female	2 (40.0)	91 (72.8)		
Ethnicity			1.00	0.502
Malay	1 (20.0)	38 (31.7)		

Chinese / Indian / Others	4 (80.0)	82 (68.3)

Table 4.11 (cont.)

Socio-demographic characteristics	Diet quality		x^2	*p*
	High risk of poor diet quality (n%)	Low risk of poor diet quality (n%)		
Educational level			0.402	0.402
Primary/Secondary	1 (20)	11 (9.2)		
Tertiary	4 (80)	109 (90.8)		
Marital status			0.205	0.205
Single / widowed /divorced	1 (50)	82 (90.1)		
Married	1 (50)	9 (9.9)		

*Significant at p-value<0.05 level (2 tailed)

Table 4.12: Correlation between age and monthly household income with diet quality score of participants. (n=125)

Variables	**Diet Quality Scores**	
	r-value	p-value
Age	-0.069	0.445
Monthly household income	0.005	0.958

*Significant at p-value<0.05 level (2 tailed)

Table 4.11 shows the distribution of diet quality status of the participants by sociodemographic characteristics. According to the findings, all the sociodemographic characteristics were not significantly associated with diet quality status of participants. It was reported that sex has no significant association with diet quality (x^2 = 0.106,

p>0.05) which shows that women had high frequency for both status of diet quality. Previous studies also proved that sex had no significant difference with status of diet quality index (Nohan et al., 2020; Abbasi et al, 2019). Even the current study has consistent data with the previous study, but the current study showed an insignificant result. Some possible reason might relate to the aspect of food sources as previous study revealed that there was no association related with the gender in diet quality index score of all food purchased by sources of purchase (store, fast food, restaurant, and others) (Crane et al., 2019).

Besides, it was reported that ethnicity has no significant association with diet quality (x^2 = 1.00, p>0.05). This finding was inconsistent with a previous study conducted by Rezali et al. (2020) which reported that ethnicity was positively correlated with diet quality. The insignificance might be due to the proportions of Malay which was much higher than non-Malays (Chinese, Indians, and others). In addition, another probable explanation because ethnicity is a constantly developing notion, making comparing groups or tracking the same group through time difficult. Although ethnic groups might have a variety of phenotypic characteristics due to their shared heritage, the phrase is usually used to emphasise cultural and social traits rather than biological ones (Sonia et al., 2008).

Besides, there was no significant association between education level (x^2 = 0.402, p>0.05) of the participants. This study's finding contradicted the previous studies where there was an association between educational level and diet quality (Hazel et al., 2013; Silke et al., 2003, Nohan et al, 2020). Possible explanations for these findings are that

higher education is linked to a better understanding of the consequences of an unhealthy diet and that higher education is often linked to higher income and a greater ability to purchase healthy foods (Freitas et al., 2018)

Also, there was no significant association between marital status and diet quality status of participants (x^2=0.205, p>0.05). Previous study also proved that marital status had no significant difference with the status of diet quality index especially in women (Vinther et al., 2016). However, this finding contradicted the the findings from a previous study conducted in 2005 which revealed that adverse diet was associated with separation and divorce (Lee et al., 2005) and increase healthy dietary behavior after remarriage (Eng et al., 2005) as this might be due to a profound grief reaction and its impact on self-care, self-feeding, and appetite may explain changes in food intake among widowed women (Shahar et al., 2001). The insignificant result might also be due to the proportion of the single status being so much higher than the married status that might cause the result to be unstable.

Besides, there was no significant correlation between household income and diet quality (r= 0.005, p>0.05). This study's finding contradicted previous studies where there were associations between household income and the diet quality (Drewnowski et al., 2016; McCabe-Sellers et al., 2007; Ramadas et al., 2021; Nohan et al., 2020; Chong et al., 2019). Some possible reason might be the connections between household income and diet quality may vary among families. For example, one family's financial management and way of life may differ from the other family with the same income (Abrar et al., 2018).

Besides, age also showed a non-significant correlation with diet quality index score among adult (r = -0.069, p>0.05). Based on Spearman Correlation test, the higher the age of participants, the lower the diet quality index score. The finding contradicted a previous study with an association between age and diet quality index score (Silke et al., 2003; Nohan et al., 2020; Rezali et al., 2015). These findings on the present study might be due to the different sample characteristics and methodologies.

4.9 Association between physical activity with diet quality

Table 4.13: Association between category of physical activity and diet quality status of participants.

Variables	Diet Quality status		x^2	*P*
	High risk of poor diet quality n (%)	Low risk of poor diet quality n (%)		
			1.000	0.475
Does not meet recommendations	0 (0.0)	17 (14.2)		
Meet recommendations	5 (100.0)	103 (85.8)		

*Correlation is significant at the p<0.05 level (2-tailed)

According to Table 4.13, physical activity was not significantly associated with the diet quality of the participants (x^2=1.000, p>0.05). Based on the Fisher Exact test,

it was found that participants categorized into high diet quality were mostly among the participants who meet the recommendation of physical activity compared to the participants who do not meet the recommendation of physical activity by WHO.

This study shows that meeting the recommendation of physical activity among participants will have high diet quality status. However, in this present study, the association between physical activity and diet quality status of the participants was not significant. The result from this study has a contradicted finding compared to the previous studies where there was a significant difference in physical activity according to the diet quality (Xu et al., 2018; Silke et al., 2003). This different finding in this study might be due to the small sample size used in this study compared to the previous study

4.10 Association between dietary behavior and diet quality

Table 4.14: Association between dietary behavior and diet quality status of the participants.

Variables	**Diet quality**		x^2	*P*
	High risk poor diet quality n (%)	Low risk poor diet quality n (%)		
Skipping breakfast			0.388	0.279
Yes	1(20.0)	53(44.2)		
No	4(80.0)	67(55.8)		
Snacking				
Yes	3(60.0)	11(9.2)	0.010	*0.01
No	2(40.0)	109(90.8)		

*Significant at p-value<0.05 level (2 tailed)

Table 4.14 shows the distribution of diet quality of adult by dietary behavior. According to the findings, there was no significant association between skipping breakfast with diet quality among adult in low-income families ($x^2 = 0.499$, $p>0.05$). Based on the Fisher Exact test, about half of the participants (55.8%) skipping breakfast had high diet quality status. This finding contradicted to previous study conducted in United States, America as the findings reported that those participants who were skipping breakfast had poor overall diet quality Ramsay et al., (2018). The findings of this study were differentbecause the participants might not having enough intake of all food groups recommendations per day within the meals of dinner and lunch.

Besides, it was shown that there was a significant difference between snacking with diet quality status among adult in low-income families ($x^2 = 0.010$, $p>0.05$). Previous studies have supported this finding among adults that were participating National Health and Nutrition Examination Survey (NHANES) 2001-2008 were found that several snacking practises were linked to improved diet quality than individuals who did not snack (O'Neil et al., 2014; Abdullah et al., 2016). This similarity of the findings might be due to healthy snacking intake were practiced among the participants

4.11 Association between smoking behavior and diet quality

Table 4.15: Association between category of smoking behavior and diet quality status of participants.

Variables	Diet quality		x^2	*p*
	High risk poor diet quality n (%)	Low risk poor diet quality n (%)		
			1.000	0.848
Current/ Former smoker	0 (0)	4 (3.3)		
Non-smoker	5 (100.0)	116 (96.7)		

*Significant at p-value<0.05 level (2 tailed)

The distribution of diet quality of the participants by smoking behavior was shown in table 4.15. According to the finding, smoking behavior was not significantly associated with diet quality status ($x^2 = 1.000$, $p>0.05$). Based on the Fisher Exact test, it was found that participants who were categorized in high diet quality status were higher among non-smoker participants compared to the participants who were in current/ former smoker status.

