UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH ENERGY INTAKE AMONG EMPLOYEES IN HEALTHCARE FACILITIES IN FEDERAL TERRITORIES IN MALAYSIA

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BY

SITI BASYIRAH BINTI AHMAD ANUAR

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A project submitted as a fulfilment on the requirement for the degree of Bachelor of Science (Dietetics) at Faculty of Medicine and Health Sciences

Universiti Putra Malaysia

APPROVAL

Project entitled "Factors associated with energy intake among employees in healthcare facilities in Federal Territories in Malaysia" was prepared by Siti Basyirah Binti Ahmad Anuar and submitted to Faculty of Medicine and Health Sciences as a partial fulfilment of the requirement of achieving the degree of Bachelor of Science (Dietetics) from Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.

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ABSTRACT

Factors associated with energy intake among employees in healthcare facilities in Federal Territories in Malaysia.

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Introduction: Calories from food may increase the risk of obesity and cardiometabolic disease and widespread of obesity among healthcare professional may hamper their health promotion efforts. This purpose of this study was to determine the factors associated with energy intake among employees in healthcare facilities in Federal Territories in Malaysia. **Methods:** This cross-sectional study was carried out in Hospital Kuala Lumpur and Hospital Putrajaya. Energy intake was collected using 3-days 24-hour dietary recall. Weight, height, and body composition (waist circumference and body fat percentage) were measured using calibrated tools and mental health status was assessed using Depression, Anxiety and Stress Scale (DASS-21). **Results:** A total of 122 subjects participated in this study. A total of 103 (84.4%) had an inadequate energy intake while 19 (15.6%) subjects had an adequate energy intake. Of the 122 subjects, 52 (42.6%) subjects were among the normal reporter in reporting their energy intake. Significant associations were found between body composition and body mass index (BMI) with energy intake ($p<0.05$) and no associations were found between sociodemographic characteristics and mental health status with energy intake. **Conclusion:** This finding suggests that body composition and BMI are associated with energy intake. Therefore, knowledge-based intervention programmes among employees are needed to increase the level of knowledge in regard to energy intake to assist in obesity prevention.

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ABSTRAK

Faktor berhubung dengan pengambilan tenaga dalam kalangan pekerja di sektor kesihatan di Wilayah Persekutuan di Malaysia.

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Jabatan Pemakanan dan Dietetik, Fakulti Perubatan dan Sains Kesihatan, Universiti Putra Malaysia

Pengenalan: Kalori daripada makanan boleh meningkatkan risiko obesiti dan penyakit kardiometabolik, dan obesiti yang ketara dalam kalangan pekerja kesihatan boleh menghalang usaha mereka dalam mempromosikan kesihatan. Tujuan kajian ini adalah untuk menentukan faktor berhubung dengan pengambilan tenaga dalam kalangan pekerja di sektor kesihatan di Wilayah Persekutuan di Malaysia. **Kaedah:** Kajian rentas ini dijalankan di Hospital Kuala Lumpur dan Hospital Putrajaya. Pengambilan tenaga direkod dengan menggunakan tiga hari sejarah pemakanan dalam tempoh 24 jam. Berat, tinggi dankomposisi badan (ukur lilit pinggang dan peratus lemak badan) diukur dengan menggunakan alat yang telah ditentukur dan status kesihatan mental dinilai dengan menggukan Depression, Anxiety and Stress Scale (DASS-21). **Hasil:** Seramai 122 subjek telah menyertai kajian ini. Seramai 103 (84.4%) subjek mempunyai pengambilan tenaga yang tidak mencukupi manakala 19 (15.6%) subjek mempunyai pengambilan tenaga yang mencukupi. Dalam 122 subjek, 52 (42.6%) subjek adalah dalam kalangan pelapor yang normal dalam melaporkan pengambilan tenaga mereka. Persatuan yang signifikan ditemui antara komposisi badan dan Indeks Jisim Tubuh (IJT) bersama dengan pengambilan tenaga ($p<0.05$) dan tiada persatuan ditemui antara ciri sosio-demografi dan status kesihatan mental bersama dengan pengambilan tenaga. **Kesimpulan:** Penemuan ini menunjukkan komposisi badan dan IJT adalah berhubung kait dengan pengambilan makanan. Maka, program intervensi berasaskan pengetahuan dalam kalangan pekerja diperlukan untuk meningkatkan tahap pengetahuan mengenai pengambilan tenaga untuk membantu mencegah obesiti.

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CHAPTER 1

INTRODUCTION

1.1 Background

Practising and consuming a healthy diet can help in the prevention of malnutrition as well as a range of noncommunicable diseases (NCDs) and conditions. Modernization and urbanisation have led to major lifestyle changes in the world which results in nutrition transition whereby the dietary habits have been changing for the past years. Fat intake especially saturated fat is getting higher over the years as well as the consumption of food high in energy, free sugars and salts are increasing too while the intake of vegetables, fruits, cereals and legumes are not enough (WHO, 2018). The exact make-up of a diversified, balanced and healthy diet varies between one another and individual's characteristics such as age, gender, lifestyle and degree of physical activity, cultural context, locally available foods and diet traditions. However, the basic principles of what constitutes a healthy diet remain the same (WHO, 2018).

Energy intake can be defined as the total energy content of foods being consumed from the major sources of dietary energy which are carbohydrate that provides 4 kcal/g, protein providing 4 kcal/g, fat providing 9 kcal/g and alcohol providing 7 kcal/g (Astrup, 2005). Calories contribute to positive energy balance and fat gain which increases the risk for obesity and cardio metabolic diseases (Stanhope et al., 2018). However, there are additional mechanisms that are not mediated solely by caloric content that may promote obesity and cardiometabolic disease (Stanhope et al., 2018).At present, approximately 42.5% of the Malaysian population have metabolic syndrome (Mohamud et al., 2011).

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WHO defined mental health as “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” (WHO, 2004). Acute and chronic exposure to stress can alter both the quantity and quality of calories consumed, and stress-induced alterations in food intake and energy balance can interact with emotional state (Epel et al., 2001). Depression, anxiety, stress and other moods have been shown to influence eating behaviours negatively (Gan et al., 2012). The tendency to eat in order to cope with these negative emotions is termed as ‘Emotional Eating’ and most of the time, their food preferences are shifted towards unhealthy food choices. A study reported that around 38% of American adults overconsume unhealthy food due to stress and half of them are engaged with this behaviour in weekly basis or more (Bourdier et al., 2018). A study has shown that higher stress for both men and women are associated with higher fat diet and less frequent exercise in which both are associated with higher BMI (Ng & Jeffery, 2003). Stressful lifestyle causes people to experience a behavioural shift to a more westernized dietary pattern that is high in fat, salt and sugar as well as less intake of fruits and vegetables which leads to the global increase in the prevalence of obesity among other factors (Xenaki et al., 2018).

Involvement of multiple sectors and stakeholders which includes government and non-governmental organization are required to promote a healthy food environment such as a diversified, balanced and healthy diet (WHO, 2018). Workplace is one of the recognized appropriate setting for health promotion and it has an incredible potential to improve general wellbeing (Wing et al. 2010). Improving access to healthy food option, having a weight loss competition and providing spots to perform physical activity are some of the changes that can be done at workplace by employers for employees. These changes will leave an impact to the

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employees such as improved work productivity and quality of life as sick leave was associated with obese employees (Xian et al. 2016).

1.2 Problem Statement

Food energy is used to meet the body's needs, including protein synthesis; maintenance of body temperature, cardiac output, respiration, and muscle function; and storage and metabolism of food sources of energy. When more energy is consumed than is needed for metabolism and physical activity, the excess is stored, primarily as adipose tissue (National Research Council (US) Committee on Diet and Health, 1989). Poor nutrition is a factor in the development of major chronic conditions such as obesity, type 2 diabetes, cardiovascular disease, hypertension, stroke, osteoporosis, some cancers, and many other (Kachan et al., 2012).

A pilot was conducted in Turkey to determine the nutritional status of nurses working shifts. Through this study, it was found that the mean daily energy intake among shift workers was higher than day workers (Varli & Biligi, 2016). A cross-sectional study was also conducted in Mexico to describe the dietary patterns among healthcare professionals and students in University of Guadalajara found that being younger than 22 years old was positively associated with a traditional westernized dietary practice and healthy dietary practice was negatively associated with being younger than 22 years old (Betancourt-Nuñez et al., 2018). However, in Malaysia, most studies assess the energy intake among a population such as among adults or children or students or university staff. Data on the energy intake among employees in healthcare facilities in Malaysia are still limited. Health-related behaviour of employees working in healthcare facilites may have influence on the behaviours of the general population,

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therefore, studies are needed to carefully evaluate and monitor the nutritional habits of these workers (Betancourt-Nuñez et al., 2018).

A local study conducted in Melaka Tengah to study on the prevalence and factors associated with overweight and obesity among healthcare workers in Pejabat Kesihatan Daerah Melaka Tengah revealed a high prevalence of overweight and obesity among the healthcare workers (Taib, 2019). Many studies conducted in some countries have consistently reported that healthcare workers have a higher risk of developing overweight and obesity despite working in an environment that allows them to understand the etiology, risks and consequences of overweight and obesity (Chou & Johnson, 1982; Gonzalez & Mendez, 2007). High BMI is often associated with poor diet quality and unbalanced energy intake and widespread of obesity among the workforce may hamper the efficacy of healthcare professionals' health promotion efforts (Romieu et al., 2017; Kyle et al., 2017).

Dietary intake and nutritional status of individuals are some of the factors affecting mental health and the development of psychiatric disorders (Lim et al., 2016). Furthermore, stress appears to alter overall food intake in two ways, resulting in under- or overeating, which may be influenced by stressor severity (Torres & Nowsen, 2007). A study on mental disorders among workers in healthcare industry in Korea found that the workers had higher odds ratios for mood disorders, anxiety disorders, sleep disorders, and any psychiatric disorders with females having higher prevalence that male (Kim et al., 2018). Another study performed in a Dutch healthcare organization for the disabled reported that among 402 employees, 22% of them suffered experienced general stress, 17% experienced work-related fatigue, 12% experienced distress, 6% suffered from burnout and 8% experienced post-traumatic stress

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complaints (Blekemolen, Hulshof & Sluiter, 2016). Yet, such information is not available among the employees in healthcare facilities in Malaysia.

To date there are limited local studies directly associating sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among employees in healthcare facilities and this study aims to evaluate the factors associated with energy intake among employees in healthcare facilities.

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1.3 Research Question

What are the associations between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among healthcare employees in Hospital Putrajaya and Hospital Kuala Lumpur?

1.4 Significance of Study

The proposed study was conducted in order to determine the association between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among employees in healthcare facilities. This study filled the gaps in existing studies as there are not much study on the relationship between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among employees in healthcare facilities in Malaysia.

Apart from that, this study can provide baseline information for future research. The findings of the study particularly on energy intake of employees in healthcare facilities would be very helpful in order to come out with new intervention that focused on improving their energy intake to meet the appropriate recommendations. This study also found a relation between body composition and energy intake, hence, more revisions can be done on what appropriate intervention or treatment can be done to improve the body composition of the employees.

This study can provide insight for future intervention on improving the body mass index and mental health status as well as energy intake modification that would ensure better health

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outcome and quality of life for the employees. Health professionals can recognize new strategies to improve the energy intake among employees in healthcare facilities based on this study. The outcomes of this study will be able to observe the weight status of employees in healthcare facilites. Thus, training on healthy weight can be conducted to the tackle the issue of overweight and obesity among them.

1.5 Hypothesis

Alternative hypothesis

There are significant associations between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among healthcare employees in healthcare facilities.

1.6 Objectives

1.6.1 General objective

To determine the associations between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among healthcare employees in healthcare facilities in Hospital Putrajaya and Hospital Kuala Lumpur.

1.6.2 Specific objectives

i. To assess the socio-demographic characteristics, body composition, body mass index, and mental health status among the subjects.

ii. To assess the energy intake of the subjects.

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iii. To determine the associations between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among the subjects.

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1.7 Conceptual Framework

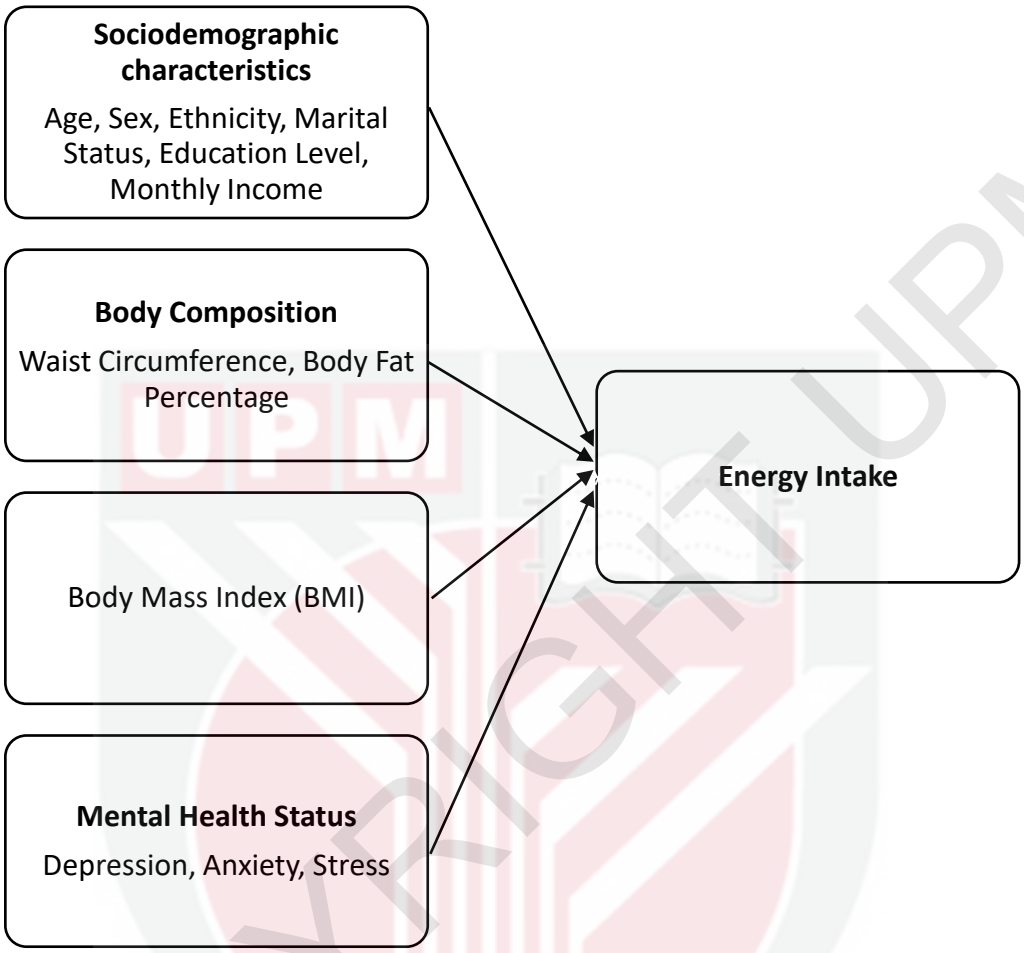

Figure 1.0 Conceptual framework

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CHAPTER 2

LITERATURE REVIEW

2.1 Energy intake

Diet is an important risk factor for disease. Non-communicable diseases (NCDs) are fast becoming the major cause of morbidity and mortality in Malaysia and dietary risk has been identified as the leading risk factor for disease and disability in the country (Jamal et al., 2015; GBD Profile: Malaysia, 2010). The WHO Global Action Plan for Prevention and Control of NCDs of 2013-2020 verified voluntary targets for member countries, including a 25% reduction in risk of premature mortality from cardiovascular diseases, cancers, chronic respiratory diseases and diabetes , by reducing modifiable risk factors such as unhealthy diets (WHO, 2013).

The Recommended Nutrient Intake (RNI) is Malaysia's standard guideline used to evaluate the dietary intake of the populace, to recognize the risk of insufficient nutrient intake of specific groups, and to minimize the risk of chronic diseases among the people (Shahar et al., 2018). RNI is defined as the "daily intake, set at estimated average requirement (EAR) plus 2 standard deviations (SD), which meets the nutrient requirements of almost all (97.5%) apparently healthy individuals in an age- and sex-specific population group". According to the 2017 RNI recommendation, the intake of energy and protein should be dependent on the reference of weight and h eight of different age/gender groups of the population and for carbohydrates and fats, it shall be based on the percentage of total energy intake (National Coordinating Committee on Food and Nutrition, 2017).

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A review and meta-analysis study conducted to analyse the adherence of intake of energy and macronutrient to national recommendations among Malaysian adults found that the intake of protein and fat was adequate to high especially among older population in both nationwide and individual studies while the energy intake of current adults were found to be low and failed to meet recommended national guideline, but, findings on the carbohydrate intake among the adults were shown to be inconsistent in which a small study found that a meta-analysis of small studies found that the carbohydrate intake of the adults was adequate but in another nationwide study, the opposite was found, i.e., the carbohydrate intake was low (Shahar et al., 2018).

For the past decades, the mean energy intake among men is 2163 kcal/day and 1718 kcal/day among women respectively. From the overall total energy intake, 63% was derived from carbohydrates, 14% from protein and 23% from fat (Lim, 2016). However, Indians recorded a surprisingly lower energy intake compared to other ethnicity while Malay women recorded a notably higher energy intake than other ethnicities (Lim, 2016). While an increase in energy intake has been shown to parallel an increase in body mass index, there is conflicting evidence as to the role macronutrients play in the development of overweight and obesity (Lee et al., 2010). Malaysian adults appear to have increased their fat intake while decreasing their carbohydrate intake over the years (Lee et al., 2010).

A cross-sectional study was conducted among US adults to test the hypothesis that energy density of the diet is associated with total energy intake, the weight of food consumed, and body weight, and influence of fruit, vegetable, and fat intakes on energy density and body weight was also explored (Ledikwe et al., 2006). This study used data from the 1994-1996 Continuing Survey of Food Intakes by Individuals which was a 2-day survey conducted by the

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US Department of Agriculture (USDA). The findings from this study showed that even though men and women with a low-energy-dense diet consumed more food, they had a lower mean intake of total energy, energy from food, and energy from beverages whereas men and women with a medium- or high-energy-dense diet showed an opposite result. This study also stated that by adding fruits and vegetables, the energy density of a variety of dietary patterns including higher-fat diets can be lowered.

Diet evolves over time, being influenced by many social and economic factors that interact in a complex manner to shape individual dietary patterns. These factors include income, food prices (which will affect the availability and affordability of healthy foods), individual preferences and beliefs, cultural traditions, and geographical and environmental aspects (including climate change) (WHO, 2018). A review study on social class and diet quality in western society demonstrated that high SES groups consume more whole grains, lean meats, fish, low-fat dairy products and fresh vegetables and fruits while lower SES groups of people has been associated with the consumption of refined grains and added fat. However, there is not much evidence showing that energy intake or macronutrient composition of diet is affected by SES (Darmon & Drewnowski, 2008).