This study showed that being a non-smoker adult will have a high diet quality status. However, in this present study, the association between smoking behavior and diet quality status was not significant. The result from this study have contradicted findings from the previous studies where there was a significant association was found between smoking status and diet quality which is the former smokers had higher diet quality food (Andrade et al., 2016) while diet quality of heavy smokers was significantly lower than those who had never smoked Alierwu et al., (2019). The result

of the present study might be because of the increasing awareness among the smokers' and non-smokers' nutrition knowledge as majority of the participants were in tertiary level of education. This is due to the increase in educational level will increase the nutrition knowledge and also increase diet quality status (Akkartal et al., 2020).

4.12 Association of Energy Intake with Diet Quality

Table 4.16: Correlation between energy intake and mean diet quality scores of participants

Variables	r-value	p-value
mean Energy (kcal) 2711± 2397	-0.227	*0.018

*Correlation is significant at the p<0.05 level (2-tailed)

Based on Table 4.16, shows the distribution of diet quality of the participants by energy intake of the participants. Based on the finding, there was a negative association between energy (r=-0.227, p<0.05) and diet quality among the participants inversely.

It was shown in this present study that lower intake of energy is related to low risk of poor diet quality status. However, a previous study reported that the overall energy consumption is positively related to the deficit index and for both males and females (Silke et. al., 2013). Besides, Jayedi et al., (2020) also revealed that a higher

irregularity score of daily energy intake was significantly associated with lower consumption of fruit, vegetables, legumes, low-fat dairy products, and poultry. Thus, the divergent findings with the current study might be due to the different methods used to assess energy intake while the source of energy may be the contributing factor negative correlation with diet quality.

4.13 Association of Body Mass Index with diet quality status

Table 4.17: Correlation of BMI with diet quality scores of participants.

Variables	r-value	p-value
BMI	0.129	0.153

*Correlation is significant at the p<0.05 level (2-tailed)

The increasing rates of obesity make it crucial to look at other potential causes, such as diet quality status beyond physical activity and energy intake. Based on Table 4.17, it was found that there was no significant association between BMI and diet quality status among adults in low-income families in Selangor.

The finding from this present study has almost the same finding with previous studies (Nohan et al., 2020; Ramadas et al., 2021. It was also consistent with a previous study conducted among adults in Australia which revealed that overall score of Mexican diet quality index was not correlated with the BMI between men and women (Lopez et al., 2019). These similar findings might be due to BMI not giving a

really accurate result to analyse the diet quality index because BMI was only involving the weight and height of the individuals which is unable to analyse the body composition of individuals such as muscle, water, and fat. In summary, even if participants were in normal category of body weight status, it might have the possibility that the participants were taking too much saturated fat in their meal which just gives a little bit of weight changes for the BMI assessment. In addition, weight for fat is lighter than muscle weight.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Maintaining a diet quality has proven to improve overall health status and avoid non-communicable disease. Based on the data by the National Health Morbidity Survey (NHMS) 2015, the prevalence of obesity among adults was higher among urban residents (17.7%) than in rural residents (17.5%), with a national prevalence of 17.7%. Apart from that, based on the data by National Health Morbidity Survey (NHMS) 2019 the prevalence of obesity among urban residents at adult age was 12.1%, which was higher than in rural residents (11.2%) with the national prevalence of 11.9%. Based on this study, the diet quality status was 96% of the participants are at the lower risk of poor diet quality. This showed that the diet quality status was increasing among adult in low-income families. As we know that, body weight status can be related with diet quality of the individuals, as we can observe that the prevalence of obese number among adult were decreasing compared to the prevalence of the previous year. There could be various factors contributing to the diet quality status among young adults, especially in low-income families setting. Realizing the fact that did not only it gives a negative impact on health, but it could also be worse and cause mortality, this study was conducted to determine the association of the factors, which were sociodemography,

dietary behaviour, smoking behavior, physical activity, energy intake and body weight status with diet quality assessment among adult in low-income families in Selangor.

A total of 125 adults have participated in this study that comprises of 25.6% of males and 74.4% of females with a mean age of 28.88 ± 8.79years. Since this study was conducted in low-income families in Selangor, all of the participants were categorized as B40 based on the report of Household Income and Basic Amenities Survey 2016 from Department of Statistics Malaysia (DOSM). We could see from the finding that majority of the participants were categorized as non-smoker (96.8%) and 2.4% were categorized as current smoker while the other 1% were categorized as former smoking. Apart from that, the majority of the adults had adequate and excessive energy intake per day as the means of the participants' energy intake. Besides, one-third of the adults (32.8%) were skipping breakfast while about half (51.2%) of the participant practicing snacking between each meal per day. Meanwhile, majority of the adults were classified as does not meeting recommendations of physical activity per week (84.8%) while the rest of them were classified as meet the recommendation of physical activities by WHO. Apart from that, majority of the adult (96.0%) were categorized as low risk of poor diet quality. Meanwhile, the majority of the adults were categorized in normal BMI.

The snacking behavior and energy intake were significantly associated with diet quality status among adult in Selangor. Hence, holistic observations should be done to the factors that may be associated with diet quality status, especially among adult in low-income families.

5.2 Limitations

This study assessed the factors were associated with diet quality status among adults in low-income families, Selangor. This is an important advantage in this study in which the study only recruited adults from the same characteristics of B40 household income. However, there are some limitations which need to be acknowledged in this study.

Firstly, this study is a cross-sectional study where the causal relationship between the independent variable and dependent variable could not be established. This is because this type of study was to assess the frequency, distribution, and burden of health needs of a population for one point of time. As this is a cross-sectional study, this study could not determine whether the exposure (factors) or the outcome came first, and cross-sectional study can only measure the prevalent rather than incident cases. Hence, the associations could be difficult to be interpreted by the researcher. Besides, cross-sectional study was more susceptible to biases such as recall bias. This could also lead to under-reporting or over-reporting findings.

Next, due to the global issues of pandemic covid-19 and the researchers are not allowed to collect the data face to face so this study used an online data collection which is online questionnaire. As this is an online questionnaire, so it is quite hard for researcher to reach the participants. This is because some of the participants are not having strong enough connection. Some of them also do not have any connection of

internet to reach the link of the questionnaire given by the researcher. In addition, due to the online data collection, it is hard for some participants to answer the questionnaire completely. They lacked view on how to imagine the size of portion food in the food frequency questionnaire.

Lastly, the participants were recruited from one geographic area, which this study only involved adults among low-income families from Selangor. The results only represented adults in Selangor area; hence it may not represent adults from other areas. Besides, the small sample size and recruited participants from one area will give a less conclusive result and could not be conclusive to other populations. Thus, future research is encouraged to include a larger sample size that covers various geographical areas and diverse backgrounds.

5.3 Recommendations

Despite the limitations of this study that have been discussed earlier, some recommendation should be considered to improve the study. The present findings may be influenced by confounding variables such as socio-demographic characteristics when assessing the factors associated with the diet quality among adults in low-income families. In order to control the confounding variables, statistical analysis such as multivariate models may be considered to assess the association between the independent variable and dependent variable while controlling the potential

confounders. Thus, the regressions may identify the factors that may influence the diet quality status among the study population.

Besides, a longitudinal study is recommended to be done by future researchers by conducting observations for the same participant over a period of time. By this, development, or changes in the characteristics of the participant can be detected and could establish sequences of events. Furthermore, this longitudinal study can also be retrospective or prospective, which means that the researcher can look back in time or collecting new data to observe the factors that may associate with the health status of the participants.