Turrel and Kavanagh (2016) studied on the socioeconomic pathways to diet from the viewpoint of purchasing behaviour in Australia. This study found significant associations between education level, household income level and food purchasing behaviour. The study reported that food shoppers who are least likely to buy foods that are high fibre and low in fat, salt and sugar are those with low levels of education and come from low-income household. Variation in purchasing of food from different household income is related due to food-cost

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concern and dietary information is related to educational level which influences eating practices. Socioeconomic differences in terms of dietary knowledge and concerns regarding the cost of healthy food play an important role in these relationships (Turrel & Kavanagh, 2016; Murayama, 2015).

Across the ethnicity of Malaysian population, there is a variation in nutrient intake. understanding the variation of nutrients intake across the ethnicity is crucial as it reflects the cultural, religious, geographical, genetic and other differences between ethnicity (Lee & Khir, 2007).

Among young adults, skipping meal is becoming a norm and these practices are associated with adverse health effect. This poor and unhealthy eating habit is becoming a great concern. Intake of high fat diet may negatively influence individual's health and can lead to an increase in body weight. In addition, skipping meals often results in excessive eating which eventually will cause an increment in body weight (Mahmoud, 2017).

2.2 Body composition

Body composition expressed as body fat and fat free mass reflects the total energy daily intake as well as the relative contribution of macronutrient which as carbohydrate, protein and fat (Keska et al., 2013). Despite body fat content, fat distribution is importance in health status as excess of subcutaneous upper body fat results in metabolic syndrome which includes obesity, insulin resistance, hypertension, impaired glucose tolerance, dyslipidemia, and vascular complications (Keska et al., 2013). Studies have suggested that waist circumference remains a

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significant predictor of chronic diseases such as type 2 diabetes mellitus, cardiovascular diseases, cancer, as well as total mortality after adjusting for BMI or fat mass (Bigaard et al., 2005). Changes in diet quality may affect energy partitioning, i.e., the specific location and amount of fat mass relative to fat-free mass that is deposited or lost (Goss et al., 2013). There is a positive relationship between fat intake and fat storage, with ingestion of high-fat diets resulting in increased fat storage and obesity and thus potentially the associated negative consequences for health and survival (Moatt et al., 2017).

Deposition of body fat may be influenced by the composition of diet. Studies from previous research evaluating the association between obesity and specific nutrients such as carbohydrate and fat have indicated different findings (Othman et al., 2018). Observational and intervention studies evaluating the relationship between obesity and specific nutrients have demonstrated various results. A few researches reported an inverse association between body fat and high carbohydrate diet (Miller et al., 1990; Atlantis et al., 2008) while a few others found a positive relationship between body fat and diet high in fat (Miller et al., 1990; Larson et al., 1996; Tucker & Kano, 1992). As for the associations between body fat and diet high in protein, both positive and inverse associations were found (Koppes et al., 2008; Soenen & Westerterp, 2010; Vinknes et al., 2011; Liza et al., 2015). Diet manipulations were often confounded by metabolic, physiologic and environmental differences, thus, it is not easy to connect whether the impact of dietary composition independent of total energy intake is associated with adiposity (National Research Council, 1989; Galgani & Ravussin, 2008; Othman et al., 2018).

A finding from a study carried out among middle-aged adults and elder showed that protein intake was associated with higher percentage body fat and BMI while in the subgroup

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consisting individuals with intermediate and stable weight, no association was found between protein intake and percentage body fat or BMI but association between fat intake and carbohydrate intake with percentage body fat were found. Therefore, dietary intake high in protein may contribute to deposition of fat in general population but in specific population such as mong individuals with average and stable weight, fat intake appeared to be more significant (Vinkness, 2010). Another study investigating the relationship between macronutrient composition and energy intake and body fatness for a period of 23 years also found that high protein intake is associated with high body fat percentage and is not in line with previous studies but limiting it to the fact that it could be due to underestimation of fat intake among individuals with high BMI leasing to a relatively higher protein and carbohydrate intake (Koppes et al., 2008).

2.3 Mental health status

The relationship between obesity and mental states has begun to attract serious research interest as well as the relationship between specific micronutrients and psychological health (Becker et al., 2001; Stough et al., 2011). Absence of physical exercise and poor dietary quality have long been associated with abdominal obesity and in the recent years, scientists have started to investigate the role of chronic psychological distress as an associated factor of abdominal obesity. Researchers hypothesized that eating behaviour may be altered by psychological distress thus causing a high intake of energy dense food which may expose overweight adults to the risk of cardio-metabolic diseases (Grossniklaus et al., 2010). The NMHS2019 key findings on non-communicable diseases, healthcare demand and health literacy showed that the national prevalence of depression among Malaysian adults is 2.3%

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which is about half a million people with the highest prevalence found in the Federal Territories of Putrajaya (NHMS, 2019).

When surroundings are viewed as demanding and burdening, grown-ups are bound to feel stressed especially when they find themselves to be inadequate in terms of coping and meeting the demands (Cohen et al., 1995). Stress can also accelerate or worsen the symptoms of depression thus reinforcing the unhealthy and poor dietary patterns prompting more prominent psychological distress and possibly chronic diseases (Bale, 2006; McEwen, 2005). A local study conducted among a public university staff to determine the prevalence of job stress and its associated factors found that the overall prevalence of stress was 21.7% with work stressor such as job demand being the main predictor of stress (Mukosolu et al., 2015). Another study found that overweight people reported that eating practices and food choices are influenced by stress and depressive symptoms (Chambers & Swanson, 2006).

Anger, fear and sadness are negative emotions that are associated with irregular eating patterns and eating to distract, to relax or to feel better (Macht & Simons, 2000). Stress is associated with cravings for high fat and high carbohydrate foods especially among women and stress related eating is much more common among women than men (Benton, 2002; Epel et al., 2001). Depressive symptoms are associated with increase in appetite, excessive food intake, preferences for high fat and carbohydrate foods, excessive alcohol intake and higher BMI in women (Benton, 2002; Strine et al., 2008). In addition, adherence to dietary recommendation may be less among severely depressed individuals (Ciechanowski et al., 2003). Although stress and depressive symptoms may contribute to weight gain, in some individuals, psychological distress can have the opposite effect (Dallman et al., 2003).

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A 2-year cohort study conducted among non-obese Japanese workers found that weight gain over the two years among the employees was associated with 'eating to satiety' which is an eating behaviour that may be influenced by psychological response to job stress such as tension/anxiety and depression (Nishitani & Sakakibara, 2007). The same author conducted another similar study in the two years later but among male Japanese workers and found a similar finding. The authors analysed the association between eating behaviour and job stress factors using Spearman's correlation coefficient and encountered positive association between quantitative workload and eating behaviours such as eating rhythm abnormalities, substitute eating and drinking and feeling of satiety. The findings from this study also showed that psychological stress response especially depression was positively correlated with eating behaviours of eating rhythm abnormalities, substitute eating and drinking and feeling of satiety (Nishitani & Sakakibara, 2009).

2.4 Body Mass Index (BMI)

The prevalence of overweight and obesity in Malaysia is skyrocketing over the years and it is threatening the health of Malaysians as well as the healthcare system. Excess energy is deposited as body tissue when energy intake exceeds energy expenditure (Romieu et al., 2017) One of the major contributors to growing numbers of obesity and non-communicable diseases as well as cancer is poor quality dietary intake. Studies have suggested that mechanisms underlying the obesity-cancer connection can be explained by the pleomorphic effects exerted due to obesity on pathways related to tumour development and progression and, thus, there are potential opportunities for primary to tertiary prevention of obesity-related cancer (Hanahan & Weinberg, 2011; Romieu et al., 2017).

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Among the earlier human population (hunter-gatherers), obesity was not common mainly due to their active lifestyle which involves physical activity and occasionally unpredictable diet and food shortages. However, changes in culture and technology that we are experiencing today have led to changes in the types of food consumed as well as reduced the need for physical activity. Poor dietary habits and the lack of physical activity contributes to the development of obesity and NCDs (Lee & Wan, 2019).

BMI is most used body composition marker in epidemiologic studies, though it cannot differentiate between lean and adipose tissue, it is comparable with gold standard methods (Sun et al., 2010; Romieu et al., 2017). A study carried out among adults residing in Kota Bharu and Penang Island found that respondents residing in Kota Bharu had significantly higher BMI and waist circumference measurement than respondents residing in Penang Island (Lee & Wan, 2019). The study applied MIXED model statistical test to determine the associations between several dietary intake variables (energy, carbohydrate, protein, fat, dietary fibre, total sugar, number of servings of vegetables and fruits) with BMI and waist circumference measurements and found that only the carbohydrate intake had a significant negative association with both BMI and waist circumference measurements (Lee & Wan, 2019).

One study was conducted to test the relation existing between BMI and energy intake by Herrera et al. (2003). This study was participated by more than 1000 young adults in Venezuela whose age ranged from 19-29 years old. The body weight, height, BMI, and energy intake of the participants were assessed and evaluated. Data from this study found that the mean energy intake in the male group was 387 kcal lower than recommended whereas the energy intake in the female group was 440 kcal higher than the recommended intake despite not having a

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significant percentage of overweight and obesity. This study concluded that the distribution of BMI percentage was fairly similar across gender and that BMI was highly influences by food consumption, independent of sex (Herrera et al., 2003).