Next, due to the using of online questionnaire, the researcher and the participants need to have a great communication and keep in contact to make sure that all the data collection were completely answered and acceptable to be used. Besides, instead of sharing the link online questionnaire to the participants, the researcher can also provide some incentives for the participants to attract them to be involved in the study. In addition, due to the use of online questionnaire, the researcher needs to improve the IT skills and be more creative to make the questionnaire not too bored and too hard to be understood.

Lastly, future intervention such as health awareness and promotion should focus more on promoting health among low-income communities. This will provide additional knowledge to these communities on health issues to improve their well-

being. Besides, holistic cooperation should be done by the government from different ministries to overcome the health issues that were happening among the low-income community in Malaysia, especially in the urban area. Cooperation from different ministries may help these groups overcome the health issues affecting their quality of life and well-being.

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APPENDIX A (APPROVAL LETTER FROM JKEUPM)

Ref. no: UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM)
Date: 6 April 2021

Dear Prof./Dr./Mr./Ms.,

APPLICATION FOR JKEUPM ETHICAL CLEARANCE: APPROVED

With reference to the above, I am pleased to inform you that your application for ethical clearance for the research project entitled **'Factors Associated with Diet Quality Assessment among Adults in Low Income Families in Selangor, Malaysia'** has been approved.

Please note that the official letter of approval will be issued as soon as possible. However, the ethical clearance is considered effective from the date of this email, and you may now proceed with your research.

Kindly remind the ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

Researchers should also complete a Study Final Report upon study completion. The form can be obtained from the Ethics Committee for Research Involving Human Subjects (JKEUPM) website (http://www.tncpi.upm.edu.my/faildokumen).

If you have any enquiries, please contact Ms. Nurulhasanah Ishak (03-97691605) or Ms. Nor Ellia Abd Ajis (03-97691244).

Note: Please use this reference number for any transaction:- **JKEUPM-2020-522**

Thank you.

Yours faithfully,

Prof. Dr. Zamberi Sekawi
Chair
Ethics Committee for Research Involving Human Subjects
Universiti Putra Malaysia

APPENDIX B
INFORMATION SHEETS AND CONSENT FORM FOR PARTICIPANTS

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG, SELANGOR, MALAYSIA

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE

Factors associated with diet quality assessment among adults in low-income families in Selangor, Malaysia

2. INTRODUCTION:

Diet quality is one of the parameters and a validated instrument able to categorize subjects to either having good dietary intake or poor dietary intake in their daily life. It can be measured by identifying the adequate nutrients intake based on the recommended intake, as stated in the Malaysian Dietary Guidelines. Parameters such as macronutrient distribution and a balance between the food groups are assessed through this diet quality instrument. Besides, diet quality also helps in the prevention of any diet- related diseases. There is a study which suggested that diet quality is associated with quality of life; better quality diets can reflect a better quality of life. The prevalence of overweight and obesity was increasing among adults. Besides, poor diet quality may lead to diet-related disease. Therefore, this study aims to identify the factors associated with diet quality among adults, specifically in low-income families in Selangor, Malaysia

This study is part of the graduation requirement for Bachelor of Science (Nutrition and Community Health) from the Faculty of Medicine and Health Sciences, UPM is expected to be completed within one year of study. A total of 200 adults from low-income families will participate in this study.

3. WHAT WILL YOU HAVE TO DO?

You are required to answer a set of questionnaires including information on sociodemographic characteristics, behavioral factor, energy intake, anthropometric and diet quality.

This questionnaire will take approximately 30 minutes to be completed. You have the right to withdraw from this study anytime without giving any reasons and no penalty will be applied upon your withdrawal. Kindly informed that there is no incentive provided to the participants involved in this study**.**

1. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Adults with physical inability (limitation on physical functioning and mobility).

2. WHAT WILL BE THE BENEFITS OF THE STUDY?

(a) TO YOU AS THE SUBJECT?

Enhancing the knowledge of body weight status, diet quality, physical activity status, dietary behavior, and energy intake.

(b) TO THE INVESTIGATOR?

Findings of this study will provide information on factors associated with diet quality assessment among adult in low-income families. Findings of this study also will help nutritionists and health promotion planners to develop appropriate intervention and health promotion programs in improving nutritional and health status of adult population.

3. WHAT ARE THE POSSIBLE RISKS?

This study has minimal risk as it is conducted through online and the information needed for this study are participant's sociodemographic characteristics, behavioral factor, energy intake, anthropometric measurement, and diet quality.

4. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

All information provided will be remained confidential and used for academic purposes only. Researchers will not disclose your name or any personal information to third parties. No individual description will be made on any parts of the study or publication.

5. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

If you have any enquiries, you can contact as follows:

Researcher:	Supervisor:
Nurul Aida Syafiqah Binti Mohd Ghalil	Prof. Dr. Rosita Jamaluddin
018-2021812	603-9769 2467
aidamohdghalil@gmail.com	rositaj@upm.edu.my

APPENDIX C
QUESTIONNAIRE

No. Rujukan : ☐☐☐

FACULTY OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF NUTRITION

QUESTIONNAIRE

"CONFIDENTIAL"

RESEARCH TITLE:

FACTORS ASSOCIATED WITH DIET QUALITY ASSESSMENT AMONG ADULTS IN LOW INCOME FAMILIES IN SELANGOR, MALAYSIA

FAKTOR YANG MEMPENGARUHI PENILAIAN KUALITI DIET DALAM KALANGAN ORANG DEWASA YANG BERPENDAPATAN RENDAH DI SELANGOR, MALAYSIA.

Researcher / Penyelidik : Nurul Aida Syafiqah Binti Mohd Ghalil (192162)

Supervisor / Penyelia : Prof. Dr. Rosita Binti Jamaluddin

Date/ Tarikh : / / 20__

Instruction: Questions in this questionnaire are for academic purposes only. All information collected is secured. Your involvement and cooperation are greatly appreciated.

Arahan: Soalan dalam soal selidik ini adalah untuk tujuan akademik sahaja.Semua maklumat yang dikumpul adalah selamat. Penglibatan dan kerjasama anda amat dihargai.

Name / *Nama*:

No. phone / No. telefon:

SECTION A / *BAHAGIAN A*

Fill in the blank or tick (√) in the space provided below. / Isikan tempat kosong atau tandakan (√) di ruang yang disediakan di bawah.

No	Information / *informasi*	Choices / *pilihan*
1.	Date of birth / *tarikh lahir*	___ / ___ / _____ (dd/mm/yyyy)
2.	Sex / *jantina*	[ ] Male / *lelaki* [ ] Female / *perempuan*
3.	Ethnicity / *bangsa*	[ ] Malay / *melayu* [ ] Chinese / *cina* [ ] Indian / *india* [ ] Others / *lain-lain* : ……
4.	Educational level *tahap pendidikan*	[ ] Primary Level / *Pendidikan rendah* [ ] Secondary Level / *Pendidikan tinggi* [ ] Bachelor's Degree / *Ijazah bacelor* [ ] Master's Degree / *Ijazah master* [ ] Others / *lain-lain* : ……
5.	Marital status / *status perkahwinan*	[ ] Single / *bujang* [ ] Married / *berkahwin* [ ] Widowed / *balu* [ ] Divorced / *bercerai*
6.	Smoking *Merokok*	[ ] current smoker (≥100 cigarette in lifetime and had smoked in the last one month) / *merokok (≥100 rokok seumur hidup dan telah merokok dalam sebulan yang lalu)* [ ] former smoker (≥100 cigarette in lifetime and had no smoked in the last one month) / *bekas perokok (≥100 rokok seumur hidup dan tidak merokok dalam sebulan yang lalu)* non-smoker (<100 cigarette in lifetime) / bukan perokok *(<100 rokok dalam seumur hidup)*