Employees' food choices and physical activity may be influenced by their physical and social workplace environment, thus, increasing the risk of gaining weight (Rusali et al. 2018). The development of modern technology at workplace including increase computer use, often lead to prolonged sitting times (Rusali et al. 2010). In Australia, employees in the desk-based work settings were having more than 60% of daily occupational sitting time and longer sitting hours were associated with higher BMI (Bennie et al. 2015). While in Malaysia, it was reported that senior officers, managers, technical staff and associated groups had the highest prevalence of overweight (37.4%) due to sitting hours in front of computer (National Health and Morbidity Survey III (NHMS III), 2006).

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CHAPTER 3

METHODOLOGY

3.1 Study design

This cross-sectional study was carried out in a public hospital in the Federal Territory of Putrajaya and the Federal Territory of Kuala Lumpur, Malaysia. This cross-sectional study is to determine the associations between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among healthcare employees in healthcare facilities.

3.2 Study location

This study was carried out in Hospital Putrajaya (HPJ) and Hospital Kuala Lumpur (HKL) which are located in the Federal Territory of Putrajaya and Federal Territory of Kuala Lumpur respectively. HPJ is located in the administrative area of Putrajaya where Putrajaya is the federal government administrative centre. It is located about 35 km south of capital city of Kuala Lumpur. HKL is located in the capital city of Kuala Lumpur. It is located on 150 acres of prime land in the city and is the largest hospital under the Ministry of Health of Malaysia.

3.3 Sample Size Determination

The sample size for this study is calculated using the following formula:

$$\mathbf{C = 0.5*\ln[(1+r)/(1-r)]}$$

$$\boldsymbol{N = [(Z\alpha + Z\beta)/C]^2 + 3}$$

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(Hulley, Cummings, Browner, Grady & Newman, 2013)

Where;

$\alpha = Z\alpha = 1.96$

$\beta = Z\beta = 0.84$

r = the expected correlation coefficient

Table 3.1 Sample size determination calculation

Correlation studies	**Correlation, r**	**Sample size, n**
Energy intake and negative emotion (Rosnah et al., 2017)	0.25	C = 0.5*ln[(1+r)/(1-r)] C = 0.26 $N = [(Z\alpha + Z\beta)/C]^2 + 3$ N = 119
Energy intake and waist circumference (Lee et al, 2010)	0.545	C = 0.5*ln[(1+r)/(1-r)] C = 0.61 $N = [(Z\alpha + Z\beta)/C]^2 + 3$ N = 24
Energy intake and BMI (Lee et al., 2010)	0.635	C = 0.5*ln[(1+r)/(1-r)] C = 0.75 $N = [(Z\alpha + Z\beta)/C]^2 + 3$ N = 17
Energy intake and body fat percentage (Lee et al., 2010)	0.534	C = 0.5*ln[(1+r)/(1-r)] C = 0.6 $N = [(Z\alpha + Z\beta)/C]^2 + 3$ N = 25

Additional 10% was added to estimated sample size to account for dropout rate or any other errors. Thus, the estimated sample size were 130.

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3.4 Subject

Subjects for this study are employees in healthcare facilities in Hospital Putrajaya (HPJ) and Hospital Kuala Lumpur (HKL). Subjects who met the inclusion and exclusion criteria were invited to participate in this study. The inclusion and exclusion criteria are as below:

Table 3.2 Inclusion and Exclusion criteria of the subjects

Inclusion Criteria	Exclusion Criteria
≥ 18 years old	With chronic diseases
All ethnicities	Pregnant women
Malaysian	Breastfeeding

3.5 Sampling Method

Sampling method that was used in this study is purposive sampling which is a non-probability sampling as shown in Figure 3.1 below. A list of public hospitals in Federal Territories was obtained and Hospital Putrajaya and Hospital Kuala Lumpur were chosen as they are the nearest hospital located in Federal Territories from faculty. Next, a list of employees in Hospital Putrajaya and Hospital Kuala Lumpur were obtained. The subjects included in this study are employees who met the selection criteria and agreed to participate.

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Figure 3.1 Flow chart of sampling method

3.6 Study Measures

An interview-administered questionnaire (Appendix IV) was used in this study to obtain the dietary behaviour and anthropometry measurement of subjects involved and a self-administered questionnaire was used in the study to obtain the socio-demographic factors and mental health status of subjects involved.

3.6.1 Sociodemographic characteristics

Sociodemographic characteristics was assessed using self-developed questionnaire in which personal details which includes but not limited to age, gender, monthly income, marital status, education level and occupation will be asked.

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3.6.2 Body composition

Body composition of subjects that was measured are body fat percentage (BFP) and waist circumference (WC). BFP of subjects was measured using OMRON HBF-375 KaradaScan (OMRON, Japan) whereas WC was measured using SECA 206 Measuring Tape (SECA, Germany).

Waist circumference are classified into normal waist circumference and high waist circumference according to Clinical Practice Guideline – Management of Obesity (2004). Male subjects with waist circumference below or 90cm was categorized as normal waist circumference and measurement above or equal to 90cm is categorized as high waist circumference whereas for female subject, those with waist circumference below 80cm was categorized in the normal waist circumference category and female subjects with waist circumference above or equal to 80cm was categorized in the high waist circumference category.

Body fat percentage of subjects that were measure was classified into normal BFP and high BFP according to Clinical Practice Guideline – Management of Obesity (2004). Male subjects with BFP above 25% were considered as having high BFP and those with BFP measurement below or equal to 25% were considered as having a normal BFP. For female subjects with BFP higher than 35% were considered as having high BFP while female subjects with BFP below or equal to 25% were considered as having a normal BFP.

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3.6.3 Body Mass Index

BMI of subjects was determined by measuring the body weight and height of subjects. Body weight and height of subjects was measured using the OMRON HBF-375 KaradaScan (OMRON, Japan) and the SECA 216 Stadiometer (SECA, Germany) respectively. The obtained measurement was further calculated by dividing square of height with weight to obtain the BMI value. The BMI of subjects were then classified according to World Health Organization BMI classification as below:

Table 3.3 Classifications of BMI for adults

Classification	BMI (kg/m2)
Underweight	<18.5
Normal	18.5-24.9
Overweight	25.0-29.9
Obesity	≥30.0

(World Health Organization, 2004)

3.6.4 Mental Health Status

Mental Health Status was assessed by using the Depression, Anxiety and Stress Scale (DASS-21). DASS-21 is a 21-item scale designed to measure three negative emotional states of depression, anxiety and stress. Subjects were required to rate the extent to which they experience each state on a 4-point Likert scale (0 = did not apply to me at all, 3 = apply to me most of the time). High score indicates frequent negative emotional states.

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Each question asked represents either symptoms of depression, anxiety or stress. Total marks for each question that represent respective feelings are total up and were then classified into five categories: normal, mild, moderate, severe, extremely severe.

3.6.5 Energy intake

Energy intake of subjects was assessed using 3-days 24-hour diet recall. Diet recall that was collected consists of diet from two weekdays and one weekend. The total energy intake was recorded using average energy intake and analysed through Nutritionist Pro.

The energy intake was then classified into adequate and inadequate according to Recommended Nutrient Intake 2017 (RNI 2017). Male subjects that achieved more than or equal to 2190 kcal were considered as having adequate energy intake whereas male subjects whose energy intake is lower than 2190 kcal were considered as having inadequate energy intake. As for female subjects, they are considered as having adequate energy intake when they achieved more than or equal to 1840 kcal as recommended by RNI, however, for female subjects having energy intake lower than 1840 kcal, they were considered as having inadequate energy intake.

3.6.6 Under-reporting of energy intake

Estimation of under-reporting of energy intake from the 3-days 24-hour diet recall among the respondents was calculated using the ratio of reported total energy intake to Basal Metabolic Rate (BMR), or EI:BMR ratio. BMR of respondents was calculated using the BMR for the Malaysian population predictive equation proposed by Ismail et al. (1998). The cut-off point for EI:BMR ratio was calculated using equation by Black (2000) and Goldberg et al. (1991).

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Respondents were classified under-reporters (EI:BMR <0.98); normal reporter (EI:BMR 0.98-2.47) and over-reporters (EI:BMR >2.47) of energy intake.

3.7 Procedure

Data collection were conducted from January to February 2020. Approval for study protocol has been obtained from Ministry of Health National Medical Research Registry & Medical Research and Ethics Committee (MREC) (NMRR ID: NMRR-17-3347-39165). Upon approval, a permission letter to conduct a study was sent to Hospital Kuala Lumpur and Hospital Putrajaya. Informed consent was obtained prior to the administration of questionnaire. An information sheet containing the objectives of the study was distributed to every subject. Subjects were assessed on socio-demographic characteristics and mental health status using self-administered questionnaire. Body composition and energy intake of subjects were assessed through interview-administered questionnaire.

3.8 Pre-testing

Prior to this study, the questionnaire for sociodemographic characteristics, 3-days dietary record and DASS-21 were pre-tested on 26 subjects. The subjects for pre-testing had similar characteristics as the study sample. The time needed for diet record and subjects to complete the questionnaire was determined. The clarity of instructions regarding food recording and understanding of questionnaires were assessed. Problems encountered by subjects during pre-testing were identified and corrected based on their feedback and the feasibility of

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questionnaire was re-assessed after pre-testing. The subjects for pre-testing were excluded during data collection of this study.

3.9 Statistical Analysis

The statistical analysis was done using IBM SPSS Statistic version 22. Descriptive data were tested using univariate analysis and results were presented as frequencies and percentage for categorical variables while continuous variables were presented using mean and standard deviation. Data was tested for normality and data that was not normally distributed was presented in median and interquartile range. For inferential statistical analysis, Pearson's product moment correlation was used to determine correlation between continuous variables while Spearman's rank order test was used to determine correlation for non-parametric data. The associations between categorical variables were analysed using Chi-square test of independence. Fisher's exact test was used for data that violated the assumption of Chi-square test. The level of statistical significance was set at $p<0.05$.

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CHAPTER 4

RESULTS

4.1 Sociodemographic characteristics

A total of 122 subjects participated in this study. The socio-demographic characteristics of the subjects are presented in table 4.1. The mean age of subjects participated in this study was *M* = 35.22, *SD* = 7.727. Majority of the subjects were female (78.7%), are of Malay ethnicity (93.4%), are married (77.0%) and had tertiary education (73.8%). In terms of income level, 58.2% of the participants have monthly income between RM1000-RM3000, followed by 25.4% of them having monthly income between RM3000-RM5000, >RM5000 (12.3%) and <RM1000 (4.1%).

Table 4.1 Sociodemographic background of subjects (n=121)

Characteristics	Mean ± SD	n (%)
Age (years)	35.22 ± 7.73	
Sex		
Female		96 (78.7)
Male		26 (21.3)
Ethnicity		
Malay		114 (93.4)
Chinese		2 (1.6)
Indian		3 (2.5)
Others		3 (2.5)
Marital Status		
Single		25 (20.5)
Married		94 (77.0)
Divorced		2 (1.6)
Widow		1 (0.8)
Educational Level		
Primary education		1 (0.8)
Secondary education		31 (25.4)

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Tertiary education		90 (73.8)
Monthly Income (RM)	3320.96 ± 2180.15	
<1000		5 (4.1)
1000-3000		71 (58.2)
3000-5000		31 (25.4)
>5000		15 (12.3)

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4.2 Body composition

Table 4.2 shows the body composition of subjects. The mean value for waist circumference and body fat percentage is *M* = 93.95, *SD* = 35.55 and *M* = 93.95, *SD* = 6.17, respectively. Majority of the participants have high waist circumference (86.9%) and high body fat percentage (95.9%). Most of the male and female respondents were shown to have high waist circumference and body fat percentage. Gender wise, female recorded a higher waist circumference and body fat percentage than male.

Table 4.2 Body composition of subjects

Characteristics	Mean ± SD	Male (n=26)	Female (n=96)
Waist circumference (cm)	93.95 ± 11.92		
Normal (≤90; ≤80)		7 (26.9)	9 (9.4)
High (>90; >80)		19 (73.1)	87 (90.6)
Body fat percentage (%)	35.55 ± 6.17		
Normal (<20; <30)		2 (7.7)	3 (3.1)
High (≥20; ≥30)		24 (92.3)	93 (96.9)

4.3 Body Mass Index (BMI)

BMI of subjects participated in this study are depicted in Table 4.3. The participants had a median BMI of 28.95 kg/m². Most of the respondents are overweight (50.8%), followed by obesity (41.8%) and normal (7.4%).

Table 4.3 BMI status of subjects (n=122)

BMI	Median (IQR)	n (%)
Body mass index (kg/m²)	28.95 (5.93)	
Normal		9 (7.4)
Overweight		62 (50.8)
Obesity		51 (41.8)

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4.4 Mental health status

The mental health status of subjects was assessed using DASS-21 questionnaire which is designed to measure three negative emotional states of depression, anxiety, and stress. In terms of depression, 6.6% of the respondents have mild depression, followed by 3.3.% of them having moderate depression and 0.8% have severe depression whereas the rest of the respondents are normal. As for anxiety, most of the respondents are in normal categories (63.1%), followed by mild anxiety (23.8%), moderate anxiety (5.7%), severe anxiety (5.7%) and extremely severe anxiety (1.6%). In terms of stress, majority of the respondents have normal stress categories (95.9%) while the rest have mild stress (1.6%), moderate stress (1.6%) and severe stress (0.8%).

Table 4.4 Mental health status of subjects (n=122)

Characteristics	Frequency (n)	Percent (%)
Depression		
Normal	109	89.3
Mild	8	6.6
Moderate	4	3.3
Severe	1	0.8
Extremely severe	0	0
Anxiety		
Normal	77	63.1
Mild	29	23.8
Moderate	7	5.7
Severe	7	5.7
Extremely severe	2	1.6
Stress		
Normal	117	95.9
Mild	2	1.6
Moderate	2	1.6
Severe	1	0.8

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Extremely severe	0	0

4.5 Energy intake

Data on energy intake of subjects was tabulated in table 4.5. The mean energy intake is 1439 ± 477 kcal/day. Majority of the respondents (84.4%) have low energy intake below the recommended value. When stratified according to gender, male respondents were shown to have higher mean energy intake than female.

Table 4.5 Energy intake of subjects

Characteristics	Mean ± SD	Male (n=26)	Female (n-96)
Energy (kcal/day)	1439 ± 477	1784 ± 524	1346 ± 419
Inadequate (<2190 ; <2240)		20 (76.9)	83 (86.5)
Adequate (≥2240 ; ≥1900)		6 (23.1)	13 (13.5)

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4.6 Under-reporting

As seen in Table 4.6, 57.4% of the respondents were found to be under-reporting their energy intake. When the under-reporting among the respondents was grouped by gender, female showed a higher under-reporting rate than male.

Table 4.6 Under-reporting among subjects

Characteristics	Male (n=26)	Female (n-96)	Total n (%)
Under-reporter	12 (46.2)	58 (60.4)	70 (57.4)
Normal-reporter	14 (53.8)	38 (39.6)	52 (42.6)

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4.7 Hypothesis testing

4.7.1 Association between sociodemographic characteristics and energy intake

Chi-square test between sociodemographic characteristics and energy intake tabulated in Table 4.7 showed that there is no association between sociodemographic characteristics and energy intake.

Table 4.7 Chi-square test between sociodemographic characteristics and energy intake

Variable	Adequate (n=18)	Inadequate (n=34)	χ^2	p-value
Age (years old)			1.813	[a]0.178
19-29	7 (53.8)	6 (46.2)		
30-59	11 (28.2)	28 (71.8)		
Sex			0.185	[a]0.667
Male	6 (42.9)	8 (57.1)		
Female	12 (31.6)	26 (68.4)		
Ethnicity				[b]1.000
Malay	17 (34.0)	33 (66.0)		
Others	1 (50.0)	1 (50.0)		
Marital status				[b]0.747
Single	5 (38.5)	8 (61.5)		
Married	13 (33.3)	26 (66.7)		
Educational level			0.015	[a]0.902
Tertiary	13 (35.1)	24 (64.9)		
Others	5 (33.3)	10 (66.7)		
Income			0.306	[a]0.580
≤RM3000	12 (37.5)	20 (62.5)		
>RM3000	6 (30.0)	14 (13.1)		

[a]Chi-square test
[b]Fisher's exact test

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4.7.2 Association between body composition and energy intake

Table 4.8 and Table 4.9 show the correlation between body composition and energy intake and body composition and energy intake according to genders, respectively. Positive correlation was found between waist circumference and energy intake while negative correlation was found between body fat percentage and energy intake, suggesting that the higher the energy intake, the lower the body fat percentage. When grouped by gender, only waist circumference of female was found to be correlated with energy intake.

Table 4.8 Pearson correlation between body composition and energy intake

Variables	**Energy intake**	
	r-value	p-value
Body composition		
Waist circumference	0.562	[c]0.000**
Body fat percentage	-0.293	[c]0.035*

[c]Pearson moment correlation test
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.9 Pearson correlation between body composition and energy intake by gender

	----------Male----------		**----------Female----------**	
Variables	**Energy intake**			
	r-value	p-value	r-value	p-value
Body composition				
Waist circumference	0.361	[c]0.205	0.509	[c]0.001**
Body fat percentage	-0.270	[c]0.351	0.274	[c]0.096

[c]Pearson moment correlation test
**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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4.7.3 Association between Body Mass Index and energy intake

Data on the correlation between BMI and energy intake was tabulated in Table 4.10. There is a positive correlation found between BMI and energy intake (r=0.422, p=0.012) which suggests that BMI increases as energy intake increases.

Table 4.10 Spearman's rank order test between body mass index and energy intake

Variables	**Energy intake**	
	r-value	p-value
Body mass index	0.422	[c]0.012*

[c]Pearson moment correlation test

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4.7.4 Association between mental health status and energy intake

Table 4.11 shows the chi-square test between mental health status and energy intake among respondents. No association was found between mental health status (depression, anxiety, and stress) and energy intake among subjects.

Table 4.11 Chi-square test between mental health status and energy intake

Variable	Adequate (n=18)	Inadequate (n=34)	χ^2	p-value
Mental health status				
Depression				[b]1.000
Normal	16 (34.0)	31 (66.0)		
Not normal	2 (40.0)	3 (60.0)		
Anxiety			0.002	[a]0.963
Normal	11 (34.4)	21 (65.6)		
Not normal	7 (35.0)	13 (65.0)		
Stress				[b]1.000
Normal	18 (35.3)	33 (64.7)		
Not normal	0	1 (100.0)		

[a]Chi-square test
[b]Fisher's exact test

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CHAPTER 5

DISCUSSION

Workplace was recognized by WHO as an environment that can influence individual's dietary behaviour as they spend up to two-thirds of their time at work (WHO, 2013). Employees' food choices and physical activity may be influenced by the physical and social workplace environments, thus, making them more susceptible to gaining weight (Rusali et al., 2018). A diet that is excessive or lacking in balance between macronutrient and micronutrient intake may lead to impaired cell function, adverse effect, intoxication, and it may also impair the quality of life of an individual (Hossein et al., 2020). This study provides results on the association between sociodemographic characteristics, body composition, BMI, mental health status and energy intake of employees in healthcare facilities in Federal Territories, Malaysia.