7.	Monthly household income / *pendapatan bulanan isi rumah*	[ ] less than RM2500 / *kurang daripada RM2500* [ ] RM2501 - RM3170 [ ] RM3171 - RM3970 [ ] RM 3971 - RM4850

SECTION B / *BAHAGIAN B*

The following questions are about your dietary behavior. Please choose one of the choices and circle it. / *Soalan berikut adalah mengenai tingkah laku pemakanan anda. Sila pilih salah satu pilihan dan bulatkan pada skala.*

1 **= Everyday / *setiap hari***
2 **= 4–6 days a week / *4-6 hari seminggu***
3 **= 2–3 days a week / *2-3 hari seminggu***
4 **= Once a week / *sekali seminggu***
5 **= 1–3 times a / *1-3 kali seminggu***
6 **= Never/less than once a month / *kurang dari sekali seminggu***

No	Statements / *Penyataan*	Scales / *Skala*
1a	How frequent do you consume **breakfast**? / *Berapa kerap anda mengambil **sarapan pagi**?*	1 2 3 4 5 6
1b	How frequent do you consume **morning tea**? / *Berapa kerap anda mengambil **minum pagi**?*	1 2 3 4 5 6
1c	How frequent do you consume **lunch**? / *Berapa kerap anda mengambil **makan tengahari**?*	1 2 3 4 5 6
1d	How frequent do you consume **afternoon tea**? / *Berapa kerap anda mengambil **minum petang**?*	1 2 3 4 5 6
1e	How frequent do you consume **dinner**? / *Berapa kerap anda mengambil **makan malam**?*	1 2 3 4 5 6
1f	How frequent do you consume **supper**? / *Berapa kerap anda mengambil **minum malam**?*	1 2 3 4 5 6
2	Please list out **3 types of foods or beverages** that you usually take in between of main meals (snacks, e.g. tea, milk, *kuih*, ais cream, fruits, *pisang goreng* etc.) and its **frequency** of consumption. / *Sila senaraikan **3 jenis makanan atau minuman** yang kebiasaan anda ambil di antara makanan utama (snek, contohnya.teh, susu, kuih, ais krim, buah-buahan, pisang goreng dan lain-lain) dan **kekerapan** penggunaannya.*	
	i.	1 2 3 4 5 6
	ii.	1 2 3 4 5 6
	iii.	1 2 3 4 5 6

3	How frequent do you eat at hawker centers, coffee shops or other food stalls? / *Berapa kerap anda makan di pusat penjaja, kedai kopi atau gerai makanan lain?*	1	2	3	4	5	6
4	How frequent do you eat at western fast-food restaurants (e.g. KFC, McDonald's, Pizza Hut etc.)? / *Berapa kerap anda makan di restoran makanan segera barat (cth.KFC, McDonald's, Pizza Hut dan lain-lain)?*	1	2	3	4	5	6
5	How frequent do you buy/take-away food from western fast-food restaurants (e.g. KFC, McDonald's, Pizza Hut etc.)? / *Berapa kerap anda membeli /mengambil makanan dari restoran makanan segera barat (cth.KFC, McDonald's, Pizza Hut dan lain-lain)?*	1	2	3	4	5	6

SECTION C / *BAHAGIAN C*

Physical Activity / *Fizikal Aktiviti*

In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate. /
Dalam menjawab soalan-soalan berikut 'aktiviti berintensiti bersungguh-sungguh' adalah aktiviti yang memerlukan usaha fizikal yang keras dan menyebabkan peningkatan besar dalam pernafasan atau kadar jantung, 'aktiviti berintensiti sederhana' adalah aktiviti yang memerlukan usaha fizikal yang sederhana dan menyebabkan peningkatan kecil dalam pernafasan atau kadar jantung.

	Questions / *Soalan*	**Response / *Respon***
Activity at work / Aktiviti Fizikal Berkaitan Pekerjaan		
1	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like *[carrying or lifting heavy loads, digging or construction work*] for at least 10 minutes continuously? / *Adakah pekerjaan anda melibatkan aktiviti kerja berat yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung seperti, membawa atau mangangkat barang yang berat, menggali, atau melakukan kerja pembinaan sekurang-kurangnya 10 minit secara berterusan?*	Yes 1 Ya 1 2 *If No, go to No. 4* *No* *2 Jika 'Tidak', sila ke P4* *Tidak*
2	In a typical week, on how many days do you do vigorous-intensity activities as part of your work? / *Biasanya dalam seminggu, berapa harikah anda melakukan kerja-kerja berat dalam pekerjaan anda?*	Number of days Bilangan hari └┘
3	How much time do you spend doing vigorousintensity activities at work on a typical day? / *Pada hari biasa yang anda lakukan kerja berat, berapa lamakah anda melakukannya?*	└┘└┘ : └┘└┘ Hours : minutes Hrs mins Jam : minit jam minit

4	Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking *[or carrying light loads*] for at least 10 minutes continuously? / *Adakah pekerjaan anda melibatkan aktiviti kerja sederhana yang mengakibatkan peningkatan yang sedikit dalam kadar pernafasan ataupun denyutan jantung seperti berjalan pantas, membawa barang yang ringan sekurang-kurangnya 10 minit secara berterusan?*	Yes 1 Ya 1 *No* 2 *If No, go to No. 7* *Tidak 2 Jika 'Tidak', sila ke no. 7*
5	In a typical week, on how many days do you do moderate-intensity activities as part of your work? / *Biasanya dalam seminggu, berapa harikah anda melakukan kerja-kerja sederhana dalam pekerjaan anda?*	Number of days Bilangan hari └─┘

6	How much time do you spend doing moderateintensity activities at work on a typical day? / Pada hari biasa yang anda lakukan kerja sederhana, berapa lamakah anda melakukannya?	Hours : minutes Jam : minit └─┘└─┘ : └─┘└─┘ Hrs jam mins minit
Travel to and from places / *Aktiviti Fizikal Berkaitan lanan Perja*		
The next questions exclude the physical activities at work tha you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship. / *Soalan-soalan seterusnya **TIDAK** termasuk aktiviti fizikal se asa bekerja yang telah anda nyatakan.* *Sekarang, saya ingin bertanya mengenai kaedah yang biasa anda gunakan untuk bergerak dari satu tempat ke tempat yang lain (seperti ke tempat kerja, pasar, membeli-belah, masjid, dan se againya).*		
7	Do you walk or use a bicycle (*pedal cycle*) for at least 10 minutes continuously to get to and from places? / *Adakah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke, dan dari sesuatu tempat?*	Yes 1 Ya 1 *No* 2 *If No, go to No. 10* *Tidak 2 Jika 'Tidak', sila ke no. 10*
8	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places? / *Dalam satu minggu yang biasa, berapa harikah anda berjalan atau berbasikal secara berterusan sekurang-kurangnya 10 minit untuk menuju ke, dan dari sesuatu tempat?*	Number of days Bilangan hari └─┘
9	How much time do you spend walking or bicycling for travel on a typical day?/ *Dalam satu hari yang biasa, berapa lamakah anda berjalan atau berbasikal untuk bergerak dari satu tempat ke tempat yang lain?*	Hours : minutes Jam : minit └─┘└─┘ : └─┘└─┘ Hrs jam mins minit
Recreational activities / *Aktiviti Fizikal Pada Waktu Lapa g*		
The next questions exclude the work and transport activities that you have alrea ly mentioned. Now I would like to ask you about sports, fitness and recreati onal activities (leisu e), [insert relevant terms]. / *Soalan-soalan seterusnya **TIDAK** termasuk aktiviti semasa b ekerja dan semasa perjalanan yang telah anda*		

nyatakan. Sekarang, saya ingin bertanya tentang aktiviti yang anda lakukan untuk rekreasi, kecergasan, dan sukan.		
10	Do you do any vigorous-intensity sports, fitness or recreational (*leisure*) activities that cause large increases in breathing or heart rate like [*running or football,]* for at least 10 minutes continuously? / *Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang lasak yang mengakibatkan peningkatan yang banyak dalam kadar pernafasan ataupun denyutan jantung, seperti berlari atau bermain bola sepak, sekurangkurangnya 10 minit secara berterusan?*	Yes 1 Ya 1 2 *If No, go to No. 13* *No* *Tidak* *2 Jika 'Tidak', sila ke no. 13*
11	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (*leisure*) activities? / Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?	Number of days Bilangan hari └─┘
12	How much time do you spend doing vigorousintensity sports, fitness or recreational activities on a typical day? / Dalam satu hari yang biasa, berapa lamakah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang lasak?	Hours : minutes Jam : minit └─┘└─┘ : └─┘└─┘ Hrs mins jam minit
13	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate such as brisk walking, cycling, swimming, volleyball for at least 10 minutes continuously? / Pada masa lapang, adakah anda melakukan aktiviti sukan, kecergasan atau riadah yang sederhana yang mengakibatkan peningkatan yang sedikit dalam kadar pernafasan ataupun denyutan jantung, seperti berjalan pantas, berbasikal, berenang, atau bermain bola tampar, sekurang-kurangnya 10 minit secara berterusan?	Yes Ya 1 1
		No 2 If No, go to No. 16 Tidak 2 Jika 'Tidak', sila ke no. 16
14	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities? / Biasanya dalam seminggu pada waktu lapang, berapa harikah anda melakukan aktiviti-aktiviti sukan, kecergasan atau riadah yang sederhana?	Number of days Bilangan hari └─┘
15	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day? / Dalam satu hari yang biasa, berapa lamakah anda melakukan aktivitiaktiviti sukan, kecergasan atau riadah yang sederhana?	Hours : minutes Jam : minit └─┘└─┘ : └─┘└─┘ Hrs mins jam minit
Sedentary behaviour		
The following question is about sitting or reclining at work, at ɔome, getting to an l from places, or with friends including time spent [sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or		

watching television], but do not include time spent sleeping. / *Soalan berikut adalah berkaitan dengan aktiviti duduk atau b* *aring/sandar di tempat kerja, di rumah, semasa dalam perjalanan, atau semasa bersama rakan- rakan. Contohnya,* *duduk menulis, mengguna komputer, duduk bersama rakan- rakan, perjalanan dalam kereta, bas, keretapi, duduk* *nembaca, bermain kad atau menonton televisyen,* ***TETAPI TIDAK TERMASUK*** *waktu tidur.*		
16	How much time do you usually spend sitting or reclining on a typical day? / *Dalam satu hari yang biasa, berapakah jumlah masa yang anda gunakan untuk duduk atau baring/bersandar?*	⌊_⌊_⌋ : ⌊_⌊_⌋ Hours : minutes Hrs mins Jam : minit jam minit

SECTION D / BAHAGIAN D

Instruction: In this section, you will be asked questions on whether you have eaten or not the type of foods listed. Write down numbers in the column how many times were consumed whether Daily, Weekly, or Monthly during the MCO. Please fill in the serving size for each time consumption. For example, if you consume a slice of papaya twice a week, please fill in '2' in the 'Weekly' column and '1' at the 'Total servings (each time eaten)' column.

Arahan: *Dalam bahagian ini, anda akan ditanya sama ada pernah atau tidak makan makanan yang tersenarai. Tuliskan angka dalam kolum bilangan kali diambil sama ada dalam Per Hari atau Per Minggu atau Per Bulan semasa PKP. (Pastikan hanya satu kolum sahaja yang diisi) Sila isikan jumlah sajian setiap kali makan. Contohnya, anda makan sekeping betik dua hari seminggu. Sila tuliskan '2' dalam kolum 'Per Minggu' dan '1' dalam kolum sajian setiap kali makan.*

No. ***Bil.***	**Type of Food** ***Jenis Makanan***	**How frequent each food was taken (Fill in one of the columns only)** ***Berapa kali kekerapan pengambilan dalam (Isikan dalam salah satu kolum sahaja)***			**Total servings (each time eaten)** ***Jumlah sajian (setiap kali makan)***
		Daily ***Sehari***	**Weekly** ***Seminggu***	**Monthly** ***Sebulan***	
Cereals and cereals products / *Bijirin dan hasil bijirin*					
1.	White rice / *Nasi putih*				___ cup / *cawan*
2.	Brown rice / *Nari beras perang*				___ cup / *cawan*
3.	Flavoured rice / *Nasi berperisa (Nasi briyani, nasi goreng, dsb)*				___ cup / *cawan*
4.	Rice porridge / *Bubur nasi*				___ cup / *cawan*
5.	Glutinous rice / *Pulut*				___ cup / *cawan*
6.	Noodles / *Mee kuning/Mee siput/Mee segera*				___ cup / *cawan*
7.	Mihun / Kueh teow / laksa / laksam / loh shi fun				___ cup / *cawan*
8.	Pasta				___ cup / *cawan*

9.	*Sagu / ambuyat / linut*				___ cup / *cawan*
10.	Bread / *Roti*				___ slices / *keping*
11.	Wholemeal bread / *Roti bijirin penuh*				___ slices / *keping*
12.	Bread bun / *Roti bun*				___ pieces/ *biji*
13.	*Roti canai (termasuk roti telur, roti sardine, roti bawang, roti pisang, murtabak)*				___ slices / *keping*
14.	*Capati*				___ slices / *keping*
15.	*Tosai*				___ slices / *keping*
16.	Breakfast cereals / *Bijirin sarapan pagi (Cornflakes, Koko Crunch, Honey star, dsb)*				___ cup / *cawan*
17.	Cereal grains prepared with water / *Bijirin tersedia perlu dibancuh (Nestum, quaker oats dsb.)*				___ cup / *cawan*
18.	Corn / *Jagung*				___ *tongkol*

No. ***Bil.***	**Type of Food** ***Jenis Makanan***	**How frequent each food was taken (Fill in one of the columns only)** ***Berapa kali kekerapan pengambilan dalam (Isikan dalam salah satu kolum sahaja)***			**Total servings (each time eaten)** ***Jumlah sajian (setiap kali makan)***
		Daily ***Sehari***	**Weekly** ***Seminggu***	**Monthly** ***Sebulan***	
Fast food / *Makanan segera*					
19.	Burger				___ pieces / *biji*
20.	Fried chicken / *Ayam goreng*				___ pieces / *ketul*
21.	Pizza				___ slices / *keping*
22.	French Fries / *Kentang goreng*				___ medium size / *hidang medium*
23.	Mashed potatoes / *Kentang Lenyek*				___ small container / *bekas kecil*
24.	Coleslaw				___ small container / *bekas kecil*
25.	Sausage / Hotdog / Frankfurter / *Sosej*				___ slices / *keping*
26.	Nugget				___ pieces / ketul
Meat and meat product / *Daging dan hasil daging*					
27.	Chicken / *Ayam*				___ pieces / *ketul*
28.	Quail / *Burung puyuh*				___ whole / *ekor*
29.	Duck / *Itik*				___ pieces / *ketul*
30.	Meat / *Lembu / kerbau*				___ matchbox size / *kotak mancis*
31.	Mutton / *Kambing*				___ matchbox size / *kotak mancis*
32.	Internal organs (liver, spleen, lungs) / *Organ Dalaman (Hati, Limpa, paru)*				___ matchbox size / *kotak mancis*
33.	Chicken/ meat ball / *Bebola ayam/daging*				___ pieces / *ketul*
Meat and meat product (For non-Muslim only) / *Daging dan hasil daging (Bagi peserta bukan Islam sahaja)*					
34.	Ham				___ slices / *keping*
35.	Bacon				___ slices / *keping*
36.	Luncheon meat				___ slices / *keping*
37.	Pork / B*abi*				___ matchbox size / *kotak mancis*
Fish and seafoods / *Ikan dan makanan laut*					
38.	Marine fish / *Ikan laut*				___ whole / *ekor*
39.	Freshwater fish / *Ikan air tawar*				___ whole / *ekor*