The energy intake of the employees was categorized into two groups, those with adequate energy intake achieved 100% of the recommended energy intake and inadequate energy intake for those who were unable to achieve 100% of the recommended energy intake according to RNI2017 (National Coordinating Committee on Food and Nutrition, 2017) . The findings in this study showed that more than half of the employees did not have an adequate energy intake. The overall mean energy intake of the employees is 1439 ± 477 kcal/day with male employees having higher energy intake than female. This finding is comparable with a previous local study conducted to study on the dietary intake and obesity among adults in Malaysia which also found that the mean energy intake among the adults was lower than the recommended value and male had higher intake of energy than female (Lee & Wan, 2019; Asma, 2014;). In regard to the adequacy of energy intake among the employees, it was found that more than half of the employees were unable to achieve adequate energy intake as

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recommended and only 16% of them had an adequate energy intake in a day despite majority of them are overweight and obese. The same concern was mentioned by Shahar et al. (2018) on how the trend of overweight and obesity continue to increase even though studies showed a reduced energy intake among Malaysian adults. Under-reporting of the respondents was also calculated, and it was found that more than half of the employees under-reported their energy intake. Under-reporters of energy intake among the respondents in this study were excluded from hypothesis testing.

This study was conducted among employees in healthcare facilities in Federal Territories, Malaysia. Female is the dominant group in this study with almost 79% of them participated as compared to male with only 21.3%. Majority of the respondents in this study are of Malay ethnicity (93.4%) and less than 10% are of Chinese, Indian and others ethnicity. As high number of Malay ethnicity were involved in this study, the results may not well reflect the employees of other ethnicities in Malaysia. Most of the employees participated in this study are married, had tertiary education and income between RM1000-RM3000. None of the sociodemographic characteristics of the employees were significantly associated with their energy intake. Therefore, the alternative hypothesis was rejected. A previous study also found that average caloric intake did not change significantly when stratified by race or ethnicity (Ladabaum et al., 2014).

Looking into the body composition of the employees, majority of them have high waist circumference and are at risk of abdominal obesity as well as high body fat. When grouped by gender, female employees were shown to have higher waist circumference and body fat percentage than their male counterpart. The proportion of female participants with abdominal

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obesity being higher than their male counterpart in this study is comparable with National Health and Morbidity Survey 2019: Malaysian Adults Nutrition Survey (NHMS 2019:MANS) which showed that the prevalence of abdominal obesity among females was significantly higher than males. Significant association was found between waist circumference and energy intake. Therefore, the alternative hypothesis failed to be rejected. The finding on the association between waist circumference and energy intake is in-line with previous studies by (Slattery et al., 1992; Duvigneaud et al., 2007; Lee et l., 2010) which also found an association between waist circumference and energy intake. When stratified according to gender, positive correlation was found between waist circumference and energy intake in women but not in men. This finding is parallel with a study by Nikbazm et al. (2013) which also approved the role of energy intake on abdominal obesity in women. Nikbazm et al. (2013) suggested that factors such as physical activity could be the reason for the insignificant correlation between waist circumference and energy intake in men. This finding is also supported by WHO (2000) whereby, besides unhealthy diet, low physical activity is also one of the factors causing obesity and abdominal obesity. Previous study also indicated that low physical activity and sedentary lifestyle besides changes in diet and higher energy intake play key roles in the increasing trend of abdominal obesity (Zhai et al., 2017).

This study found a negative correlation between body fat percentage and energy intake which means, the higher the body fat percentage, the lower the energy intake, thus, the alternative hypothesis failed to be rejected. This finding contradicted with previous findings which found a positive correlation instead (Nelson & Tucker, 1996; Vinkness, 2010; Lee et al., 2010; Bowen et al., 2015). A cross-sectional study on the associations between diet, physical activity and body fat distribution among Indian population which is participated by individuals

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who participated in the Indian Migration Study (IMS) or the Andhra Pradesh Children and Parents' Study (APCAPS) found that a 100 kcal higher energy intake was associated with 45 g higher body fat among the APCAPS population (Bowen et al., 2015). However, the association between body fat and energy intake in Nelson & Tucker (1996) study disappeared when differences in body weight were adjusted, suggesting that there is no relationship between energy intake per kilogram body weight and body fatness. Due to the nature of cross-sectional study design, it is difficult to read the association between body fat percentage and energy intake because both data were collected at the same point in time. As such, participants could be making some changes in their dietary habits to reduce weight due to the perception of being overweight or obese during the data collection (Lee & Wan, 2019).

Majority of the employees (~90.0%) who participated in this study had a high BMI and are either overweight (50.8%) or obese (41.8%) with a median BMI of 28.95 kg/m². The proportion of participants with overweight and obesity in this study exceeds the proportion from previous study (~50.0%) by Lee & Wan (2019) and (50.1%) NHMS 2019:MANS. This study was able to find a correlation between BMI and energy intake. Therefore, the alternative hypothesis failed to be rejected. Another local study conducted to study on the association of energy intake and macronutrient composition with overweight and obesity in Malay women also found a positive correlation between energy intake and body weight status (Lee et al., 2010). The WHO MONICA project which was conducted to monitor the trends and determinants in cardiovascular disease found that increment in energy supply is closely associated with the increase in overweight and obesity in western countries (Silventoinen et al., 2004). A study conducted among Flemish adults too found that total energy intake was positively associated with obesity (Duvigneaud et al., 2007). Energy intake that exceeds energy

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expenditure will results in excess energy being deposited as body tissue which over time, will causes obesity (Romieu et al., 2017).

Mental health status that was assessed in this study is depression, anxiety, and stress. Depression, anxiety, and stress were found in 10.7%, 36.8% and 4% of the employees. A study conducted among Yazd populations found that depression, anxiety, and stress were found in 29%, 32.2%, and 34.8% of adult residents of Yazd Greater Area with the symptoms of the disorders were moderate to very severe in 18.2%, 20.2%, and 23.4% of the population, respectively (Mirzaei et al., 2019). The symptoms of the disorders were moderate to extremely severe. Almost 90% of the participants in this study had a normal depression level while approximately only around 10% of the participants had either a mild, moderate, or severe depression level. However, a study conducted among public workers to determine the prevalence of depression and its relationship with work characteristics in Italy found that 83% of the participants reported depression and 17% with no depression (Luca et al., 2014). A local finding on the prevalence and related factors of depression among healthcare personnel at primary healthcare centres reported that 38.5% of the population studies met the minimum criteria for depression with one-third of them found to have moderate to severe depression (Izzudin et al., 2018). Around 23.8% of the participants in this study was found to have a mild level of anxiety and less that 15% of them had either moderate, severe, or extremely severe level of anxiety and the rest had a normal level of anxiety. The finding on the level of anxiety in this study is higher than a research conducted among government employees in India which found that 18.9% of the employees had a symptomatic mild anxiety followed by 11.4% moderate and 2.9% had severe anxiety (Thakur et al., 2019). Looking into the stress level of the participants in this study, 96% of the participants was found to have a normal stress level

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with less than 5% of them had either a mild, moderate, or severe stress level. The discrepancy in findings may be affected by different tools being used to assess the mental health status of the participants.

In this study, depression was not found to be significantly associated with energy intake, thus, the alternative hypothesis was rejected. Similarly, Paans et al. (2019) found no direct association between depression severity and total energy intake. Instead, Paans et al. (2019) found a mediating effect of depression severity on total energy intake through external eating. This study uses data of an ongoing cohort study of persons with depressive and anxiety disorders from the Netherlands Study of Depression and Anxiety (NESDA). A total of 1442 adults from control, with remitted depressive disorder and with current depressive disorder participated in the study at 9-year follow up after excluding those with pure anxiety disorders, missing follow-up data, missing data on psychological eating styles, or had improbable energy intake. Depressive symptoms of the participants were assessed using 30-item Inventory of Depressive Symptomatology – Self Report. Although the procedure of the study was different, some of the findings were similar. On the other hand, a study conducted within a representative sample of individuals from north eastern Iran reported an association between diet and depression score, in which risk of a high depression score was positively associated with energy adjusted dietary vitamin E intake and negatively associated with MUFA (Banikazemi et al., 2015).

This study was not able to find an association between anxiety and energy intake. Therefore, the alternative hypothesis was rejected. In contrast, a study conducted to investigate the interaction effect of anxiety and mood on energy intake and blood pressure in healthy

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women university students found that students who suffered from severe trait and state anxiety level, consumed more energy from food (Jampour et al., 2019). This study was conducted among 82 university students and they were required to complete a valid anxiety questionnaire called state-trait anxiety inventory (STAI) questionnaire at baseline to measure trait and state anxiety score before being divided into two groups to watch a comedy and drama movies for mood induction. Snacks were presented after the movie and energy intake and blood pressure were measured afterwards. Students that had an inappropriate emotional situation before the study were excluded. It could be due to the differences in study design and method as well as different tools being used to assess the anxiety level that leads to a different finding. To add on, another study examining whether trait anxiety and trait anger are associated with vulnerability to emotional eating, especially among obese individuals too found that high trait anxiety was positively associated with food intake among obese individuals (Schneider et al., 2011).