40.	Prawn / *Udang basah*				___ whole / *ekor*
41.	Squid / *Sotong basah*				___ whole / *ekor*
42.	Canned fish / *Ikan dalam tin*				___ whole / *ekor*
43.	Crab / *Ketam*				___ whole / *ekor*
44.	Anchovy / *Ikan bilis*				___ tablespoon / *sudu makan*
45.	Shellfish / *Kekerang (kerang, lala, remis, kupang, mentarang dsb.)*				___ tablespoon / *sudu makan*
46.	Snail / *Siput sedut (Belitung, siput buluh dsb.)*				___ tablespoon / *sudu makan*
47.	Pickled fish / *Ikan jeruk / pekasam*				___ pieces / *keping*
48.	Dried squid / *Sotong kering*				___ pieces / *keping*
49.	Fish/prawn/squid/crab crackers / *Keropok ikan/udang/sotong/ketam*				___ slices / *keping*
50.	Keropok lekor				___ slices / *keping*

No. ***Bil.***	**Type of Food** ***Jenis Makanan***	**How frequent each food was taken (Fill in one of the columns only)** ***Berapa kali kekerapan pengambilan dalam (Isikan dalam salah satu kolum sahaja)***			**Total servings (each time eaten)** ***Jumlah sajian (setiap kali makan)***
		Daily ***Sehari***	**Weekly** ***Seminggu***	**Monthly** ***Sebulan***	
Fish and seafoods / *Ikan dan makanan laut*					
51.	Fish/prawn/squid/crab ball or cake / *Bebola/kek ikan/udang/sotong/ketam*				___ pieces / *ketul*
52.	Dried fish / *Ikan kering*				___ whole / *ekor*
Eggs / *Telur*					
53.	Hen eggs (bulls eye, omelette, boiled, with chilies or herbs) / *Telur ayam (mata kerbau, telur dadar, telur rebus, telur masak sambal, telur pindang)*				___ pieces / *biji*
54.	Duck eggs (cooked with coconut milk gravy, omelette) / *Telur itik (masak lemak/gulai, telur dadar)*				___ whole / *biji*
55.	Quail eggs (boiled, with chilies) / *Telur puyuh (rebus, masak sambal)*				___ pieces / *biji*
56.	Salted egg / *Telur masin*				___ pieces / *biji*
Legumes and legumes product / *Kekacang dan hasilnya*					
57.	Legumes / *Kekacang (kacang hijau, kacang parang, kacang kuda, kacang merah dsb.)*				___ tablespoon / *sudu makan*
58.	Groundnuts / *Kacang tanah*				___ tablespoon / *sudu makan*
59.	Taufufa				___ tablespoon / *sudu makan*
60.	Tauhu				___ slices / *keping*
61.	Fermented soybeans / *tempe*				___ slices / *keping*
Milk and milk products / *Susu dan hasil tenusu*					
62.	Fresh milk / *Susu segar (yang tidak diproses)*				___ cup / *cawan*
63.	Commercial milk / *Susu komersial*				___ cup / *cawan*
64.	Yogurt/lassi/curd				___ cup / *cawan*
65.	Powdered milk / *Susu tepung*				___ tablespoon / *sudu makan*
66.	Evaporated milk / *Susu sejat/cair*				___ tablespoon / *sudu makan*

67.	Cheese / *Keju*				___ slices / *keping*
Vegetables / *Sayur-sayuran*					
68.	Leaf green vegetables / *Sayuran berdaun hijau (bayam, kangkong, kailan dsb.)*				___ tablespoon / *sudu makan*
69.	Ladies finger / *Bendi*				___ tablespoon / *sudu makan*
70.	Other type of legumes / *Sayuran kekacang lain (kacang panjang, kacang buncis, kacang botol dsb.)*				___ tablespoon / *sudu makan*
71.	Bean sprout / *Taugeh*				___ tablespoon / *sudu makan*
72.	Tubers (potatoes, sweet potatoes, yam) / *Sayuran berubi (kentang, keladi, keledek)*				___ tablespoon / *sudu makan*
73.	Cabbages / *Sayuran kobis (kobis bulat, brokoli, kobis cina, bunga kobis)*				___ tablespoon / *sudu makan*
74.	Chilies / *Cili*				___ tablespoon / *sudu makan*
75.	Tomatoes / *Tomato*				___ tablespoon / *sudu makan*

No. ***Bil.***	**Type of Food** ***Jenis Makanan***	**How frequent each food was taken (Fill in one of the columns only)** ***Berapa kali kekerapan pengambilan dalam (Isikan dalam salah satu kolum sahaja)***			**Total servings (each time eaten)** ***Jumlah sajian (setiap kali makan)***
		Daily ***Sehari***	**Weekly** ***Seminggu***	**Monthly** ***Sebulan***	
Vegetables / *Sayur-sayuran*					
76.	Brinjal / *Terung*				___ tablespoon / *sudu makan*
77.	Fruit vegetables (Luffa/pumpkin/cucumber/baby corn) / *Sayuran berbuah lain (Petola/labu/timun/putik jagung)*				___ tablespoon / *sudu makan*
78.	Salted or dried vegetables / *Sayuran masin/kering (pucuk soo hon dsb.)*				___ tablespoon / *sudu makan*
79.	Local fresh salads / *Ulam-ulaman*				___ tablespoon / *sudu makan*
80.	Mushrooms / *Cendawan basah*				___ tablespoon / *sudu makan*
81.	Dried mushrooms / *Cendawan kering*				___ tablespoon / *sudu makan*
Fruits / *Buah-buahan*					
82.	Papaya / *Betik*				___ slices / *potong*
83.	Mango / *Mangga*				___ slices / *potong*
84.	Pineapple / *Nanas*				___ slices / *potong*
85.	Watermelon / *Tembikai*				___ slices / *potong*
86.	Dragon fruit / *Buah naga*				___ slices / *potong*
87.	Honey dew / *Tembikai susu*				___ slices / *potong*
88.	Rock Melon				___ slices / *keping*
89.	Guava / *Jambu batu*				___ slices / *keping*
90.	Water apple / *Jambu air*				___ piece / *biji*
91.	Lime / *Limau*				___ piece / *biji*
92.	Banana / *Pisang (pisang segar, pisang goreng, pengat pisang, pisang salai dsb.)*				___ piece / *biji*
93.	Starfruit / *Belimbing*				___ piece / *biji*

94.	Apple / *Epal*				___ piece / *biji*
95.	Orange / *Oren/Mandarin*				___ piece / *biji*
96.	Pear / *Pir/Lai*				___ piece / *biji*
97.	Grape / *Anggur*				___ piece / *biji*
98.	Rambutan				___ piece / *biji*
99.	Longan / *Mata kucing segar*				___ piece / *biji*
100.	Lychee / *Laici segar*				___ piece / *biji*
101.	Mangosteen / *Manggis*				___ piece / *biji*
102.	Durian				___ piece / *ulas*
103.	Jackfruit / *Nangka/Cempedak*				___ piece / *ulas*
104.	Canned fruits / *Buahan dalam tin (laici, longan dsb.)*				___ tablespoon / *sudu makan*
105.	Dried fruits / *Buahan kering (kurma, prun, kismis dsb.)*				___ tablespoon / *sudu makan*
106.	Pickled fruits / *Buahan jeruk/acar*				___ tablespoon / *sudu makan*
107.	Young coconut / *Kelapa muda*				___ tablespoon / *sudu makan*

No. ***Bil.***	**Type of Food** ***Jenis Makanan***	**How frequent each food was taken (Fill in one of the columns only)** ***Berapa kali kekerapan pengambilan dalam (Isikan dalam salah satu kolum sahaja)***			**Total servings (each time eaten)** ***Jumlah sajian (setiap kali makan)***
		Daily ***Sehari***	**Weekly** ***Seminggu***	**Monthly** ***Sebulan***	
Drinks / ***Minuman***					
108.	Plain water / *Air kosong*				___ cup / *cawan*
109.	Tea / *Teh*				___ cup / *cawan*
110.	Coffee / *Kopi*				___ cup / *cawan*
111.	Chocolate drink / *Minuman bercoklat (van houten, cadbury dsb.)*				___ cup / *cawan*
112.	Malted drink / *Minuman bermalt (milo, horlick dsb.)*				___ cup / *cawan*
113.	Pre-mixed drinks / *Minuman Pra Campuran 2 in 1/3 in 1 dsb. (kecuali botani/herba)*				___ cup / *cawan*
114.	Ready-to-drink drinks / *Minuman Ready-todrink seperti air tin/air kotak (kecuali botani/herba)*				___ cup / *cawan*
115.	Cordial syrup / *Sirap cordial*				___ cup / *cawan*
116.	Fruit juice / *Jus buah-buahan*				___ cup / *cawan*
117.	Carbonated drinks (includes isotonic) / *Minuman bergas (termasuk isotonik)*				___ cup / *cawan*
118.	Soy milk / *Air kacang soya*				___ cup / *cawan*
119.	Herbal/botanical drinks (pre-mixed) / *Minuman botani/herba 2 in 1/3 in 1 dsb. (pra campuran)*				___ cup / *cawan*
120.	Herbal/botanical drinks (ready-to-drink) / *Minuman botani/herba seperti dalam tin/kotak (ready-to-drink)*				___ cup / *cawan*
121.	Herbal/botanical brewed drinks / *Minuman air rebusan botani/herba*				___ cup / *cawan*

122.	Energy drinks / *Minuman bertenaga (Red Bull, Livita)*				___ cup / *cawan*
123.	Yoghurt drinks / *Minuman yogurt*				___ cup / *cawan*
Alcoholic drinks (For non-Muslim only) / *Minuman beralkohol (Untuk peserta bukan Islam sahaja)*					
124.	Shandy / *Syandi*				___ glass / *gelas*
125.	Beer/lager/ale/stout / *Bir*				___ glass / *gelas*
126.	Todi (Palm wine) / *Todi (tuak kelapa/bahar)*				___ glass / *gelas*
127.	Wine/cider/champagne/ peri				___ glass / *gelas*
128.	Rice wine/lihing / *Wain beras/tuak beras/lihing*				___ glass / *gelas*
129.	Brandi/rum/whiskey/ vodka/samsu/sam cheng/montoku/langkau				___ glass / *gelas*
Confectionaries / *Konfeksi*					
130.	Local kuih / *Kuih-muih*				___ pieces / *ketul*
131.	Sweets / *Gula-gula*				___ pieces / *ketul*
132.	Chocolate bar / *Coklat bar*				___ small size 40g / *bar kecil 40g*
133.	Cake / *Kek*				___ slices / *potong*
134.	Jelly/custard / *Agar-agar/kastard*				___ slices / *potong*
135.	Lolly ice / *Aiskrim (tanpa susu)*				___ slices / *potong*
136.	Ice cream / *Aiskrim (susu)*				___ slices / *potong*
137.	ABC/Ice blended / *ABC (Air batu campur)/ais*				___ cup / *cawan*

No. ***Bil.***	**Type of Food** ***Jenis Makanan***	**How frequent each food was taken (Fill in one of the columns only)** ***Berapa kali kekerapan pengambilan dalam (Isikan dalam salah satu kolum sahaja)***			**Total servings (each time eaten)** ***Jumlah sajian (setiap kali makan)***
		Daily ***Sehari***	**Weekly** ***Seminggu***	**Monthly** ***Sebulan***	
Confectionaries / *Konfeksi*					
138.	Cream crackers / *Biskut tawar/krim kraker*				___ pieces / *keping*
139.	Flavoured/cream/ filled cookies / *Biskut berperisa/berkrim/berinti*				___ pieces / *keping*
140.	Pastry (Pie, croissant) / *Pastri (Pai, croissant)*				___ pieces / *keping*
141.	Snacks/crackers / *Snek/kerepek*				___ pieces / *keping*
Bread spread / *Sapuan roti*					
142.	Jam / *Jem*				___ teaspoon / *sudu teh*
143.	Kaya (coconut jam) / *Seri kaya*				___ teaspoon / *sudu teh*
144.	Butter / *Mentega*				___ teaspoon / *sudu teh*
145.	Margarine / *Marjerin*				___ teaspoon / *sudu teh*
146.	Peanut butter / *Mentega kacang*				___ teaspoon / *sudu teh*
147.	Cream cheese / *Krim keju*				___ teaspoon / *sudu teh*
148.	Chocolate spread / *Sapuan coklat*				___ teaspoon / *sudu teh*

149.	Garlic spread / *Sapuan bawang putih*				___ teaspoon / *sudu teh*
Flavours / *Perencah/Perasa*					
150.	Sugar (white, brown, Melaka) / *Gula (putih, perang, Melaka)*				___ teaspoon / *sudu teh*
151.	Honey / *Madu*				___ teaspoon / *sudu teh*
152.	Condensed milk (creamer) / *Susu Pekat Manis (Susu isian pekat manis/Krimer pekat manis)*				___ tablespoon / *sudu makan*
153.	Condiment / *Sambal (lada, belacan, tempoyak, bambangan)*				___ teaspoon / *sudu teh*
154.	Pickles / *Jeruk (bawang, tuhau)*				___ teaspoon / *sudu teh*
155.	Shrimp paste / *Belacan*				___ teaspoon / *sudu teh*
156.	Budu				___ teaspoon / *sudu teh*
157.	Cencalok				___ teaspoon / *sudu teh*
158.	Soy sauce / *Kicap*				___ teaspoon / *sudu teh*
159.	Chili sauce / *Sos cili*				___ teaspoon / *sudu teh*
160.	Tomato ketchup / *Sos tomato*				___ teaspoon / *sudu teh*
161.	Oyster sauce / *Sos tiram*				___ teaspoon / *sudu teh*
162.	Fish sauce / *Sos ikan*				___ teaspoon / *sudu teh*
163.	Petis/heko/otak udang				___ teaspoon / *sudu teh*
164.	Chili flakes / *Cili kering*				___ teaspoon / *sudu teh*
165.	Salad dressing				___ teaspoon / *sudu teh*

SECTION F / *BAHAGIAN F*

In answering the following questions,think about all the meals and snacks you had from the time you got up until you went to bed according to the food group. Be sure to include the food you eat at home, at the workplace, in the restaurants, or anywhere else. Please read each of the example from each food group and tick (√) one answer only in the space provided below which indicates how much food that you take in daily. /
Dalam menjawab soalan-soalan berikut, fikirkan tentang semua makanan dan makanan ringan yang anda ada dari masa anda bangun sehingga anda pergi ke tempat kerja mengikut kumpulan makanan.Pastikan anda memasukkan makanan yang anda makan di rumah, di tempat kerja, di restoran, atau di mana-mana sahaja.Sila baca setiap contoh dari setiap kumpulan makanan dan tandakan (√) satu jawapan hanya di ruang yang disediakan di bawah yang menunjukkan berapa banyak makanan yang anda ambil setiap hari.