An association between stress and energy intake was not found in this study. Therefore, the alternative hypothesis was rejected. However, a contrasting result was found in a by Koenders and Strien (2011). This study examined the associations between emotional eating and weight gain, whereby, emotional eating was found to be an atypical response of distress. Through this study, it was found that emotional eating maybe a better predictor of overeating causing weight gain and that emotional eating tend to drive people with overweight or obesity to overeat rather than external eating which is a tendency to eat in response to food cues such as sight and smell of food (Koenders & Strien, 2011). On the contrary, another study investigating the relationship between stress and food intake found that the stressed group consumed lower energy and fat intake compared to the non-stressed group (Cheng & Kamil, 2020). The variability between results could be further understood from the literature where a

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study stated that there are differences in individual's response to stress with some increases their food intake or being hyperphagic while others decreases their food intake or being hypophagic and there are also individuals who do experience any changes in their eating behaviour during stressful periods (Yau & Potenza, 2014).

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CHAPTER 6

CONCLUSION, STRENGTH, LIMITATION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion, the mean energy intake among the employees was 1439±477 kcal/day. About 92.6% of the respondents were either overweight or obese, and 86.9% and 95.9% of them having waist circumference and body fat which surpassed the normal values, respectively. Significant correlation was found between body composition and BMI with energy intake. The findings on high number of participants with high body composition and high BMI need to be addressed immediately as having high waist circumference, body fat percentage and BMI are associated with many major diseases. However, 84.4% of the respondents reported inadequate energy intake which did not reflect the prevalence of overweight and obesity among the subjects. The subjects were either under reported their energy intake or they could be undergoing low energy intake in order to reduce their body weight. If the subjects under reported, thus dietary recalls may not be a useful tool to assess dietary intake among overweight or obese population. Other methods need to be used.

However, no significant association was found between sociodemographic characteristics and mental health status with energy intake. The prevalence of depression or anxiety among the subjects were low, and thus no significant associations were found between their mental health status and energy intake. Even though only a small number of participants were found to have a symptoms of depression, anxiety and stress, the mental health status of the employees needs to be addressed accordingly and should not be taken lightly and neglected as the burden of mental disorders continue to grow with significant impacts on health (Mirzaei et al., 2019).

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Last but not least, more findings by future studies are very much needed and important to create a better understanding about the factors associated with energy intake among employees in healthcare facilities and to provide a suitable intervention to improve the energy intake of the employees.

6.2 Strengths

Present study has provided new information on the energy intake among employees in healthcare facilities. This study also used a validated instrument such as DASS-21 to assess the mental health of the employees. Furthermore, trained researchers were involved for the measurement and assessment during the data collection.

6.3 Limitations

The present findings must be interpreted in light of several limitations. Firstly, as this study uses a cross-sectional study design, it was not able to determine the causality between the independent variables and dependent variables. Secondly, this study was conducted employees working in healthcare facilities in the Federal Territories of Putrajaya and the Federal Territories of Kuala Lumpur, therefore, the findings of this study may not well represent other employees working in healthcare facilities in sub-urban or rural settings. Thirdly, majority of the participants of this study were either overweight and obese and only a very small number were of normal weight, thus, some of the findings of this study may not well reflect those with normal weight. Fourthly, the usage of diet recall may not be suitable as it may not represent the long-term dietary habits of the respondents. Fifthly, this study assessed the mental health status of participants using a self-reporting questionnaire. The limitation of this approach is

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that self-reporting does not necessarily accurately reflect the mental health of the participants. And sixth, due to the COVID19 pandemic, this study was only able to achieve 94% from the target sample population.

6.4 Recommendations

Although this study cannot determine the causality relationship between independent and dependent variables, the findings from this study can be used as a piece of baseline information for researchers to improvise a longitudinal study to conduct research that may show the causality relationship between variables. This may add to the body of literature review regarding which factors really influence the energy intake among employees in healthcare facilities. Furthermore, future studies should also be conducted in rural or sub-urban area or other parts of Malaysia. Finally, more health promotion program focusing to improve the energy intake among employees working in healthcare facilities should be conducted to improve the general well-being of the employees.

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APPENDICES

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Appendix I: APPROVAL FROM MEDICAL RESEARCH AND ETHICS COMMITTEE

JAWATANKUASA ETIKA & PENYELIDIKAN PERUBATAN
(*Medical Research & Ethics Committee*)
KEMENTERIAN KESIHATAN MALAYSIA
d/a Kompleks Institut Kesihatan Negara
Blok A, No 1, Jalan Setia Murni U13/52,
Seksyen U13, Bandar Setia Alam,
40170 Shah Alam, Selangor.
Tel: 03-3362 8888/8205

Ref : KKM/NIHSEC/ P18-2230 (12)
Date: 13-February-2020

DR ROSITA JAMALUDDIN
UNIVERSITY PUTRA MALAYSIA (UPM)

WAN SAHIDA BINTI WAN ZULKIFLI
UNIVERSITY PUTRA MALAYSIA (UPM)

Dear Sir/ Mdm,

AMENDMENTS FOR STUDY: NMRR-17-3347-39165 (IIR)

Protocol No :
EFFECTIVENESS OF HEALTH EDUCATION ON WEIGHT STATUS AMONG EMPLOYEES DINING AT CAFETERIA SIHAT AT SELECTED HOSPITAL IN FEDERAL TERRITORY, MALAYSIA

Your amendment submission dated 07-February-2020 is referred.

2. Amendments of the following have been received and reviewed with reference to the above study:

Documents received and reviewed with reference to the above study:

1. Addition of new investigators:

Investigators	Study Sites	Investigators' role	Investigator's document
Nurin Fariha Bt Ahmad Badrin	Hospital Putrajaya, Hospital Kuala Lumpur	Co / Sub Investigator at the site	CV, GCP Certificate
Siti Basyirah Bt Ahmad Anuar	Hospital Putrajaya, Hospital Kuala Lumpur	Co / Sub Investigator at the site	CV, GCP Certificate

2. Declaration conflict of interest

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Appendix II&III: INFORMATION SHEET & CONSENT FORM

PARTICIPATION SHEET AND INFORMED CONSENT FORM

1. **Title of study:** Factors associated with energy intake among employees in healthcare facilities in Federal Territories in Malaysia.

2. **Name of investigator:** Siti Basyirah Binti Ahmad Anuar

   Name of institution: Hospital Kuala Lumpur & Hospital Putrajaya

3. **Introduction:**
   You are invited to participate in a research study because you are the employees of Hospital Kuala Lumpur/Hospital Putrajaya. The details of the research are described in this document. It is important that you understand why the research is being done and what it will involve. Please take your time to read through and consider this information carefully before you decide if you are willing to participate. Ask the study staff if anything is unclear or if you like more information. After you are properly satisfied that you understand this study, and that you wish to participate, you must sign this informed consent form. Your participation in this study is voluntary. You do not have to be in this study if you do not want to. You may also refuse to answer any questions you do not want to answer. Of you volunteer to be in this study, you may withdraw from it at any time. If you withdraw, any data collected from you up to your withdrawal will still be used for the study. Your refusal to participate or withdrawal will not affect any medical or health benefits to which you are otherwise entitled. This study has been approved by the Medical Research and Ethics Committee, Ministry of Health Malaysia.

4. **What is the purpose of the study?**
   The purpose of this study is to determine the association between sociodemographic characteristics, body composition, body mass index, mental health status and energy intake among employees in healthcare facilities in Federal Territories in Malaysia.

   A total of 122 subjects will be participating in this study. The whole study will last about 3 months and your participation will be about 20 minutes.

5. **What will happen if I decide to take part?**
   Firstly, you need to fill in your sociodemographic data in the section A of the questionnaire. Next, section B of the questionnaire which include measuring weight, height, waist circumference and body fat percentage will be measured 3 times by the researcher. You may need to stand up for a long period to measure 3 times of height, weight, waist circumference and body fat percentage. After that, you will need to fill in the questionnaire regarding your mental health status. Finally, your dietary intake for the past 2 weekdays and 1weekend will be asked by the researcher.

6. **What are my responsibilities when taking part in this study?**
   It is important that you answer all of the questions asked by the study staff honestly and completely. You are also required to follow the instructions of researcher during the health measurements. If you feel uncomfortable to join any part of the study, you must tell the researcher. You will be informed if new information relevant to consent becomes available and you will be asked to reconsent.

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7. **What are the benefits of being in this study?**
   There may or may not be any benefits to you. Information obtained from this study will help improve the treatment or management of other participants with the same disease or condition.

8. **What are the risks of being in this study?**
   Low risk may present since no treatment or intervention is involved in the study.

9. **What are the anticipated expenses, if any, including who pays for study treatments and procedures?**
   No expenses are required as the researcher only involve interview and questionnaires.

10. **Will my information be kept private?**
    All of your information obtained in this study will be kept and handled in a confidential manner, in accordance with applicable law and/or regulations. When publishing or presenting the study results, your identity will not be revealed without your expressed consent.

11. **Will the study findings be informed if the study is potentially useful to me?**
    If you are interested to the research results, you can leave your contact number. The researcher will contact you about the findings after they analyse the data.

12. **Who should I call if I have questions?**
    If you have any questions about the study, please contact the researcher of this study, Siti Basyirah at telephone number 01139026736 or email to sitibasyirah@yahoo.com. You may also contact the researcher's supervisor, Assoc Prof. Dr Rosita Jamaluddin at telephone number 03-97692467

    If you have any questions about your right as a participant in this study, please contact: The Secretary, Medical Research & Ethics Committee, Ministry of Health Malaysia, at telephone number 03-22874032

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INFORMED CONSENT FORM

Title of study: Factors associated with energy intake among employees in healthcare facilities in Federal Territories in Malaysia.

By signing below, I confirm the following:

- I have been given oral and written information for above study and have read and understood the information given.
- I have had sufficient time to consider participation in the study and have had the opportunity to ask questions and all my questions have been answered satisfactorily.
- I understand that my participation is voluntary and I can at any time withdraw from the study without giving a reason and this will in no way affect my future treatment. I am not taking part in any other research study at this time. I understand the risks and benefits, and I freely give my informed consent to participate under the conditions stated. I understand that I must follow the study investigator's instruction related to my participation in the study.
- I understand that all the information gathered in this research will be kept strictly confidential and not made available to anyone not involved in this research.
- I agree/disagree* to take part in the research stated above.
  *(*delte which is not applicable)*

Subject:

Signature: I/C number:

Name: Date:

Investigator conducting informed consent:

Signature: I/C number:

Name: Date:

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Appendix IV: QUESTIONNAIRE

FACULTY OF MEDICINE AND HEALTH SCIENCES
DEPARTMENT OF DIETETICS AND NUTRITION

QUESTIONNAIRE *(BORANG SOAL SELIDIK)*
CONFIDENTIAL (*SULIT*)

FAKTOR BERHUBUNG DENGAN PENGAMBILAN TENAGA DALAM KALANGAN PEKERJA DI SEKTOR KESIHATAN DI WILAYAH PERSEKUTUAN DI MALAYSIA.

Researcher's name (*Nama penyelidik)* : Siti Basyirah Binti Ahmad Anuar

Programme *(Program)* : BSc (Dietetics)

Supervisor *(Penyelia)* : Prof Madya Dr Rosita Jamaluddin

Participant's name (*Nama peserta)* : _____

Date (*Tarikh)* : _____/_____/2019

Hospital Awam :

(Sila tandakan (√) pada yang berkenaan)

A	Hospital Kuala Lumpur	
B	Hospital Putrajaya	

Soal selidik ini mengandungi:

Seksyen 1: *Personal information (15 questions)/ Maklumat diri (15 soalan)*
Seksyen 2: *DASS 21 Questionnaire*
Seksyen 3: *3 Days Dietary recall*

(Maklumat peribadi yang diberikan adalah sulit dan hanya digunakan untuk tujuan kajian sahaja. Kesudiaan anda dalam menjawab soalan soal selidik ini amat dihargai dan jutaan terima kasih diucapkan di atas kerjasama yang diberikan).

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SEKSYEN 1: KETERANGAN DIRI (✓PADA YANG BERKENAAN)

No Id kakitangan : _____

1. Umur : _____ Tahun
2. Jantina :

Lelaki		Perempuan	

3. Bangsa :

a) Melayu		b) Cina	
c) India		d) Lain-lain	

Nyatakan: _____

4. Status Perkahwinan :

a) Bujang		b) Bercerai	
c) Berkahwin		d) Balu/duda	

5. Pendapatan bulanan : _____

6. Taraf Pendidikan:

Tidak bersekolah	
Rendah (UPSR)	
Menengah (PMR/SPM)	
Pra-Universiti (STPM/Diploma)	
Sarjana Muda (Bachelor)	
PhD/ Sarjana	

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Pengukuran Antropometrik

1) Tinggi:	M
2) Berat:	Kg
3) Indeks Jisim Tubuh (BMI):	Kg/m^2
4) Ukur Lilitan Pinggang:	CM
5) Peratus Lemak Badan:	%

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QUESTIONNAIRE DASS-21 (STRESS, ANXIETY & DEPRESSION)

Sila baca setiap kenyataan di bawah dan bulatkan pada nombor 0,1,2 atau 3 bagi menggambarkan keadaan anda sepanjang minggu yang lalu. Tiada jawapan betul atau salah. Jangan mengambil masa yang terlalu lama untuk menjawab mana-mana kenyataan.

Skala permakahan adalah seperti berikut:

Kod	Skala
0	Tidak langsung menggambarkan keadaan saya
1	Sedikit atau jarang- jarang menggambarkan keadaan saya
2	Banyak atau kerapkali menggambarkan keadaan saya
3	Sangat banyak atau sangat kerap menggambarkan keadaan saya

Kod	**Item**	**0**	**1**	**2**	**3**
D1	Saya dapati diri saya sangat sukar ditenteramkan				
D2	Saya sedar mulut saya terasa kering				
D3	Saya tidak dapat mengalami perasaan positif sama sekali				
D4	Saya mengalami kesukaran bernafas (Cth; nafas yang laju, tercungkap-cungkap)				
D5	Saya sukar mendapatkan semangat bagi memerluka sesuatu perkara				
D6	Saya cenderung untuk bertindak keterlaluan dalam sesuatu keadaan				
D7	Saya rasa menggeletar (Cthnya pada tangan)				
D8	Saya rasa saya mengguynakan tenaga dalam keadaan cemas				
D9	Saya bimbang keadaan di mana saya mungkin menjadi panic dan melakukan perkara yang membodohkan				
D10	Saya rasa saya tidak mempunyai apa-apa untuk diharapan				
D11	Saya dapati diri saya semakin gelisah				
D12	Saya rasa sukar untuk relaks				

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D13	Saya rasa sedih dan murung				
D14	Saya tidak dapat menahan sabar dengan perkara yang menghalang saya meneruskan apa yang saya lakukan				
D15	Saya rasa saya menjadi hamper panic				
D16	Saya tidak bersemangat dengan apa yang saya lakukan				
D17	Saya tidak bergitu berharga sebagai seorg individu				
D18	Saya rasa saya mudah tersentuh				
D19	Saya sedar tindakbalas jantung saya walaupun tidak melakukan aktiviti fizikal (Cth; Kadar denyutan jantung bertambah atau denyutan jatung berkurangan)				
D20	Saya berasa takut tanpa sebab munasabah				
D21	Saya rasa hidup ini tidak bermakna				

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- DIETARY RECALL-

Hospital Awam : **Hospital Putrajaya / Hospital Kuala Lumpur**

Nama : _____

Jabatan : _____

No. telefon : _____

Arahan Mengrekod Pengambilan Makanan dan minuman Anda

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Sila ikut arahan di bawah dengan teliti. Lebih tepat anda menerangkan semua yang anda makan dan minum untuk data yang lebih tepat dalam penyelidikan ini.

1. Di bahagian atas setiap halaman, isikan hari dalam seminggu dan tarikh.
2. Tulis semua yang anda makan dan minum termasuk air dan semua vitamin dan suplemen yang diambil untuk tempoh 3 hari. Jangan lupa untuk memasukkan snek atau makanan yang dimakan semasa menyediakan makanan.
3. Untuk kajian ini anda akan merekod pengambilan makanan selama tiga hari, iaitu dua hari (2) bekerja dan satu (1) hari bagi hujung minggu (Sabtu atau Ahad.

Saya akan merekod pengambilan makanan dan minuman saya selama tiga (3) hari ini
(Contoh: Jumaat, 15/2/2018)

Hari 1, Tarikh: _____

Hari 2, Tarikh: _____

Hari 3, Tarikh: _____

Sila rekod makanan dan minuman yang diambil menggunakan alat ukur rumahtangga (cawan/gelas/senduk/sudu,) untuk mengukur bahagian makanan yang dimakan. Sekiranya alat ukur tidak tersedia, anda mesti menganggarkan saiz bahagian apa yang anda makan. Sila rujuk pengiraan anggaran bahagian alat pengukuran rumahtangga yang telah disediakan bagi membantu anda merekod pengambilan makanan dan minuman anda.

a) Anda mempunyai dua muka surat untuk merekod pengambilan makanan dan minuman anda setiap hari. Termasuk seberapa banyak yang mungkin tentang setiap item makanan, seperti jenis susu, potongan daging, nama restoran, nama jenama, kaedah penyediaan dan lain-lain.
b) Jangan lupa merekod pengambilan sos, kuah, dan atau perasa yang ditambah kepada makanan dan minuman anda. Senaraikan ini pada baris berasingan. Juga, jangan lupa untuk merekodkan semua minuman anda yang diambil bersama makanan atau di antara waktu makan.
c) Jika anda makan di luar sila rekodkan restoran atau tempat makan, serta jika boleh sila nyatakan kaedah penyediaan makanan. Anggarkan saiz jika tidak dinyatakan pada me

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Pengambilan Makanan dan Minuman, Hari 1

Hari : _____ Tarikh : _____

Masa	Makanan & Minuman (termasuk jenama, penyediaan dan restoran)	Jumlah	Catatan
Sarapan Pagi			
Snek pagi			
Makan tengahari			
Minum petang			
Makan Malam			
Lain-lain			

11

Pengambilan Makanan dan Minuman, Hari 2

Hari : _____ Tarikh : _____

Masa	Makanan & Minuman (termasuk jenama, penyediaan dan restoran)	Jumlah	Catatan
Sarapan Pagi			
Snek pagi			
Makan tengahari			
Minum petang			
Makan Malam			
Lain-lain			

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Pengambilan Makanan dan Minuman, Hari 3

Hari : _____ Tarikh : _____

Masa	Makanan & Minuman (termasuk jenama, penyediaan dan restoran)	Jumlah	Catatan
Sarapan Pagi			
Snek pagi			
Makan tengahari			
Minum petang			
Makan Malam			
Lain-lain			

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