Food groups / *kumpulan makanan*	**Examples of food / *contoh makanan***	**Scoring Criteria /Penilaian *Kriteria***	**/**
1. Cereals, cereal products and tubers /	*Rice, rice porridge, noodles, Mihun, Kueh teow, laksa, laksam, pasta, sago, bread, capati, roti canai, Tosai,*	Daily (4 to 8 servings) / *Harian (4 hingga 8 hidangan)*	
		Daily (> recommended serving) / *Harian (> saranan hidangan)*	

Bijirin, produk bijirin dan ubi	*breakfast cereals, Instant cereal, pizza, corn, potatoes, tubers* *Nasi, bubur nasi, mi, Mihun, Kueh teow, laksa, laksam, pasta, sagu, roti, capati, roti canai, Tosai, bijirin sarapan, bijirin segera, pizza, jagung, kentang, ubi*	Daily (< recommended serving) / *Harian (< saranan hidangan)*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *Jarang / tidak pernah*	
2. Wholegrain cereals / *Bijirin wholegrain*	*Capati*, *Atta* flour, wholemeal bread, brown rice, oats, barley *Capati, tepung Atta, roti wholemeal, beras perang, oat, barli*	Daily (≥½ of recommended serving) / *Harian (≥½ saranan hidangan)*	
		Daily (<½ of recommended serving or exceeding recommended serving) / *Harian (<½ saranan hidangan atau melebihi saranan hidangan)*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *Jarang / tidak pernah*	

3. Fruits / *Buahan*	Fresh fruits, canned fruits, dried fruits *Buah-buahan segar, buah dalam tin, buah kering*	Daily (≥2 servings) / *Harian (≥2 hidangan)*	
		Daily (< 2 servings) / *Harian* (< 2 hidangan)	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week */sekali semingu*	
		1 to 3 times per month / 1 hingga 3 kali sebulan	
		Rarely/Never / *jarang / tidak pernah*	
4. Vegetables / *Sayuran*	Cooked vegetables, *Ulam*, salads, green leafy vegetables, bean vegetables, canned vegetables, frozen vegetables *Sayur-sayuran dimasak, Ulam, salad, sayur-sayuran berwarna hijau, sayur kacang, sayur dalam tin, sayur sejuk beku*	Daily (≥3 servings) / *Harian* (≥3 hidangan)	
		Daily (< 3 servings) / *Harian* (<3 hidangan)	
		2 to 6 times per week / *2 hingga kali seminggu)*	
		Once per week / *seminggu sekali*	
		1 to 3 times per month / *1 hingga 3 kali seminggu*	
		Rarely/Never / *jarang / tidak pernah*	
5. Milk and dairy products / *Susu dan produk tenusu*	Unsweetened liquid or powdered cow's milk, cheese, yogurt, fermented milk beverages	Daily (1 to 3 servings) / *Harian (1 hingga 3 hidangan)*	
		Daily (> recommended serving) / *Harian (>saranan hidangan)*	

	Susu lembu yang tidak diselaraskan atau serbuk, keju, yogurt, minuman susu 'unsweetend'	Daily (< recommended serving) / *Harian (<saranan hidangan)*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *seminggu sekali*	
6. Legumes and their products / *Kekacang dan produk mereka*	Chickpeas, dhal, canned baked beans, *tempe*, *tauhu*, unsweetened plain soybean milk *Chickpeas, dhal, kacang bakar dalam tin, tempe, tauhu, susu kacang soya unsweetened*	Daily (½ to 1 serving) / *Harian (½ to 1 hidangan)*	
		Daily (> recommended serving) / *Harian (> saranan hidangan)*	
		Daily (< recommended serving) / *Harian (< saranan hidangan)*	
		2 to 6 times per week / *2 hingga 3 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	

Food groups / *kumpulan makanan*	**Examples of food / *contoh makanan***	**Scoring criteria / *kriteria pemarkahan***	***/***
7. Fish / *Ikan*	Fresh fish, frozen fish, dried fish, canned fish *Ikan segar, ikan sejuk beku, ikan kering, ikan dalam tin*	Daily (1 serving) / *Harian (1 hidangan)*	
		Daily (> 1 serving) / *Harian* (> 1 *hidangan*)	
		Daily (< 1 serving) / *Harian* (< 1 *hidangan*)	
		2 to 6 times per week / *2 hingga 3 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	
8. Poultry, meat, egg / *Ayam, daging, telur*	Chicken, duck, beef, mutton, goat, chichen's egg, duck's egg, quail's egg *Ayam, itik, daging lembu, kambing, kambing, telur ayam, telur itik, telur puyuh*	Daily (½ to 2 servings) / *Harian* (½ to 2 *hidangan*)	
		Daily (> recommended serving) / *Harian* (>*saranan hidangan*)	
		Daily (< recommended serving) / *Harian* (< *saranan hidangan*)	
		2 to 6 times per week / *2 hingga 3 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	

9. High fat protein foods / *Makanan protein lemak tinggi*	Organ meats (liver, intestines, etc.), sausages, hotdogs, ready-made burgers *Daging organ (hati, usus, dan lainlain), sosej, hotdogs, burger*	More than once daily / *lebih dari sekali sehari*	
		Once daily / *sekali sehari*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	
10. Fat-rich foods / *Makanan kaya lemak*	Butter, margarine, peanut butter, snacks, crackers, chips *Mentega, marjerin, mentega kacang, makanan ringan, keropok, kerepek*	More than once daily / *lebih dari sekali sehari*	
		Once daily / *sekali sehari*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	

Food groups / *kumpulan makanan*	**Examples of food / *contoh makanan***	**Scoring criteria / *kriteria pemarkahan***	**/**
11. Salt-rich foods / Makanan kaya garam	Chilli sauce, tomato sauce, soy sauce, fish sauce, oyster sauce, shrimp paste, *Sambal belacan, Budu, Cencaluk* *Sos cili, sos tomato, kicap, sos ikan, sos tiram, pes udang, Sambal belacan, Budu, Cencaluk*	More than once daily / *lebih dari sekali sehari*	
		Once daily / *sekali sehari*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	
12. Sugar-rich foods / *Makanan kaya gula*	Sweets, candies, chocolate, cookies, cakes, ice cream, jam, *Seri kaya*, fizzy drinks, sweetened beverages *Gula-gula, gula-gula, coklat, biskut, kek, aiskrim, jem, Seri kaya, minuman fizzy, minuman manis*	More than once daily / *lebih dari sekali sehari*	
		Once daily / *sekali sehari*	
		2 to 6 times per week / *2 hingga 6 kali seminggu*	
		Once per week / *sekali seminggu*	
		1 to 3 times per month / *1 hingga 3 kali sebulan*	
		Rarely/Never / *jarang / tidak pernah*	

SECTION G / *BAHAGIAN G*

In this section, you are required to provide your latest weight and height in the space provided / *Di bahagian ini, anda diminta untuk menyatakan berat badan dan ketinggian terkini dalam ruangan yang disediakan.*

Anthropometry Measurements / *Pengukuran Antropometri*

Measurement / *Pengukuran*	**Reading / *Bacaan***
Weight (kg) / *Berat (kg)*	
Height (cm) / *Tinggi (cm)*	

END OF QUESTIONNAIRE
THANK YOU FOR YOUR PARTICIPATION AND COOPERATION

SOAL SELIDIK TAMAT
TERIMA KASIH ATAS PENYERTAAN DAN KERJASAMA ANDA